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A Genetic Algorithm for Optimizing Background Subtraction Parameters in Computer Vision

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Abstract: Tracking moving objects in a video sequence is a critical task in several compu-ter vision applications. A common approach is to perform background subtraction which identifies moving objects in a video frame. The mixture of Gaussians model is one of the most popular techniques for performing background subtraction. The performance of the mixture of Gaussian model strongly depends on parameters such as learning rate, background ratio, and number of Gaussians. Fine tuning these parameters is a huge challenge for efficient performance of the background subtraction algorithm. In this work, we propose a genetic algorithm to determine the optimal values of the learning rate and background ratio. Experiments based on the Wallflower test images demonstrate the superior performance of the genetic algorithm when compared to a recently proposed particle swarm optimization approach.

Keywords: mixture of gaussians; background subtraction; genetic algorithm.

1. INTRODUCTION

With the arrival of fast and efficient computer programs working with real-time data, image processing has exploded into many vast fields. One such field is video surveillance. In this paper, we consider the problem of video surveillance and monitoring. An efficient surveillance system must be capable of handling lighting changes, cluttered background, shadows, and moving objects. Background subtraction is the very first step in several computer vision applications. The background subtraction algorithm should be able to accurately extract the foreground pixels

corresponding to the moving object. Recently, researchers have used adaptive backgrounding for effective tracking of moving objects where the images are averaged over time with a predetermined threshold for the entire scene [1,2]. Several background subtraction techniques have been proposed in the literature [3-8]. Among these, the mixture of Gaussians (MoG) model proposed by Staufer and Grimson is widely used due to its robustness to variations in lighting and higher accuracy [3]. However, the performance of this approach is dependent upon choosing the appropriate values of parameters such as learning rate and background ratio. The ideal values of these parameters change for different scenarios such as indoor vs. outdoor. Fine tuning these parameters poses significant challenges on the adaptability of the approach for a different applications. Due to these issues, end users have significant challenges choosing the right parameter values for obtaining optimal results using the background subtraction algorithm.

To address these challenges, we propose an optimization technique using a genetic algorithm to determine the optimal values of parameters such as learning rate and background ratio. This will eliminate the need for manual fine tuning of the parameters and provide the ability to perform efficient background subtraction for a variety of scenarios. We develop a fitness function that determines the similarity of the results obtained from the background subtraction technique to the ground truth image. We compare the performance of the genetic algorithm with a particle swarm optimization (PSO) approach proposed in [9]. Our simulation results show that the genetic algorithm outperforms PSO on a variety of test images in the wallflower data set.

2. MIXTURE OF GAUSSIANS

In this section, we describe the mixture of Gaussians model proposed in [3]. Background modeling is a key element of a background subtraction algorithm. Several researchers have developed background modeling techniques for identifying moving objects of interest.

Among these, the mixture of Gaussians approach is widely popular because of its high accuracy and ability to handle multimodal background distributions. The MoG model maintains a probability density function for each pixel. The pixel distribution $f(I_t = u)$ is modeled as a mixture of *K* Gaussians.

$$f(I_t = u) = \sum_{i=1}^{K} w_{i,t}\eta(u; \mu_{i,t}, \sigma_{i,t}) \quad (1)$$

Where I_t denotes the luminance pixel intensity at time *t*, $\eta(u; \mu_{i,t}, \sigma_{i,t})$ is the ith Gaussian distribution with mean $\mu_{i,t}$, standard deviation $\sigma_{i,t}$ and $w_{i,t}$ is the proportion of data accounted for by the *i* [th] component. The parameter *K* indicates the total number of Gaussian distributions. The weights wi,t are updated as:

$$w_{i,t} = (1-\alpha)w_{i,t-1} + \alpha \quad (2)$$

Where α is the learning rate and $0 \le \alpha \le 1$. The Gaussians are ordered by the value of $w_{i,t} / \sigma_{i,t}$. After sorting, the first M components that satisfy the following criteria are declared to be the background components.

$$\sum_{j=1}^{M} w_{j,t} \ge T \quad (3)$$

Where *T* is a measure of the minimum portion of data that should be accounted for by the background. The learning parameter and background ratio are crucial parameters of the MoG model.

The learning rate governs how rapidly the algorithm adapts to changes in a scene. For simple scenarios a small value of learning rate will enable adaptation to illumination changes and other minor modifications in the background. However in more complex scenarios such as an outdoor setting, a higher learning rate might be needed to accommodate rapid changes in illumination and factors such as wind and movement of trees. The background ratio specifies the probability of a pixel value belonging to the background. If the value of *T* is very low, only some of the modes might be considered background. A large value of *T* may cause foreground distributions to represent the background. Hence, choosing optimal values of learning rate and background ratio is a very challenging task and needs fine tuning to suit the specific application at hand. In the next section, we describe a genetic algorithm for finding the optimal values of these parameters.

3. METHODOLOGY

Our goal is to determine the vector $x = \{\alpha, T\}$ that maximizes the following objective functions:

- Recall: $f_1(x)$
- Precision: $f_2(x)$

where

$$f_1(x) = \frac{\text{Number of foreground pixels correctly identified by the algorithm}}{\text{Number of foreground pixels in the ground truth}}$$

$$f_2(x) = \frac{\text{Number of foreground pixles correctly identified by the algorithm}}{\text{Number of foreground pixels detected by the algorithm}}$$

Maximization of precision reduces the percentage of false positives while maximizing the recall reduces the number of false negatives. There is a tradeoff between recall and precision. Recall increases with the number of foreground pixels detected which results in a decrease in precision. The classical approach to solve a multi-objective optimization problem is to assign a weight to each objective function and optimize the resulting single objective function. Hence, we define a new objective function $z(x)$ as:

$$z(x) = \omega_1 f_1(x) + \omega_2 f_2(x) \tag{4}$$

Where ω_1 and ω_2 are the weights such that $\omega_1 \in (0,1)$, $\omega_2 \in (0,1)$ and $\omega_1 + \omega_2 = 1$.

3.1 Weight Based Genetic Algorithm

Genetic algorithms are a family of computational models inspired by evolution [10]. They use a population of initial sample points in search space together with selection and recombination operators to generate new sample points. The goal of

the genetic algorithm is to find the optimal values of learning rate and background ratio for maximizing the fitness function *z(x).* In this work, we propose a weight based genetic algorithm where each solution vector x_i in the population uses a different weight vector $\omega_i = \{\omega_1, \omega_2\}$. The weight vector is embedded within embedded within the solution vector x_i such that $x_i = \{\alpha_i, T_i, \omega_i\}$. Fig. 1 describes the various steps of the genetic algorithm.

1. Generate a random set of solutions x_i constituting a population P_t of size *n.*
2. Assign a fitness value to each solution x_i by performing the following steps:

   2.1 Generate a random number $u_k \in [0,1]$ for each objective *k* where *k*=1,2.

   2.2 Calculate the random weight of each objective k as $\omega_k = (1/u_k)\sum_{i=1}^{2} u_{i.}$

   2.3 Compute the fitness of each solution $z(x_i)$.

3. Calculate the selection probability $p(i)$ of each solution x_i as:

$$p(i) = \frac{z(x_i)}{\sum_{j=1}^{n} z(x_j)}$$

4. Select parents using the selection probabilities in step 3. Apply crossover and mutation operators to generate offspring. Replace the solutions in parent population P_t with the new off spring.
5. If the termination condition is not satisfied, move to step 2.

Fig. 1. Weight based genetic algorithm

We use a uniform crossover operator where each element (parameter) in the offspring is created by copying the corresponding element from one or other parent according to a random crossover mask. Each offspring undergoes a Gaussian mutation technique where a Gaussian distributed random value with mean zero and variance one is added to each element.

Details of the crossover and mutation operators are discussed in [11,12]. The background subtraction algorithm poses limits on the values of learning rate and background ratio. Hence, if the mutation operator results in a parameter value outside the limits, its value is forced to the minimum or maximum of the corresponding parameter.

4. RESULTS AND DISCUSSION

We performed several simulations based on Wallflower test images [13]. The data base includes challenging scenes such as sudden illumination change, clutter motion, and slow moving foreground objects. The mixture of Gaussians model is used for all experiments. We set the number of Gaussians to five while varying the background ratio and the learning rate. We compare the performance of the weight based genetic algorithm (GA) with the particle swarm optimization (PSO) approach proposed in [9]. We use a population size of 30 for both GA and PSO and the number of generations was set to 40. Fig. 2 shows the variation of fitness function $z(x)$ with the number of generations for the waving trees test image shown in Fig. 3a. We observe that the genetic algorithm outperforms PSO and converges within 20 generations. The GA converges to a fitness value of 0.87 while compared to PSO which converges to 0.5. This also shows that the GA obtains better precision and recall by optimizing the learning rate and background ratio.

Figs. 3a and 3b show the test image and the ground truth of a scenario obtained from the wall flower data set. The waving trees in the background pose a significant challenge in the background subtraction algorithm.

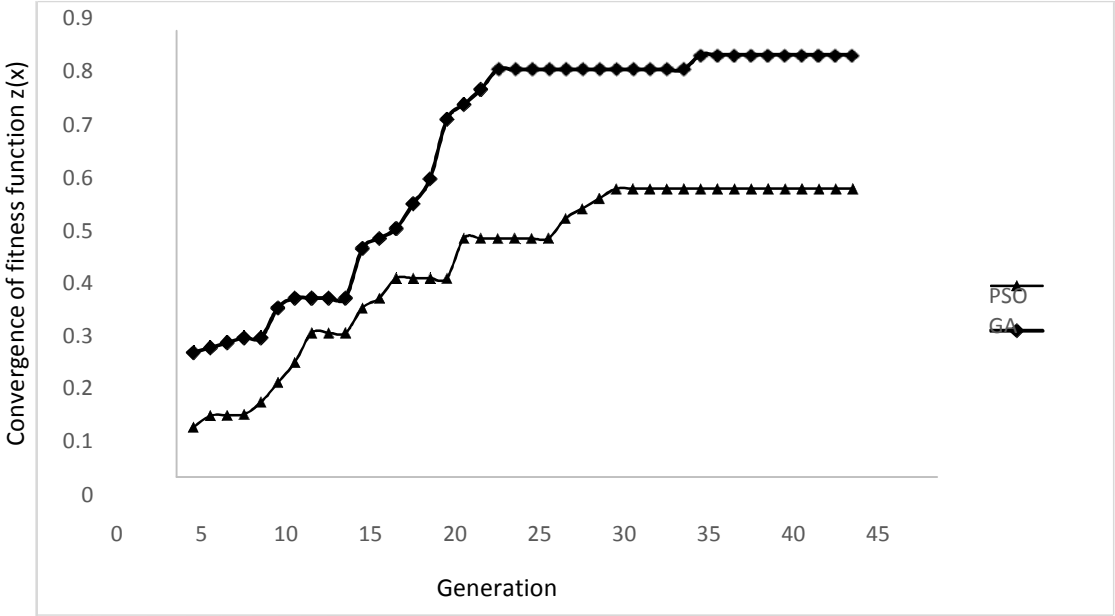

Fig. 2. Performance comparison of genetic algorithm and particle swarm optimization

Fig. 3a. Test image of the waving trees scenario

Fig. 3b. Ground truth of the waving trees scenario

Figs. 4a and 4b show the results obtained by PSO and GA respectively. From these figures, we observe that the GA outperforms PSO and obtains a binary mask that closely resembles the test image. This shows that the genetic algorithm was able to obtain the optimal values of learning rate and background ratio while handling challenges such as waving trees in the background.

Fig. 4a. PSO results for waving tree scenario

Fig. 4b. GA results for waving trees scenario

Figs. 5a and 5b show the test image and ground truth of another scenario in the wall flower data set. In this image, a static foreground occludes the dynamic background. Figs. 6a and 6b show the results obtained by PSO and GA respectively. We observe that the genetic algorithm obtains a video mask that closely resembles the ground truth. This shows the superior performance of the GA when compared to PSO while handling occlusion.

Fig. 5a. Test image of the foreground occlusion scenario

Fig. 5b. Ground truth of the foreground occlusion scenario

Fig. 6a. PSO results for the foreground occlusion scenario

Fig. 6b. GA results for the foreground occlusion scenario

We also performed experiments on several other test images from the wallflower data set. We observed that the genetic algorithm obtained much better results when compared to PSO on all test images.

To assess the efficiency of the genetic algorithm, we performed simulations for detecting a person in a room with lighting changes. Figs. 7a and 7b show the frames of the original video used in our simulations. Fig. 7a shows two people entering the room at t=3 seconds. There is a significant lighting change at t=4 seconds, which is the main source of background noise. Fig. 7b shows the person leaving the room at t=8 seconds. The total duration of the video is 9 seconds.

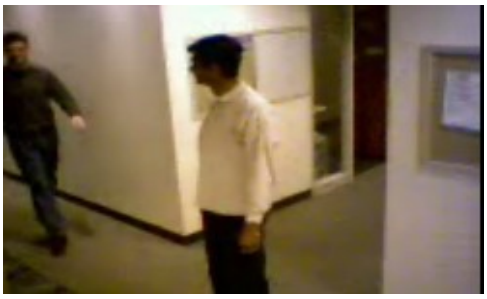

Fig. 7a. Original video at t=3 seconds

Fig. 7b. Original video at t=8 seconds

Figs. 8a and 8b show the results obtained by GA and PSO respectively. We observe that the GA outperforms PSO by eliminating background noise completely. This demonstrates the ability of the genetic algorithm to perform efficient and robust tracking.

Fig. 8a. PSO results for the video at t=8 seconds

Fig. 8b. GA results for the video at t=8 seconds

5. CONCLUSION

This paper proposed a genetic algorithm for optimizing the learning rate and background ratio in the mixture of Gaussians model. Fine tuning these parameters is a complex task and varies for different applications. To alleviate this problem, we proposed a genetic algorithm for optimizing the parameters thus improving the performance of the background subtraction algorithm. We used two important performance metrics - precision and recall to develop a fitness function. We compared the performance of the genetic algorithm with a recently proposed particle swarm optimization approach.

Simulations on several videos from the wall flower data set showed that the GA outperforms PSO and converges within twenty generations. Future work will investigate multi-objective optimization approaches for simultaneously maximizing the precision and recall. We also plan to investigate approaches for optimizing other parameters such as the number of Gaussians and the number of training frames to eliminate fine tuning of such parameters for different videos.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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Anti-Inflammatory Effects of New Flavonoids from Streptomyces sp. BT01 in Lipopolysaccharide-Stimulated RAW 264.7 Murine Macrophages via Inhibition of NF-KappaB Activation

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Abstract: Most flavonoids are known to have anti-oxidant, anti-bacterial and analgesic properties. In this study, the new flavonoids, 7-methoxy-3,3',4',6-tetrahydroxyflavo-ne (1) and 2',7-dihydroxy-4'5'-dimethoxyisoflavone (2) isolated from *Streptomyces* sp. BT01 inhibited the pro-inflammatory mediators including cytokines by blocking nuclear factor-kappaB (NF-κB) signalling in lipopolysaccharide (LPS)-stimulated RAW 264.7 cells. These flavonoids suppressed mRNA and protein expression of inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2) in LPS-stimulated RAW 264.7 cells. The molecular mechanism was associated with the inhibition of NF-κB activation. These results suggest that these flavonoids have antiinflammatory effects by suppressing expression of iNOS, COX-2 and cytokines by blocking the NF-κB signalling in LPS-stimulated RAW 264.7 cells.

Keywords: anti-inflammatory effects; flavon oids; RAW 264.7; Strep tomyces sp.

1. INTRODUCTION

Flavonoids are a family of substances whose members have many interesting biological properties including anticancer, antimicrobial, antiviral, antithrombotic, anti-inflammatory, and immunomodulatory activities [1,2,3,4]. Of these biological activities, the anti-inflammatory capacity of flavonoids has long been emphasized in oriental medicine. The excessive activation of macrophages can induce the production of several kinds of pro-inflammatory enzymes and cytokines. Pro-inflammatory enzymes, which are the mediators of inflammation, include inducible forms of nitric

oxide synthase (iNOS) which makes nitric oxide (NO) from L-arginine. NO is involved in various biological processes, including inflammation [5,6]. Cyclooxygenase-2 (COX-2) is the enzyme that converts arachidonic acid to prostaglandins which are involved in inflammatory response. Pro-inflammatory cytokines, such as tumor necrotic factor (TNF)-α, interleukin (IL)-1β, and IL-6, are mainly produced in macrophages activated by Gram negative bacteria-derived lipopolysaccharide (LPS) [7]. TNF-α is thought to be one of the most important mediators of inflammatory diseases. It is elevated in some pathogenic conditions and possesses potential toxic effect that results in hyper-sensitivity reactions with chronic inflammation [8,9]. IL-1β is a multifunctional cytokine that is responsible for various processes including host defense, inflammation and response to injury. It is produced by many cell types, predominantly by macrophage [10,11]. IL-6 is a cytokine produced by a number of normal and transformed cells. It is believed to be an endogenous mediator of LPS-induced fever [12,13,14].

In recent years, people began to use natural product compounds from plants and microorganisms to prevent and treat inflammatory responses by inhibiting inflammatory cytokines, such as TNF-α, IL-1β, and IL-6, and this has become an important area of investigation. During our recent investigations of the anti-inflammatory compounds, lansai C and lansai D were isolated from *Streptomyces* sp. SUC1 which had anti-inflammatory activity [15,16]. We report here the anti-inflammatory properties of two new flavonoids, 7-methoxy-3,3',4',6-tetrahy-droxyflavone (1) and 2',7-dihy-droxy-4'5'-dimethoxyisoflavone (2) by investigating their effects on the inhibition of production of NO, prostaglandin E_2 (PGE_2), TNF-α, IL-1β, and IL-6 and also expression of iNOS and COX-2 in LPS-activated macrophage RAW 264.7 cells. These two new flavonoids were found to have significant, dose-related inhibitory effects on LPS-induced NO, PGE_2, TNF-α, IL-1β, and IL-6 production.

2. MATERIALS AND METHODS

2.1 Microorganisms

Streptomyces sp. BT01 was isolated from the root tissues of *Boesenbergia rotunda* (L.) Mansf. by the surface-sterilization technique [17]. The characteristics of *Streptomyces* sp. BT01 were observed. For morphological characteristics, presence of aerial mycelium, spore mass colour, distinctive reverse colony colour, diffusible pigment, sporophore and sporechain morphology were recorded after 10 days incubation on International Streptomyces Project-2 (ISP-2) medium. Diaminopimelic

acid isomers and sugars from whole-cell extract were analysed for chemotaxonomic studies as report in a previous study [18].

2.2 Extraction and Purification of Active Compounds

A spore suspension of *Streptomyces* sp. BT01 was prepared in distilled water from cultures grown on International Streptomyces Project-4 (ISP-4) medium at 30 °C for 10 days. The suspension, 10^8 spores per 100 ml of liquid medium, was added to ISP-2 broth in each 500-ml Erlenmeyer flask. Cultures were kept on an orbital shaker at 30 °C for 48 h and used as seed stocks. For large production of culture filtrates, the strain BT01 was grown in a modified 3000 ml glass container containing 1500 ml of ISP-2 broth, and incubated in an orbital shaker for 5 days at the same condition. The 5-day-old cultures were filtrated by Whatman paper No. 1 under vacuum. The mycelial mats were washed with distilled water and separated by centrifugation at 8500 g for 20 min. The culture filtrate and mycelial mats of the strain BT01 were extracted three times with 1/3 volumes of ethyl acetate. This organic solvent was pooled and then taken to dryness under flash evaporation at 40ºC. The yield of dry material per litre was about 753 mg, which was dissolved in 10 ml of chloroform and fractionated on column chromatography (Merck silica gel 60, 35-70 mesh) with hexane, diethyl ether and methanol. The combined fractions eluted with 50% diethyl ether in hexane, 100% diethyl ether, and 5% methanol in diethyl ether (286 mg) were further separated by MPLC (400 x 40 mm column, Merck LiChroprep Si 60, 25-40 m, UV-detection, 254 nm) to afford fraction A (57 mg) and fraction B (104 mg). Final purification of fraction A and B were achieved by prep TLC (Merck, Si gel 60, 0.5 mm; dichloromethane: diethyl ether = 75: 25) to give 16 mg of compound 1 from fraction A and 28.5 mg of compound 2 from fraction B.

2.3 Characterisation of the Compounds

The structures of purified compounds have been identified using NMR and mass spectral data. The melting point of the compounds was determined on a Buchi-540 melting point apparatus. Optical rotations were measured on a Perkin-Elmer 241 polarimeter, IR spectra on a Perkin-Elmer 1 spectrometer, ^{1}H and ^{13}C NMR spectra on a Bruker DRX 500 spectrometer, and EI-MS and FAB-MS respectively on a Hewlett-Packard 5989 B and a Finnigan/Thermo Quest Mat 95 XL mass spectrometer.

2.4 Anti-inflammatory Activity

Murine macrophage RAW 264.7 cell line obtained from American Type Culture Collection (ATCC, Maryland, USA), was maintained in Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% heat inactivated fetal bovine serum (FBS), penicillin G (100 IU/ml), streptomycin (100 µg/ml), and L-glutamine (2 mM) and incubated at 37ºC in a humidified atmosphere containing 5% CO_2. Cells (1x10 /ml) were pre-incubated for 2 h with compound 1 or 2 (5, 10 and 20 µg/ml) and further cultured for 24 h (for pro-inflammatory cytokine, mediator and NO production) and 2, 6, 9, 12, and 24 h (for RT-PCR analysis) and 9 h (for protein expression) with LPS (1 µg/ml) in 6-well plates. Supernatants were removed at the allotted times and PGE_2, TNF-α, IL-1β, and IL-6 levels were quantified by immunoassay kits according to the manufacture's protocols (Assay Designs' Correlate-EIA™, Stressgen, USA), respectively, for Nitrite concentration in the supernatant, an indicator of NO production, was measured by a microplate assay method based on the Griess reaction [19], and the cells were used for RT-PCR analysis and protein expression.

2.5 Western Blot Analysis

Cellular proteins were extracted from control and compound 1 or 2-treated RAW 264.7 cells. The washed cell pellets were resuspended in lysis buffer (50 mM HEPES pH 7.0 250 mM NaCl, 5 mM EDTA, 0.1% Nonidet P-40, 1 mM phenyl-methyl-sulfonylfluoride, 0.5 mM dithiothreitol, 5 mM NaF, 0.5 mM Na orthovanadate) containing 5 µg/ml each of leupeptin and aprotinin and incubated for 15 min at 4ºC. Cell debris was removed by microcentrifugation, followed by quick freezing of the supernatants. Protein concentration was determined by BioRad protein assay reagent according to the manufactures instruction, 40-50 µg of cellular proteins from treated and untreated cell extracts were electroblotted onto nitrocellulose membrane following separation on a 10% sodium dodecyl sulfate (SDS)-polyacrylamide gel electrophoresis. The immunoblot was incubated overnight with blocking solution (5% skimmed milk) at 4ºC, followed by incubation for 4 h with a 1:500 dilution of monoclonal anti-iNOS and COX-2 antibody (Santacruz, CA, USA). Blots were again washed two times with PBS and incubated with a 1:1000 dilution of horseradish peroxidase-conjugated goat anti-mouse IgG secondary antibody (Santacruz, CA, USA) for 1 h at room temperature. Blots were again washed three times in Tween 20/Tris-buffered saline (TTBS) and then developed by 3,3'-diaminobenzidine (DAB) (Sigma-Aldrich,

USA) solution (0.2 M DAB, 2.5 mM $NiCl_2$) and H_2O_2 (final concentration of 0.002%) for 10 min at room temperature. After signal development, the nitrocellulose membrane was washed several times in water and dried overnight on blotting paper. The signal intensity of the specific proteins were evaluated by ImageJ and calculated as the relative amounts comparing with the LPS-treated group.

2.6 Cytotoxicity Assay

3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) cytotoxiccity assay was performed according to the method previously described [20]. MTT solution was added at a concentration of 50 µg/ml into each well, which also contain 5, 10, 20 and 40 µg/ml of compound 1 or 2. After 24 h of incubation at 37ºC, the medium was discarded and the formazan blue, which formed in the cells, was dissolved in 50 µl DMSO. The optical density values were measured at 570 nm using an AS10000 microplate reader (Hewlett-Packard spectracount, USA). The optical density of formazan formed in control (untreated) cells was taken as 100% of viability.

2.7 Preparation of Total mRNA and RT-PCR

RAW 264.7 cells were cultured in the presence of each compound in combination with LPS in 6-well plates and control for 6 h (for dose effect test) or at the allotted times (2, 6, 9, 12, and 24 h for time-course effect test). Total cellular RNA was isolated using the RNeasy mini kit (Qiagen) following the manufacturer's instructions. Total RNA (1 µg) was reverse-transcribed into cDNA using AccuPower RT-PCR Premix (Bioneer, Daejeon, Korea). The PCR primers used in this study were represented in Table 1. The β-actin gene was used as a constitutively expressed housekeeping gene for controls to determine the uniformity of the reverse transcriptions. PCR reactions were performed using Applied Biosystems 2720 thermal cycler (CA, USA) and an AccuPower RT-PCR Premix (Bioneer) according to the manufacturer's protocols. After amplification, products of the PCR reaction were separated on a 1% (w/v) triacetate/EDTA agarose gel, stained with 2% (w/v) ethidium bromide. The band was photographed under UV light using Kodak Image Station 440 (Kodak, Japan). The amount of mRNA was evaluated by ImageJ. The signal intensity of the specific mRNAs were normalised by a comparison with that of β-actin and calculated as the relative amounts comparing with the LPS-treated group.

Table 1. Primers used in RT-PCR analysis

Gene[a]	Primer sequences (5' → 3')	PCR product size (bp)
TNF-α	TNF-α-f: TTGACCTCAGCGCTGAGTTG TNF-α-r: CCTGTAGCCCACGTCGTAGC	364
IL-1β	IL-1β-f: CAGGATGAGGACATGAGCACC IL-1β-r: CTCTGCAGACTCAAACTCCAC	447
IL-6	IL-6-f: GTACTCCAGAAGACCAGAGG IL-6-r: TGCTGGTGACAACCACGGCC	308
iNOS	iNOS-f: CCCTTCCGAAGTTTCTGGCAGCAGC iNOS-r: GGCTGTCAGAGCCTCGTGGCTTTGG	496
COX-2	COX-2-f: CCCAGAGCTCCTTTTCAACC COX-2-r: ATTTGGCACATTTCTTCCCC	240
β-Actin	β-Actin-f: GTGGGCCGCCCTAGGCACCAG β-Actin-r: GGAGGAAGAGGATGCGGCAGT	603

aTNF-α, Tumor necrosis factor-α; IL-1β, Interleukin-1β; IL-6, Interleukin-6; iNOS, Inducible nitric oxide synthase; COX-2, Cyclooxygenase-2

2.8 Determination of NF-κB Activation

To evaluate effects of compound 1 or 2 on the NF-κB activation, after incubation with LPS (1 μg/ml) in the presence or absence of the compounds (5, 10 and 20 μg/ml for dose effect test) for 0.5 h or at the allotted times (0.25, 0.5, 1 and 2 h for times-course effect test), RAW 264.7 cells (2 x 10^6 cells) were washed with ice-cold PBS/phosphatase inhibitor solution and were directly lysed with the complete lysis buffer at the time interval. Proteins were separated by centrifugation (12,000 g for 20 min at 4ºC) and stored at -80ºC until analysis. Activated p65 subunits of NF-κB were determined by Trans AM ELISA kit (Active Motif, CA, USA). Whole-cell extracts (containing 10 μg total protein) were used. Absorbance was measured at 450 nm with a reference wavelength of 620 nm with an AS10000 microplate reader (Hewlett-Packard spectracount, USA).

2.9 Statistical Analysis

All data are expressed as mean ± standard error of mean (S.E.M.) from at least three independent tests. The data were analyzed by the analysis of variance followed by the Duncan's multiple range test. All of the statistical analyses were performed by means of SPSS software with a probability level of $P < 0.05$ or 0.01 (SPSS for Windows, ver. 14.0; SPSS Inc., Chicago, IL, USA).

3. RESULTS

3.1 Isolation of the Compounds from *Streptomyces* sp. BT01

In the present study, 7-methoxy-3,3',4',6-tetrahydroxyflavone (1) and 2',7-dihydroxy-4'5'- dimethoxyisoflavone (2) were isolated from the ethyl acetate extracts

from the culture of *Streptomyces* sp. BT01 by using silica gel column chromatography and thin-layer chromatography. Their structures as indicated in Fig. 1 were elucidated in previous report [18]. Their spectral data were reported as follows:

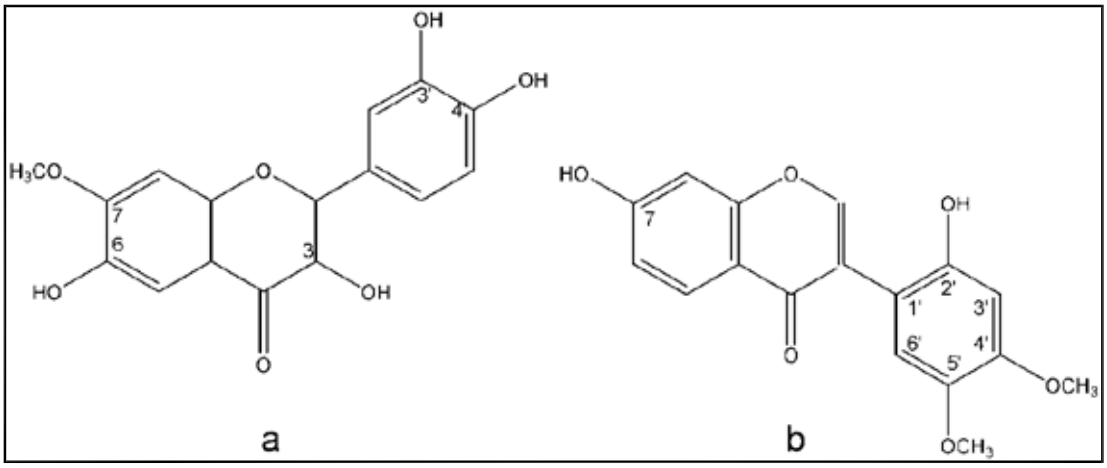


Fig. 1. Chemical structures of 7-methoxy-3,3',4',6-tetrahydroxyflavone (1)(a) and 2',7-dihydroxy-4'5'-dimethoxyisoflavone (2)(b)

Compound 1, identified by NMR and mass spectral data as 3,3',4',6-tetrahydroxy-7-methoxyflavone ($C_{16}H_{12}O_7$), was yellow crystals having: mp 315-317ºC (from methanol), UV: λ_{max} nm (log ε) = 239 (4.290), 257 sh (4.262), 349 (4.454). λ_{max} nm (+ $AlCl_3$) (log ε) = 235 (4.586), 276 (4.179), 360 (3.93), 431 (4.394). λ_{max} nm (+ $AlCl_3$/HCl) (log ε) = 228 sh (4.269), 267 (4.257), 357 sh (3.973), 419 (4.454). IR ν_{max} cm^{-1}: 3596, 3511, 3333, 3117, 1636, 1609, 551, 1508, 1497, 1435, 1289, 1223, 1169, 1123, 1038. EI-MS m/z: 316 (M+, 100%), 301 (22), 273 (35), 167 (13), 150 (16), 149 (24), 137 (39), 135 (21), 128 (14), 123 (16), 120 (13), 95 (18), 69 (42), 63 (17), 53 (31), 51 (26). HR -MS: $C_{16}H_{12}O_7$, found: 316.0580, calcd: 316.0588. 1H-NMR (DMSO-d , 200 MHz) δ: 3.91 (3H, s, 7-OCH), 6.86 (1H, d, J=8.4 Hz, H-5'), 7.20 (1H, s, 8-H), 7.29 (1H, s, 5-H), 7.54 (1H, dd, J=8.4, 2.2Hz, 6'-H), 7.70 (1H, d, J=2.2Hz, 2'-H), 9.00 (1H, s, 3-OH), 9.24 (1H, s, 3'-OH), 9.53 (1H, s, 4'-OH), 9.72 (1H, s, 6-OH).13C-NMR (DMSO-d , 75.4 MHz) δ: 56.54 (7-OCH), 100.46 (C-8), 106.9 (C-5), 115.00 (C-10), 115.33 (C-2'), 115.86 (C-5'), 119.94 (C-6'), 123.01 (C-1'), 137.39 (C-3), 145.04 (C-6),145.36 (C-3'), 145.45 (C-2), 147.48 (C-4'), 150.22 (C-9), 153.96 (C-7), 171.91 (C-4).

(C-1'), 137.39 (C-3), 145.04 (C-6), 145.36 (C-3'), 145.45 (C-2), 147.48 (C-4'), 150.22 (C-9), 153.96 (C-7), 171.91 (C-4).

Compound 2, identified by NMR and mass spectral data as 2',7-dihydroxy-4',5'-dimethoxyisoflavone ($C_{17}H_{14}O_6$), was yellow crystals having: mp 237-239ºC (from methanol), UV: λ_{max} nm (log ε) = 248 sh (4.312), 264 sh (4.211), 301 (4.256). IR ν_{max} cm^{-1}: 3414, 2940, 1705, 1616, 1562, 1512, 1458, 1343, 1300, 1246, 1188, 1103. EI-MS *m/z*: 314 (M^+, 100%), 299 (85), 271 (19), 239 (22), 200 (20), 187 (28), 137 (30), 107 (24), 92 (22), 69 (57), 63 (36), 1 53 (25), 51 (33). HR-MS: $C_{17}H_{14}O_6$, found: 314.0799, calcd: 314.0730. H-NMR (DMSO-d_6, 200 MHz) δ: 3.66 (3H, s, 5'-OCH_3), 3.72 (3H, s, 4'-OCH_3), 6.52 (1H, s, 3'-H), 6.81 (1H, s, 6'- H), 6.87 (1H, d, *J*=2.1 Hz, 8-H), 6.92 (1H, dd, *J*=8.7, 2.1 Hz, 6-H), 7.94 (1H, d, *J*=8.7 Hz, 5- H), 8.22 (1H, s, 2-H), 8.99 (1H, s, 7-OH), 10.80 (1H, br, 2'-OH). ^{13}C-NMR (DMSO-*d* , 50 MHz) δ: 55.65 (4'-OCH_3), 56.66 (5'- OCH_3), 101.53 (C-3'), 102.27 (C-8), 110.08 (C-1'), 115.42 (C-6), 116.02 (C-6'), 116.70 (C-10), 121.64 (C-3), 127.44 (C-5), 141.70 (C-5'), 149.81 (C-2'), 149.90 (C-4'), 155.24 (C-9), 157.64 (C-9), 162.79 (C-7), 175.42 (C-4).

3.2 Effects of the Compounds on Cell Viability

Fig. 2 shows the cell viability at 5, 10, 20 and 40 µg/ml of compound 1 and 2. After 24 h of incubation, concentration of 40 µg/ml of the compound 1 significantly decreased cell viability to about 83% ($P < 0.05$), whereas concentration of the compounds ranging from 5 to 20 µg/ml did not exhibit any cytotoxic effect. Therefore, concentrations of the compounds were selected from 5 to 20 µg/ml for study on anti-inflammatory effects.

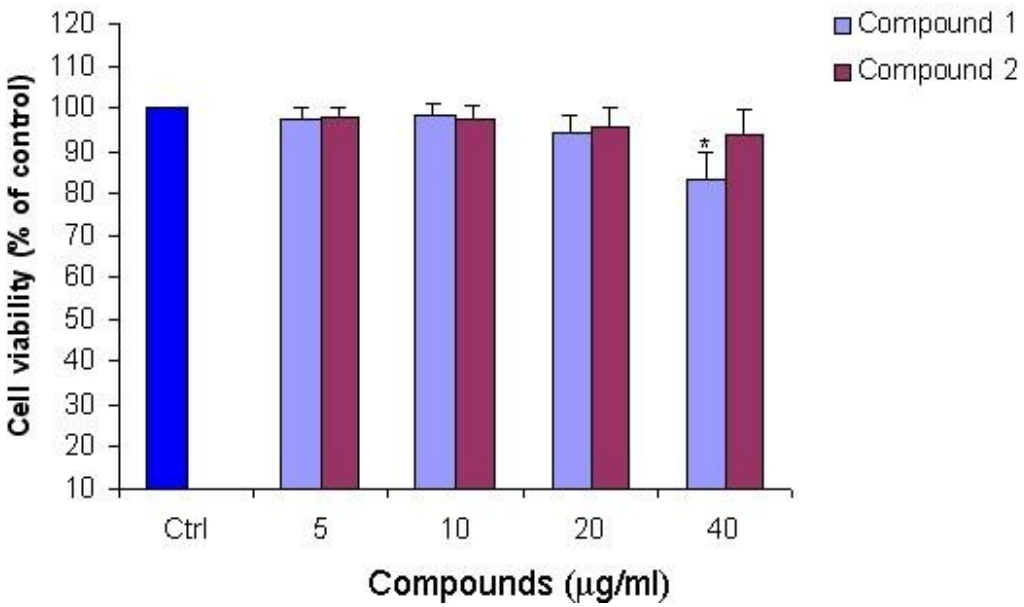
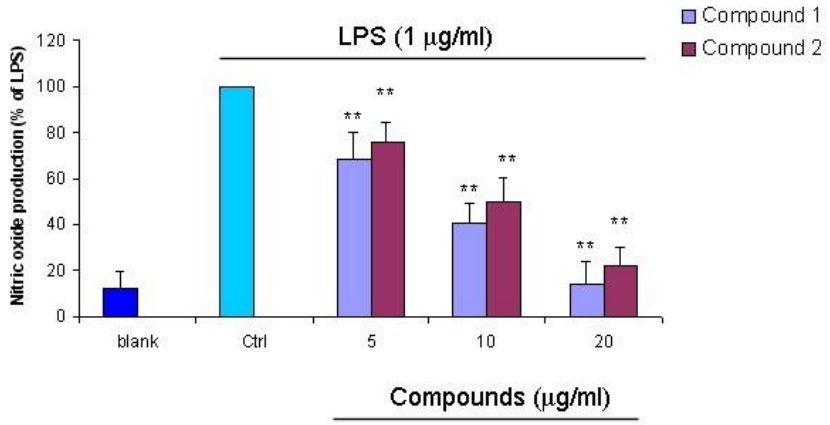


Fig. 2. Effect of the compound 1 and 2 on cell cytotoxicity. The RAW 264.7 cells were treated with indicated concentrations of the compounds (5-40 µg/ml) for 24 h, and the results are expressed by percentages of surviving cells over control cells using MTT assays

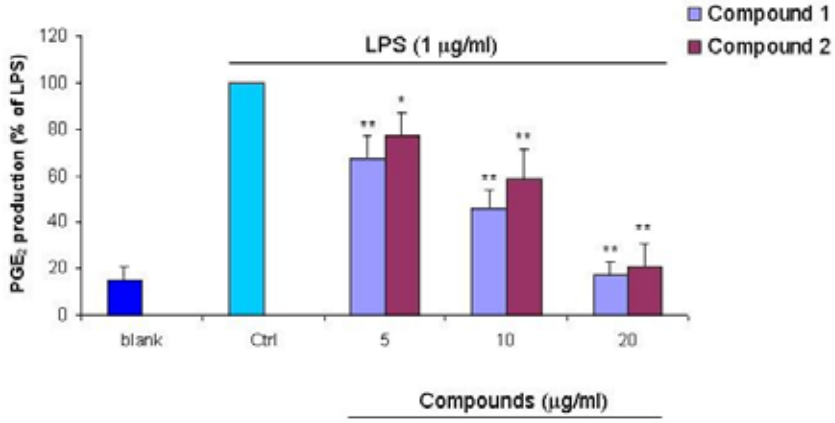
**P < 0.05 compared with the LPS-only treatment*

3.3 Effects of the Compounds on the Production of NO, PGE_2, TNF-α, IL-1β, and IL-6 in LPS-stimulated RAW 264.7 Cells

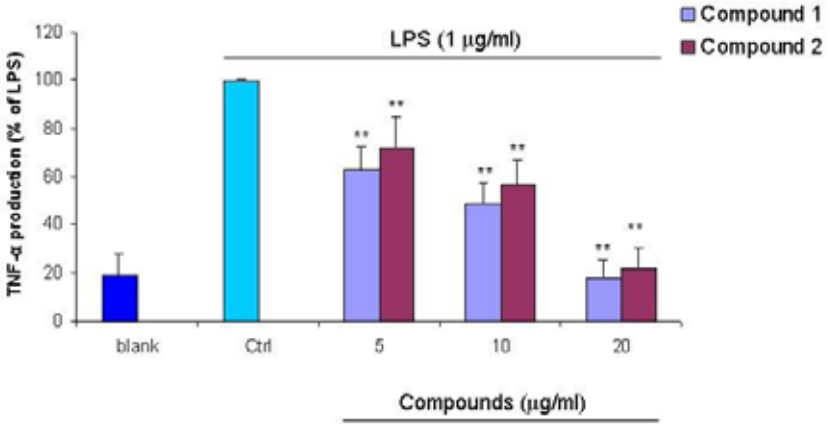
Fig. 3a, 3b, 3c, 3d, and 3e show the effects of compounds on NO, PGE_2, TNF-α, IL-1β, and IL-6 production in LPS-stimulated RAW 264.7 cells. ELISA assays were used for detection of the mediator and pro-inflammatory cytokines, and Greiss's reaction was used to estimate the NO generation. In the absence of LPS, very low amounts of NO, mediator and those pro-inflammatory cytokines were detected in the culture supernatants of RAW 264.7 cells. Upon stimulation with LPS (1 µg/ml), NO production was markedly increased (Fig. 3a). We also found significant increases of the mediator and pro-inflammatory cytokines in the presence of LPS-stimulation (Fig. 3b to 3e). However, pretreatment with the compound **1** and **2** for 2 h could significantly reduce the production of NO, PGE_2, TNF-α, IL-1β, and IL-6 in a dose-dependent manner (Fig. 3b to 3e).


Compound 1
Compound 2
LPS (1 μg/ml)
Nitric oxide production (% of LPS)
120
100
80
60
40
20
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

a


Compound 1
Compound 2
LPS (1 μg/ml)
PGE2 production (% of LPS)
120
100
80
60
40
20
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

b


Compound 1
Compound 2
LPS (1 μg/ml)
TNF-α production (% of LPS)
120
100
80
60
40
20
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

c

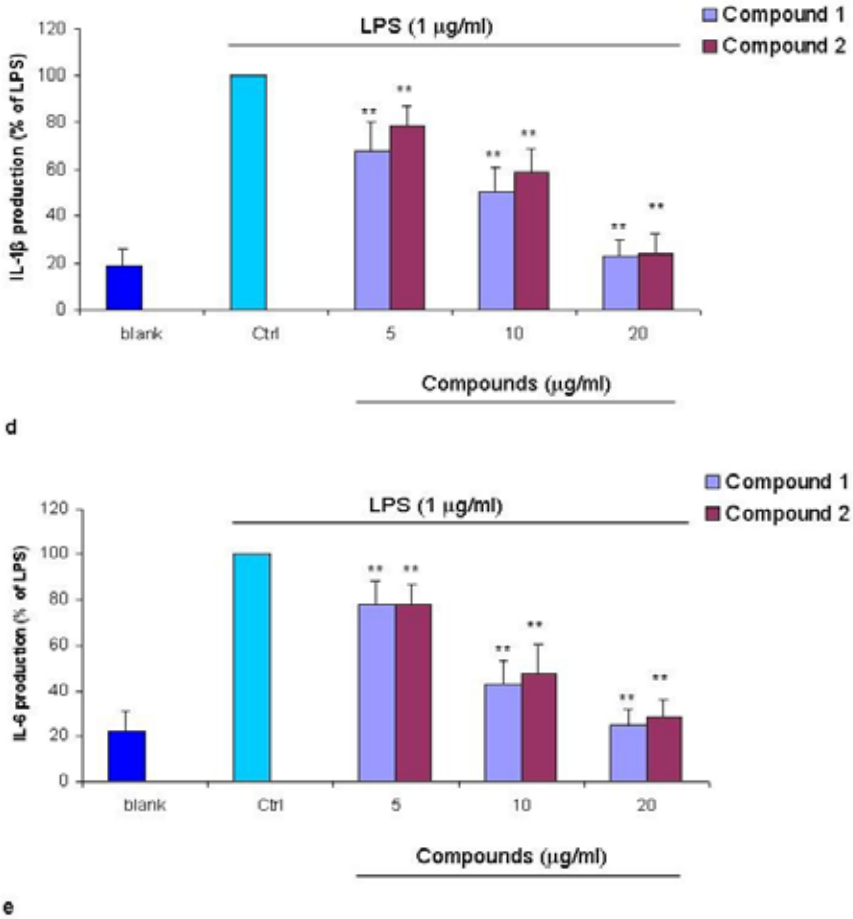


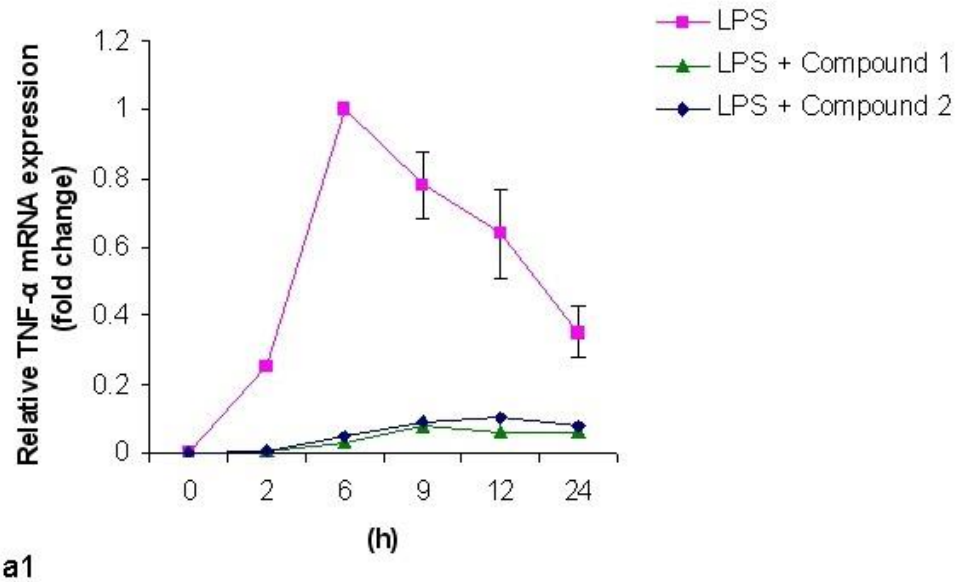
Fig. 3. Suppressive effects of the compound 1 and 2 on LPS-induced NO, PGE2, TNF-α, IL-1β, and IL-6 production in RAW 264.7 cells. Cells were pretreated with/ without indicated concentrations of the compound 1 and 2 for 2 h then stimulated with LPS (1μg/ml) for 24 h. Control values were obtained in the absence of LPS or the compounds. The values are presented as percentage of NO (a), PGE2 (b), TNF-α (c), IL-1β (d), and IL-6 (e) comparing with LPS-treated cells, respectively. The data were expressed as the means ± SDs for three independent experiments

$^{*}P < 0.05$, $^{**}P < 0.01$ compared with the LPS-only treatment

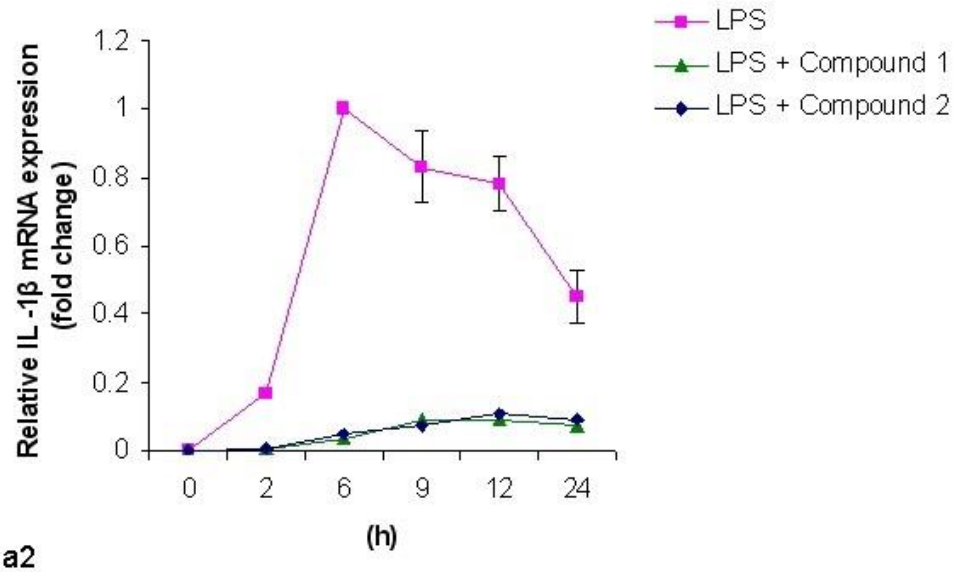
3.4 Effects of the Compounds on TNF-α, IL-1β, IL-6, iNOS and COX-2 mRNA Expression in LPS-stimulated RAW 264.7 Cells

Fig. 4 shows the effects of the compounds 1 and 2 on mRNA expression of TNF-α, IL-1β, IL-6, iNOS and COX-2 in LPS-stimulated RAW 264.7 cells. Time- and dose-effect of the compounds on the mRNA expression of TNF-α, IL-1β, IL-6, iNOS and COX-2 was measured in RAW 264.7 cells stimulated with LPS in the presence or absence of the compounds using RT-PCR. The mRNA expression reached a peak level at about 6 h for TNF-α, IL-1β, and IL-6, and 9 h for iNOS and COX-2.

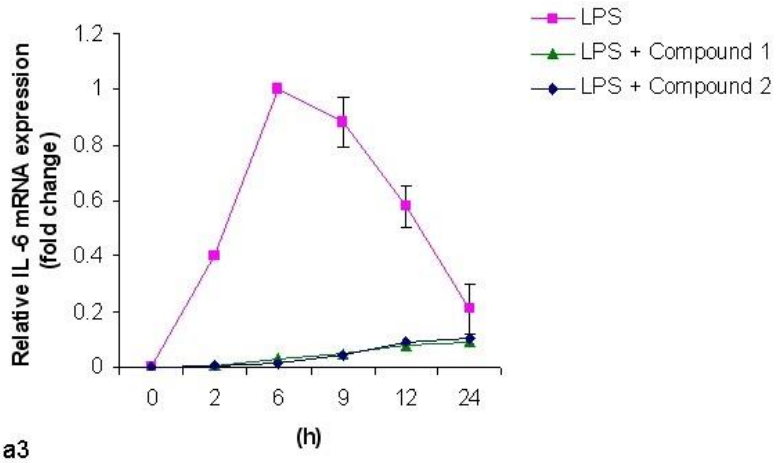
Pretreatment of the compound 1 and 2 at 20 µg/ml could block the expression of these mRNAs at all of indicated time points (Fig. 4a). We also observed that pretreatment of various concentrations of the compound 1 and 2 on the inhibition of LPS-induced mRNA levels of those five genes was a dose-dependent manner (Fig. 4b and Fig. 5).



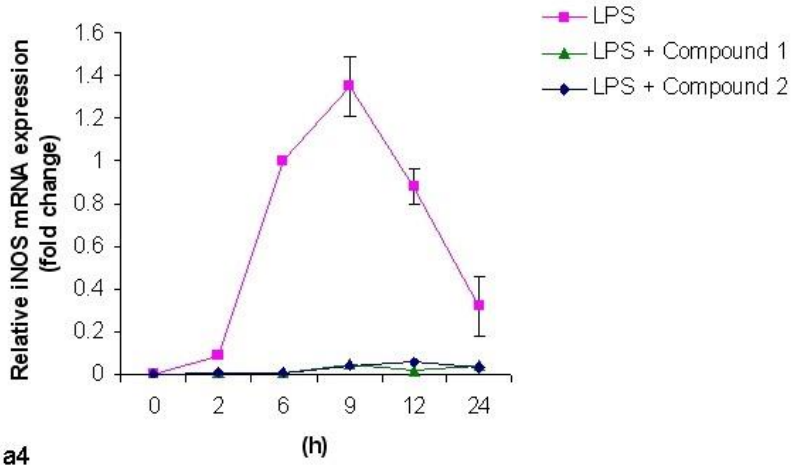
a1



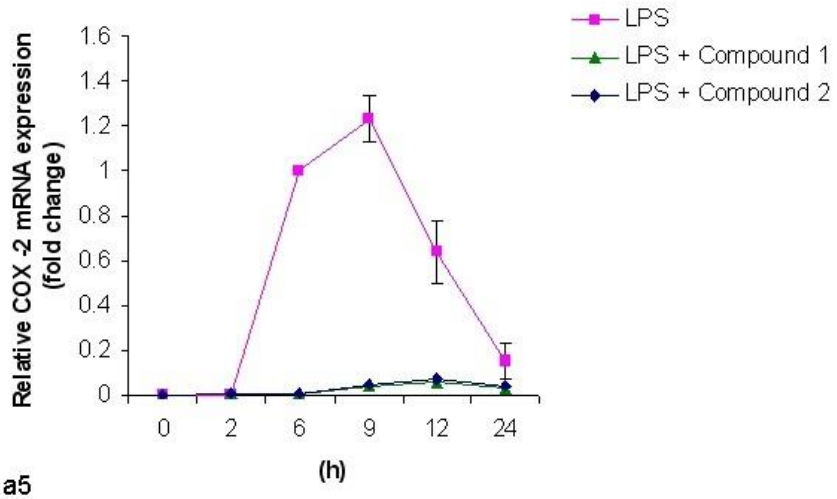
a2


LPS
LPS + Compound 1
LPS + Compound 2
Relative IL -6 mRNA expression (fold change)
1.2
1
0.8
0.6
0.4
0.2
0
0
2
6
9
12
24
(h)

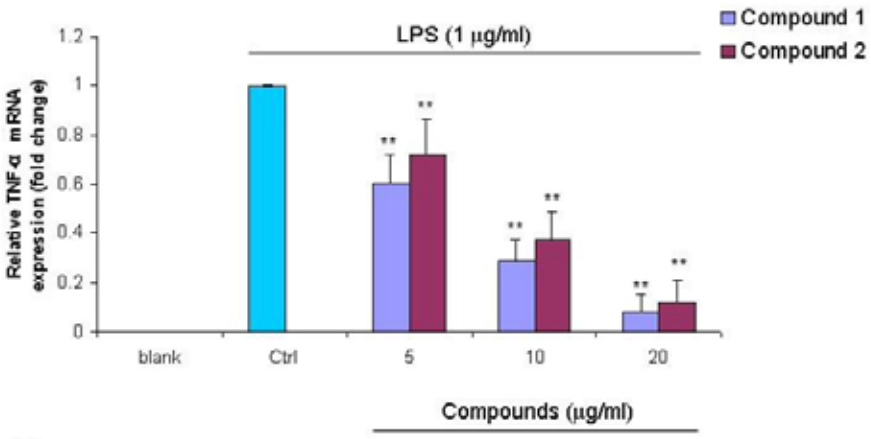
a3


LPS
LPS + Compound 1
LPS + Compound 2
Relative iNOS mRNA expression (fold change)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
6
9
12
24
(h)

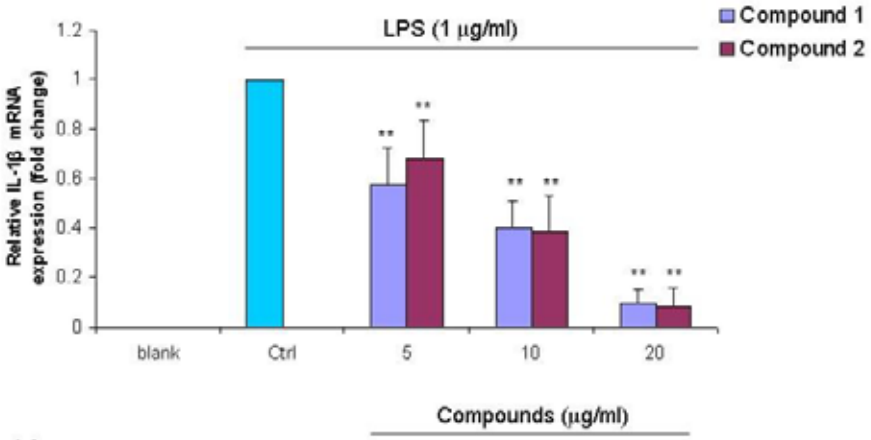
a4


LPS
LPS + Compound 1
LPS + Compound 2
Relative COX -2 mRNA expression (fold change)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
6
9
12
24
(h)

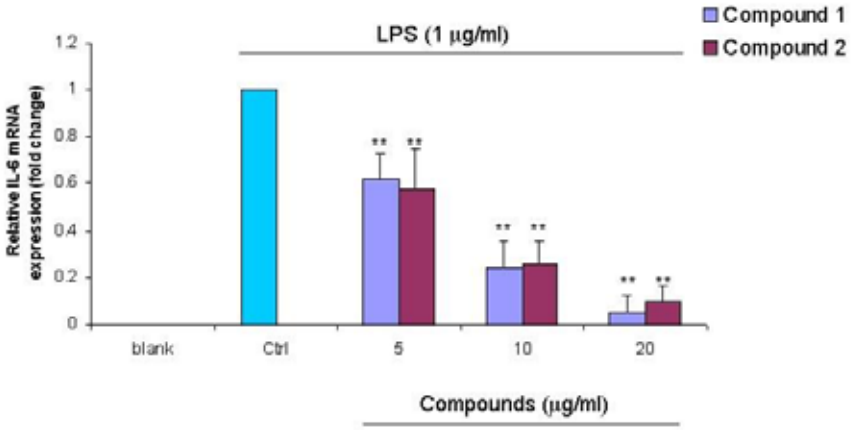
a5


Compound 1
Compound 2
LPS (1 μg/ml)
Relative TNF-α mRNA expression (fold change)
1.2
1
0.8
0.6
0.4
0.2
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

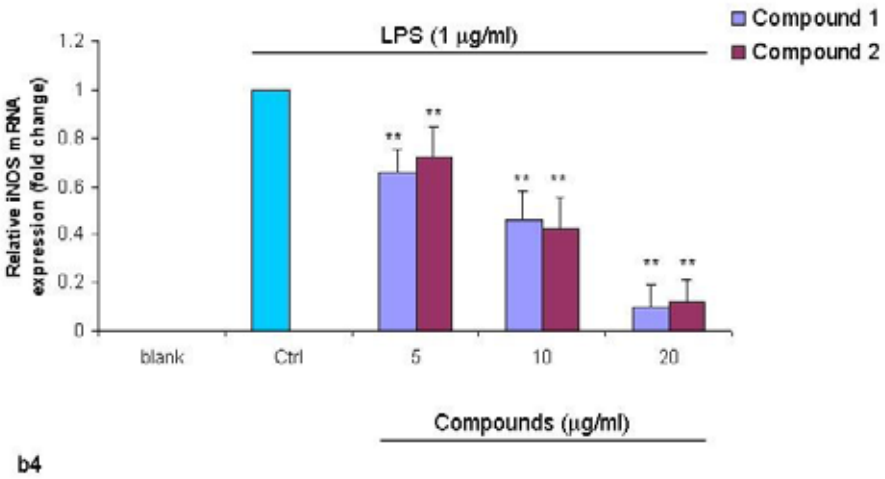
b1


Compound 1
Compound 2
LPS (1 μg/ml)
Relative IL-1β mRNA expression (fold change)
1.2
1
0.8
0.6
0.4
0.2
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

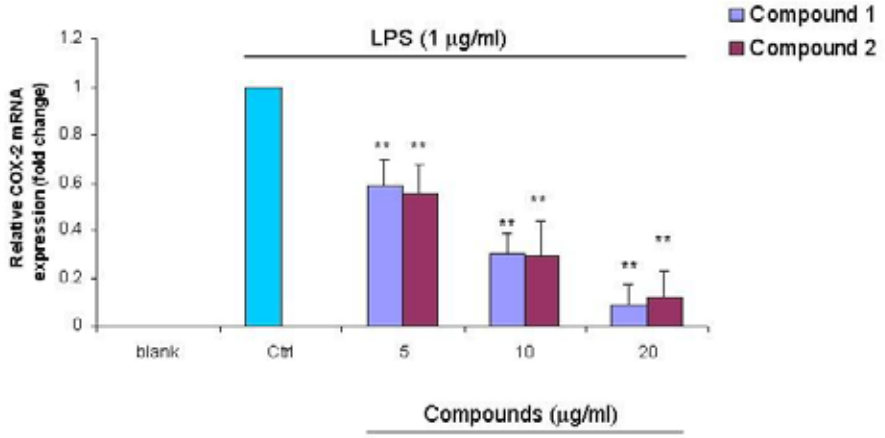
b2


Compound 1
Compound 2
LPS (1 μg/ml)
Relative IL-6 mRNA expression (fold change)
1.2
1
0.8
0.6
0.4
0.2
0
blank
Ctrl
5
10
20
Compounds (μg/ml)

b3



b4



b5

Fig. 4. Suppressive effects of the compound 1 and 2 on LPS-induced mRNA expression of TNF-α, IL-1β, IL-6, iNOS and COX-2 in RAW 264.7 cells. Time-course (a1-a5) and dose-dependent (b1-b5) inhibitory effect of the compound 1 and 2 were measured on LPS-induced TNF-α, IL-1β, IL-6, iNOS and COX-2 mRNA expression in RAW 264.7 cells were measured using RT-PCR. (a1-a5) Cells were pretreated with the compounds (20 µg/ml) or not for 2 h, then stimulated with LPS (1 µg/ml) at various time points. (b1-b5) Dose-effect relationship was measured after 6 h stimulation with LPS (1 µg/ml). Results were expressed as a target gene expressions ratio comparing with the LPS-treated group. The data were the means ± SDs for three independent experiments

***P < 0.01 compared with the LPS-only treatment*

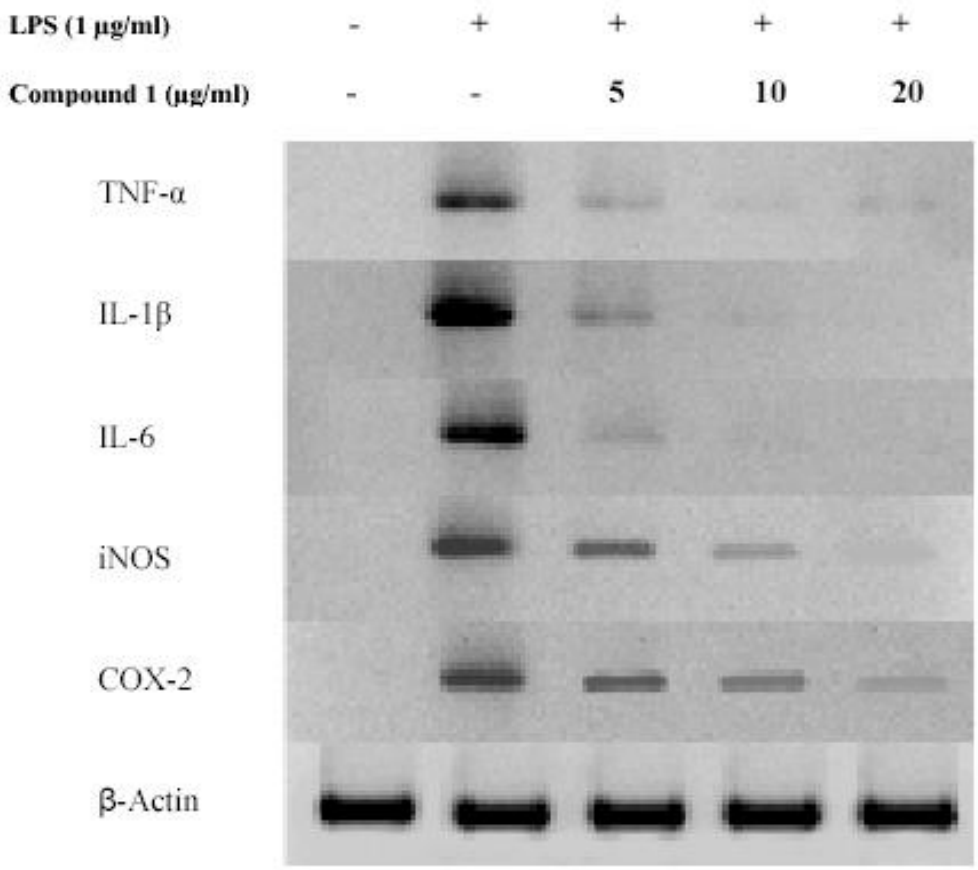


Fig. 5. Suppressive effects of compound 1on LPS-induced mRNA expression of proinflammatory cytokines, inducible nitric oxide synthase (iNOS) and cyclo-oxygenase-2 (COX-2) in RAW 264.7 cells. The cells were pretreated with different concentrations (5, 10, 20 μg/ml) of compound 1 for 2 h and then incubated with or without 1 μg/ml of LPS for 6 h, total mRNA was isolated, and the mRNA levels of proinflammatory cytokines, iNOS and COX-2 were examined by RT-PCR

3.5 Effects of the Compounds on iNOS and COX-2 Production in LPS-stimulated RAW 264.7 Cells

The iNOS and COX-2 productions of the compound 1 and 2 pretreatment in RAW 264.7 cells stimulated with LPS were performed by Western blot analysis. The relative intensity of iNOS and COX-2 bands were significantly increased upon LPS treatment and this induction was effectively inhibited in a dose-dependent manner by the compound 1 and 2 treatment (Fig. 6a and 6b). Similarly, in the case of mRNA expression of iNOS and COX-2. LPS-activated macrophages increased the protein expression of iNOS and COX-2 when compared to the untreated control group (Fig. 7).

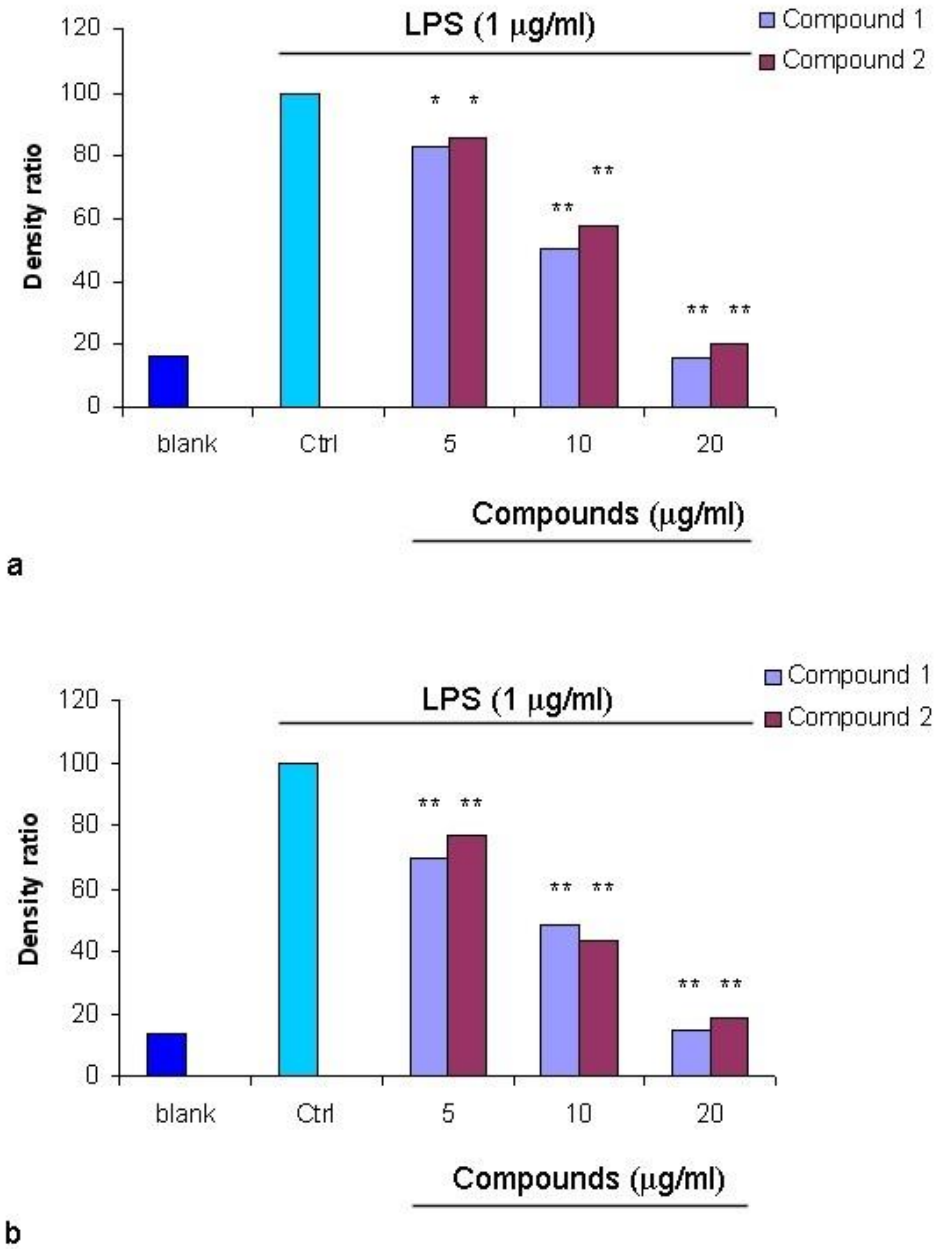


Fig. 6. Suppressive effects of the compound 1 and 2 on LPS-induced protein expression of iNOS and COX-2 in RAW 264.7 cells. RAW 264.7 cells were pretreated with the compounds for 2 h and then stimulated with LPS (1 μg/ml) for 9 h. The cells were lysed, and the lysates were examined by Western blot for (a) iNOS and (b) COX-2. Results were expressed as a protein expressions ratio comparing with the LPS-treated group. The data were the means ± SDs for three independent experiments

**P < 0.05, **P < 0.01 compared with the LPS-only treatment*

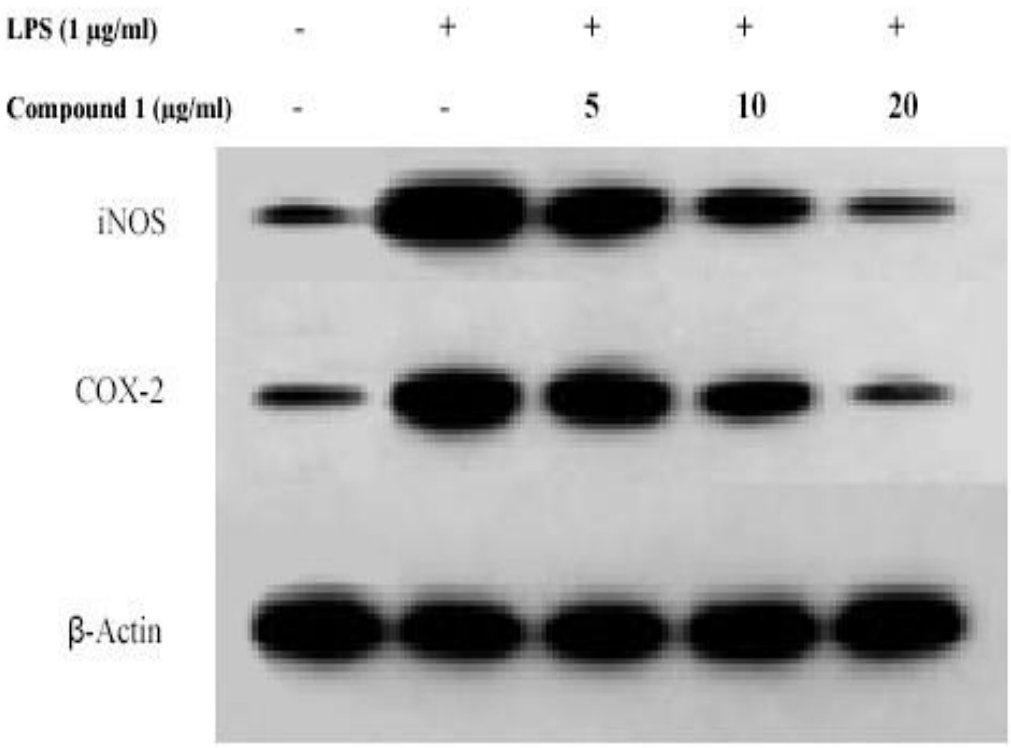


Fig. 7. Suppressive effects of compound 1 on LPS-induced protein expression of iNOS and COX-2 in RAW 264.7 cells. The cells were pretreated with different concentrations (5, 10, 20 μg/ml) of compound 1 for 2 h and then incubated with or without 1 μg/ml of LPS for 9 h. Protein samples were analyzed by Western blot with specific antibodies as described in materials and methods

3.6 Effects of the Compounds on NF-κB Activation in LPS-stimulated RAW 264.7 Cells

Only the LPS treatment significantly increased NF-κB as a transcription factor in RAW 264.7 cells, when compared to untreated LPS ($P < 0.01$). The compound 1 and 2 treatment with LPS significantly decreased the activation of NF-κB in a dose- and time-dependent manner ($P < 0.01$), when compared to only LPS treatment (Fig. 8a and 8b).

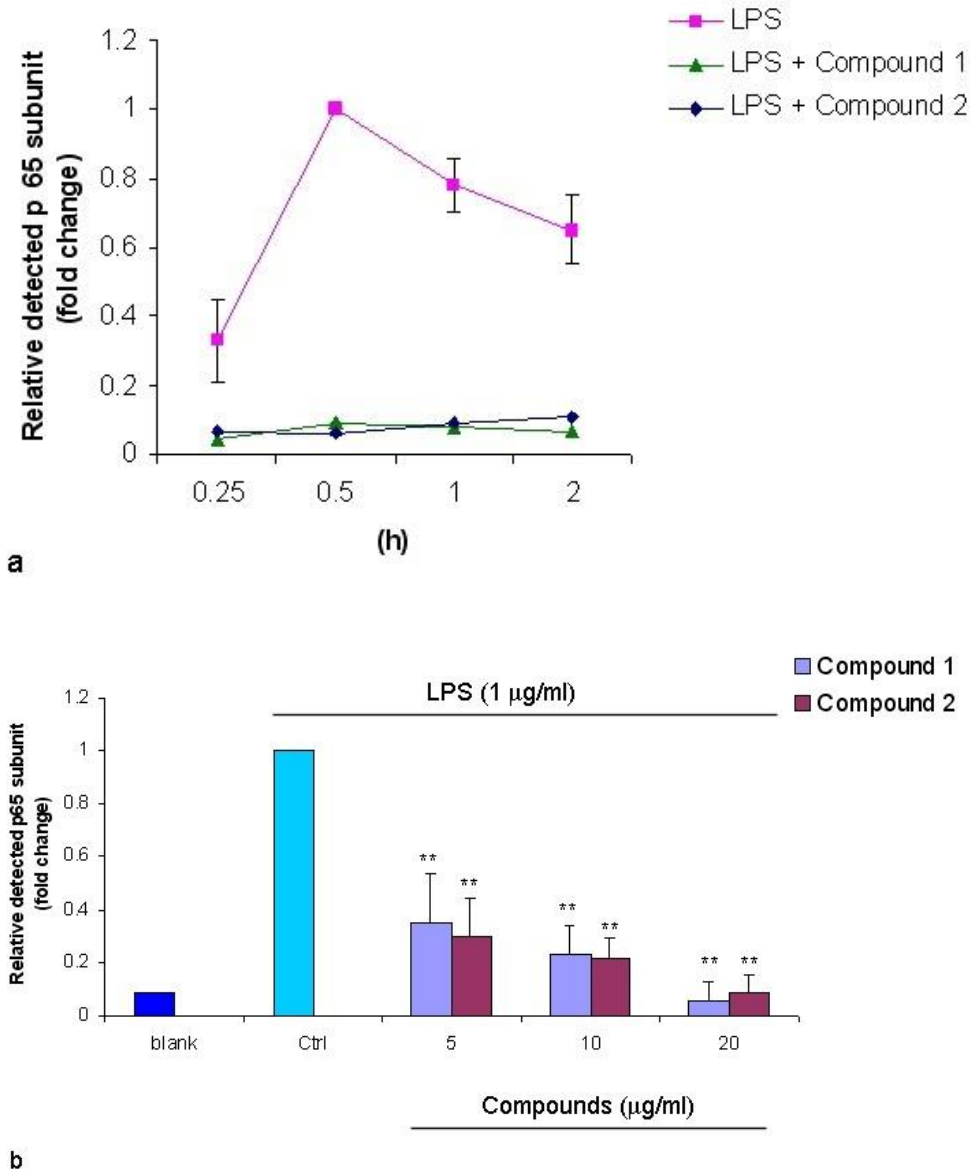


Fig. 8. Suppressive effects of the compound 1 and 2 on LPS-induced NF-κB activation in RAW 264.7 cells. Time-course (a) and d ose-dependent (b) inhibitory effect of the compound 1 and 2 were measured on LPS-induced NF-κB activation in RAW 264.7 cells were measured using ELISA. (a) Cells were pretreated with the compounds (20 µg/ml) or not for 2 h, then stimulated with LPS (1 µg/ml) at various time points. (b) Dose-effect relationship was measured after 0.5 h stimulation with LPS (1 µg/ml). Re-sults were expressed as a target gene expressions ratio comparing with the LPS- treated group. The data were the means ± SDs for three independent experiments

***P < 0.01 compared with the LPS-only treatment*

4. DISCUSSION

Previously, it was reported that the ethyl acetate extract of *Streptomyces* sp. BT01 culture possessed antibacterial activity [18]. The extract was purified by column chromatography and thin-layer chromatography. Two new flavonoids, 7-methoxy-3, 3',4',6-tetrahydroxyflavone (1) and 2',7-dihydroxy-4',5'-dimethoxyisoflavone (2) (Fig. 1) were obtained from the extracts. Flavonoids have biological activities including anti-inflammatory, anticancer, antimicrobial, antiviral, immunomodulatory, and antithrombotic activities [21]. In the present study the results demonstrated that the flavonoids isolated from *Streptomyces* sp. BT01 could inhibit inflammatory responses in LPS-induced RAW 264.7 macrophages.

It is known that macrophage plays an important role in the immune system as well as the inflammatory process. The activated macrophages can secrete a variety of inflammatory mediators and cytokines, including NO, PGE_2, TNF-α, IL-1β, and IL-6 [22]. However, chronic inflammation causes the increase of pro-inflammatory mediators and cytokines. These are active in the pathogenesis of various chronic inflammatory diseases such as multiple sclerosis, Parkinson's disease, Alzheimer's disease and colon cancer [23]. NO is a major product regulated by three distinct NOS isoforms: neuronal NOS (nNOS), endothelial NOS (eNOS) and inducible NOS (iNOS). iNOS not only exists in healthy tissues, but also expressed after exposure to specific stimulants such as LPS and cytokines. The iNOS produces NO until the enzyme is decomposed [24]. Prostaglandins (PGs) play beneficial roles in almost every system and regulate different physiological processes including cell growth, ovulation, immunity, nerve growth and development and bone metabolism [25]. There are two major isoforms of cyclooxygenase; COX-1 and COX-2. COX-1 is expressed constitutively in many tissues and is associated with the synthesis of PGs involved in normal kidney and gastrointestinal function [26]. COX-2 is not detected in normal tissues, but is excessively induced by a variety of physiopathological conditions affecting tissues, such as growth factors, oncogenes, inflammatory stimuli and other ligands [27].

Many flavonoids for example; 4-methoxyhonokiol, poncirin genistein and apigenin inhibited LPS-induced expression of iNOS, COX-2 and cytokines through the inactivation of NF-κB in RAW 264.7 cells [28,29,30,31,32,33]. Thus, the regulation of iNOS and COX-2 is important in the inflammatory response. The present study examined the effect of the compound 1 and 2 on the expression of iNOS and COX-2 at the protein and mRNA levels. The results showed that the compound 1 and 2 dose-

dependently suppressed the expression of iNOS and COX-2 at both the protein and mRNA levels in LPS-stimulated RAW 264.7 cells.

NF-κB is a major factor regulating the expression of inflammation-induced enzymes and cytokines such as iNOS, COX-2, TNF-α, IL-1β, and IL-6, which include the NF-κB binding sites in their promoters, and has attracted attention as a new target for treating inflammatory diseases [34,35,36]. Therefore, the suitable regulation of NF-κB may be beneficial in treating many inflammatory disorders. Earlier studies had demonstrated that various natural compounds including curcumin, green tea polyphenols, resveratrol and lactones inhibited NF-κB activation. Curcumin suppresses NOS by decreasing iKK and NF-κB activation in LPS-stimulated RAW 264.7 cells [37]. Green tea polyphenols and resveratrol inhibit NF-κB activation by suppressing IKK [38]. The extract from the root of *Panax notogingeng* inhibited LPS-induced inflammatory mediators, including iNOS and COX-2 by blocking I-κB degradation in the cytosol and the nuclear translocation of the NF-κB p65 subunit [39]. The present results showed that the compound 1 and 2 inhibited LPS-induced gene expression and overproduction of TNF-α, IL-1β, IL-6, iNOS and COX-2. The compound 1 and 2 significantly inhibited the activation of NF-κB in a dose and time-dependent manner, in accordance with the suppressive effects on TNF-α, IL-1β, IL-6, iNOS and COX-2 production. The NF-κB plays a key role in the transcriptional up-regulation of the LPS-induced TNF-α, IL-1β, IL-6, iNOS and COX-2 [40,41,42]. These findings indicate that the suppression of NF-κB activation by the compound 1 and 2 is a possible mechanism of action for their anti-inflammatory activity.

In addition to cellular regulation affected by flavonoids, the various protein kinases such as protein kinase C (PKC) and mitogen-activated protein kinase (MAPK) have been reported to be involved in signal transduction [21]. Through the inhibition of these enzymes, DNA-binding capacity of transcription factors such as NF-κB or activator protein-1 (AP-1) is regulated, and the expression rate of the gene target is controlled. Therefore, suppressing or inhibiting the activation of other inflammation-linked transcription factors. Signal transductions by these compounds should be studied further.

5. CONCLUSION

Our study confirmed the *in vitro* anti-inflammatory effects of two new flavonoids, 7-methoxy-3,3’,4’,6-tetrahydroxyflavone (1) and 2’,7-dihydroxy-4’5’-dimethoxyisofla-

vone (2) isolated from *Streptomyces* sp. BT01. We also observed that these compounds could inhibit the production of NO, PGE_2, TNF-α, IL-1β, and IL-6 in LPS-stimulated RAW 264.7 cells. These compounds were able to regulate the mRNA expression of TNF-α, IL-1β, IL-6, iNOS and COX-2 in a time- and dose-dependent manner. These effects seem to be mediated by inhibiting the activation of NF-κB. We also found that these compounds could inhibit NF-κB activation in LPS-stimulated RAW 264.7 cells. These findings proved anti-inflammatory property of the new flavonoids isolated from *Streptomyces* sp. BT01. Hence, these flavonoids might be promising chemotherapeutic agents against inflammatory diseases.

ACKNOWLEDGEMENTS

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Resistance to Thaumasite Form of Sulphate Attack of Blended Cement Mortars

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Abstract: This study concerns the resistance against thaumasite form of sulphate attack on Portland cement reference with high volume ground granulated blast-furnace slag, fly ash and ground basaltic pumice exposed to tap water (5% magnesium sulphate) for ten years. The separate and intergrinding methods, two fineness (250 m^2/kg and 500 m^2/kg) and 30% proportions of each of the different additives were employed in equal amounts by weight. The development of the microstructure and the secondary minerals in the plain and blended cements were studied via polarising microscopy on thin sections and on undisturbed lumps of specimens by scanning electron microscope (SEMEDAX) analysis. A series of mechanical tests of cement mortars were undertaken on all specimens. The development of the microstructural features and the formation of the secondary minerals in pores were coherent to the increase in sulphate resistance. The presence of thaumasite together with ettringite in some specimens reflects the incomplete transformation phase of hydration. However, despite the numerous studies conducted on the relation of hydration and hydrolysis with reference to cement hardening, the hydration-bound hardening phenomenon coupled with thaumasite morphology and matrix and/or pore space orientations are recommended for further investigation. The use of the pozzolans/ground granulated blast furnace slag and basaltic pumice improved the sulphate resistance of the cement mortars, where specimen E yielded the highest sulphate resistance-highest TSA resistance.

Keywords: microstructure; magnesium sulphate resistance; thaumasite/ ettringite.

1. INTRODUCTION

Recently, there has been a growing demand towards the use of supplementary cementitious materials, be it natural, waste, or by-products, the production of composite cements because of ecological, economical, and diversified product quality reasons. Slag, a by-product of the transformation of iron ore into pig-iron in a blast furnace, is one of these materials in use of cement manufacturing dating to as far back as 1880 [1-3]. Since then, its use has expanded due to its various advantages over other cementitious materials. As a primary advantage, slag has a relatively constant chemical composition compared to fly ash, silica fume and natural pozzolan [4-8].

Durability of concrete in underground structures depends on chemical properties of soil and groundwater. A sulphate or an acid environment caused by industrial wastes, or chemical residues in reclaimed ground, is one of the most severe conditions for durability of concrete. Unfortunately, underground or underwater concrete structures can sometimes be exposed to sulphates and acids, since ater-soluble sulphate widely exists in soil, groundwater, streams, and seawater [9-12]. It has been recognised for a long time that sulphte induces damage to concrete. Some researchers have reported that the use of low water/cement ratio and the use of admixtures, such as air entraining agents to protect the chemical attack of a rich mixture, additive, or Ground Blast furnace slag (GBFS), would be the most effective treatment in reducing sulphate-inducing damage [13,14]. Deterioration of concrete by sulphate attack is commonly observed in structures exposed to soils or groundwater containing a high concentration of sulphate ions. To mitigate this attack, concrete codes recommend a concrete mixture with low water/cement ratio and sulphate resistant pozzolanic cement [15].

The European Cement Standards and The Turkish standards [16,17] allow the use of many different mineral admixtures in the production of CEM II, III, IV and V. It is necessary to note that Portland composite and composite cements contain at least two different mineral admixtures besides the Portland cement clinker. The total amount of these mineral admixtures is allowed up to 50% [18]. The durability of mortars can be greatly affected by environmental conditions, one of the most destructive effects coming from sulphates (soil, groundwater and seawater).

Wearing effects of chemical materials to concrete can be in various ways, acids induce dissolving salts in water to react with calcium hydroxide. Salts in concrete increase permeability and reduce resistance against harmful effects, whereas sulphates cause distensions and cracking in concrete**.** This damage depends on the cations taking part in building gypsum and ettrengite or the decomposition of CSH gels. The majority of these wearing reactions depend on the increase of the C_3A content in concrete with high negative effects [19]. An example for the negatıve effects of C_3A. Commonly, 15% silica ash is added together with pumice in order to reduce the amount of C_3A. However, by creating an initial resistance against damage, silica ash and pumice reduce permeability as an operative effect along with highly active calcium hydroxide [20].

The sulphate wearing, concerning increases in volume and cracks of concrete, is reduced by the the use of low ratios of tricalcium aluminate cements or suitable amounts of pumice as additives. Tricalcium aluminate indirectly decreases by the addition of pumice, and fills the pores in concrete as a connective component by joining with lime [21].

Calcium, sodium, magnesium and ammonium sulphate cause significant amounts of expansion in concrete consequently decreasing the strength. Calcium sulphate reacts with calcium aluminate to form ettrengite, and in turn, causes expansion in concrete, whereas, ammonium sulphate is responsible for the highest corrosion in concrete bodies [22]. Moreover, sodium sulphate reaction has been reported to cause expansion and cracking in concrete by initial ettringite and gypsum formation followed by the ultimate development of thaumasite [23].

A long-known and major sulphate attack in concretes and mortars is caused by the formation of thaumasite, which forms under low temperatures as well as room temperatures (25 degrees C) and at wet, alkaline conditions extensively experienced at buried concrete structures [24]. For the development of the thaumasite form of sulphate attack (TSA) in concrete the presence of a carbonate source is indispensable for an alkaline environment [25]. This can be supplied to the concrete structure from the ingredients of the concrete or from outside sources like groundwater, surface water or seawater which is also the source of sulphate [26,27]. Some recent studies revealed the absence of TSA at 5 and 25 degrees Celcius in blends containing limestone additives treated with sulphate solutions [28,29]. TSA is also reported to occur in Portland cement-based materials at low temperatures (below 15ºC) at the presence of sulfates, carbonates, andmoisture. Consequently, the dissolution–precipitation mechanism in concrete concerns most processes and

phenomena including the temperature of the reactive environment occurring during the TSA process [30].

We have opted to reveal in this paper the durability/resistance of the separate and intergrinded blended cements with the incorporation of some additives within a 10-years time span under the effect of a $MgSO_4$ solution at room temperature with special attention on TSA. The fineness of the control cement (clinker + gypsum) was maintained at constant values of approximately 250 and 500 m^2/kg. Similar Blaine values were determined for the blended cement (clinker + slag + fly ash + pumice + gypsum) and the control specimen.

2. MATERIALS AND METHODS

2.1 Materials

Ground basaltic pumice (GBP), obtained from the widespread Delihalil cinder cone system in Osmaniye, Turkey, is one of the main additives used in this study. It contains glass shards, mineral phases and some volcanic materials [31]. The clinker, ground granulated blast-furnace slag (GGBFS) and the fly ash (FA)-were obtained from the Adana Cement Plant, the Iskenderun cement grinding plant and the Afsin-Elbistan energy plant respectively.

2.1.1 Physical and chemical properties of the additives

Slag and Pumice were the high silica, alumina, magnesium and iron (in pumice only) containing additives of the mortars studied, and the fly ash was the material rich in calcium, and sulphur in particular (Table 1). The physical properties of the materials used varied slightly in specific gravity and for the two fineness ranges. The specific surface areas were the same in each mixture (Table 2). The uniform blended cement mixture was obtained by two different methods. The first was by grinding of the mixture separately for ten minutes. And for the second, blended cement mixture ratios were determined and ground. The B and C group samples were ground separately, whereas the D and E group samples were ground together.

Table 1. Total elemental contents of the additive materials

Contents	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	L.I
Slag	39.65	12.77	1.67	32.91	7.40	1.44	0.01
Flyash	44.09	22.07	4.40	20,95	1.65	2.56	2.24
Pumice	43.89	14.11	12.10	9.27	8.94	-	0.48
Clinker	20.29	5. 57	3. 85	64.75	1.96	0.89	

Table 2. Physical properties of the additives

Contents	Specific gravity (kg/cm^3)	Specific surface area (m^2/kg)	200 μm fraction (%)	90 μm fraction (%)
Slag	2.89	250 and 500	0.09	0.3
Flyash	2.85	250 and 500	0.08	0.2
Pumice	2.97	250 and 500	0.06	0.2
Clinker	3.19	250 and 500	0.09	0.3

2.2 Methods

2.2.1 Physical and chemical methods

The specific gravity and the specific surface area were determined by a method developed in accordance with ASTM-C204. The ball mill grindability tests were conducted in a standard Ball mill for the 90 micron test sieve. The basaltic pumice, the slag and the clinker were reduced down to the same fineness by crushing in the roll crusher. The 3.36 mm specimens were used as feed materials for the tests. The more grindable gypsum tends to be concentrated in the finer particle size fractions of the product during the grinding process. Particle size distribution was measured by laser diffraction. Blaine fineness values were determined according to the ASTM-C204 [4].

Total elemental contents of additives and blends (Table 3) were determined by the wet combustion method. The size fractions of 90 and 200 microns were separated through Standard ASTM. The chemical analyses are put after the physical for consistency with the subtitle which mentions the physical properties first and chemical second.

2.2.2 Blended cements preparation, mortar formation and curing

The blended cements were prepared using a clinker, 5% gypsum by weight, GGBS, FA and GBP. Equal amounts of additives (30%, by weight) were incorporated into these blends. Cement paste and mortars were prepared using plain Portland cement (A), GGBS, FA and GBP by two types of grinding processes (intergrinding and separate grinding) at two Blaine values (250 m^2/kg and 500 m^2/kg) (Table 3). The first grinding method was conducted by grinding the mixture separately for ten minutes at a non-marble grinder, and the second included the grinding of triple mixture ratios. The B and C group samples were ground separately, whereas the D and E group samples were ground together.

The mortar specimens of the plain Portland cement (A1, A2) and the blended cements (B, C, D and E) were prepared according to the Rilem-Cembureau method at laboratory conditions (20±2ºC and 50±5% relative humidity). Following the 24-hour demolding, the specimens were kept in water until they were tested. Six specimens with dimensions 40 mm×40 mm×40 mm, obtained from the specimens used in the flexural strength tests, were tested under the same laboratory conditions as those applied in the flexural strength test. Thec compressive strength tests were carried out using a 20000 kN capacity automatic compression machine according to EN 196-1 [4].

Table 3. The composition of the studied cements

Cement	Composition (% percentages by weight)					Blaine
	Clinker	GBFS	FA	GBP	Gypsum	(m^2/kg)
A_1	95	0	0	0	5	250
A_2	95	0	0	0	5	500
B (separate grinding)	65	10	10	10	5	250
C (separate grinding)	65	10	10	10	5	500
D (intergrinding)	65	10	10	10	5	250
E (intergrinding)	65	10	10	10	5	500

2.2.3 Experimental setup

Sulphate durability, compressive strength and microstructure studies (by polarising and scanning electron microscopy) were conducted on standard 40 x 40 x 160 mm prismatic mortar specimens treated in a $MgSO_4$ solution for a 10-year period at stable pH levels. The solution was replaced at regular periods. Compressive strength of the mortar specimens was determined after the 10-year treatment period. Although the sulphate contents of natural or polluted waters may vary in amounts, the sulphate of most stream and luke water systems seldomly exceeds the 100 mg/l limit. Numerous studies have mentioned the increase in sulphate resistance of cement, and rapid experimental methods were developed to determine the behaviour of additives.

Mixtures and control specimens of mortars were tested according to ASTM C 1012 standards for compressive strength. Here mixtures were tested via twelve parallel specimens based on the TS EN 24 Standards after treatment for 24 hours in laboratory conditions. After 24 hours, specimens were kept in lime-rich tap water for 28 days; the durability of mixtures was determined on these specimens, and the remaining specimens were kept in tap water and magnesium sulphate

solutions. The pH of the Mg solution was periodically checked by a pH-meter to attain consistency in alkalinity (for the first 6 months varied from pH 8 to 11 after that date it was kept consistent from pH 11.5 to 12). Samples were then stored in boxes and the solution was stirred from time to time to avoid sulphate accumulation on the surface. After the 10-year treatment period, both durability and microstructure of the specimens were determined. The utilization of the pozzolans in mortars can cause cracking and weakening due to expansion by alkali–silica reaction (ASR). In this study, ASR expansion and properties of strength were analysed in terms of pozzolan used, in anticipation of reducing ASR expansion.

2.2.4 Micromorphology (microstructure/fabric) and mineralogy (x-ray diffraction and x-ray flourescence)

Thin sections were prepared according to FitzPatrick [32] from epoxy resin impregnated blocks. Undisturbed lumps of mortar were studied by sub-microscopy (scanning electron microscopy-SEM) on selected cement prisms, which were exposed to sulphate degradation for 10 years and cut into cubes of approximately 10 mm^2, one side of which was polished flat. The lumps taken from the specimens were placed in vacuum desiccators for a minimum period of 10 minutes. Sample surfaces were coated with gold using a BIO-RAD Polar Division SEM coating system and the microstructure of the specimens was studied by a JEOL JEM–8,40 SEM with a TRACTOR–TN 5502 model Energy Dispersion Spectrometer (EDS) used for point and area chemical analyses. A Bruker D8 General Area Detector for diffractometry and copper target with a scanning angle from 38 to 90 2-theta was used for XRD analysis conducted on the same, but ground specimens used for SEM. X-ray diffraction was conducted on the ground powder samples of all specimens from 5 to 65 2-theta in order to determine the secondary minerals formed in the blends. The powdered specimen E was rescanned from 5 to 65 2-theta and its elemental contents were determined by XRF primarily to better distinguish the proximate thaumasite and ettringite peaks obtained by XRD analysis. This was also an attempt to explain the nature of the vitrified-like surfaces on the edges of specimen E determined by the SEM.

3. RESULTS AND DISCUSSION

3.1 Compressive Strength of Mortars Immersed in Magnesium Sulphate

The separately produced blended cement specimens (B and C) were determined to have lower resistance to sulphate than the interground, where specimen C was higher than specimen B in terms of compressive strength (Table 4). The control specimens (A1 and A2) were found to completely crumble at the end of the 10-year period (Fig. 1). The intergrinding process was responsible for the10-year high sulphate resistance due to different grinding periods and additives [6].

Table 4. Compressive strength of mortars (MPa)

Specimens	28 days	10 years	
		Tap water	%5 $MgSO_4$
A_1	52.1	66.1	Crumbled-
A_2	58.4	69.4	Crumbled-
B	36.2	56.9	22.1
C	52.3	67.1	27.4
D	37.5	58.1	22.6
E	54.2	69.6	29.4

3.2 Expansion of the Specimens

The expansion–time history curve that was made by measurements complying with ASTM C 1260 in terms of the specimens of 250 Blaine and of 500 Blaine is shown in Figs. 2 and 3. Fig. 2 shows the variation of expansion of hardened mortars with two Blaine values. The expansion of the mortars made with blended cements with separately ground finer specimens was lower than that of the control specimens (A1 and A2) at all tested ages. The control cement mortar expanded by more than 4,5% in 10 years. The expansion of the hardened blended cement mortars was affected not only by the finenesses of the cements, but in some cases, also by the grinding method. Specimen group E had the lowest expansion in 10 years and the expansions of samples A2, B and D were 3.4%, 1,1 and 0.8%, respectively (Fig. 2). The Blaine specific surface area is the most significant property causing interground specimens to have lower expansion than their separately ground counterparts.

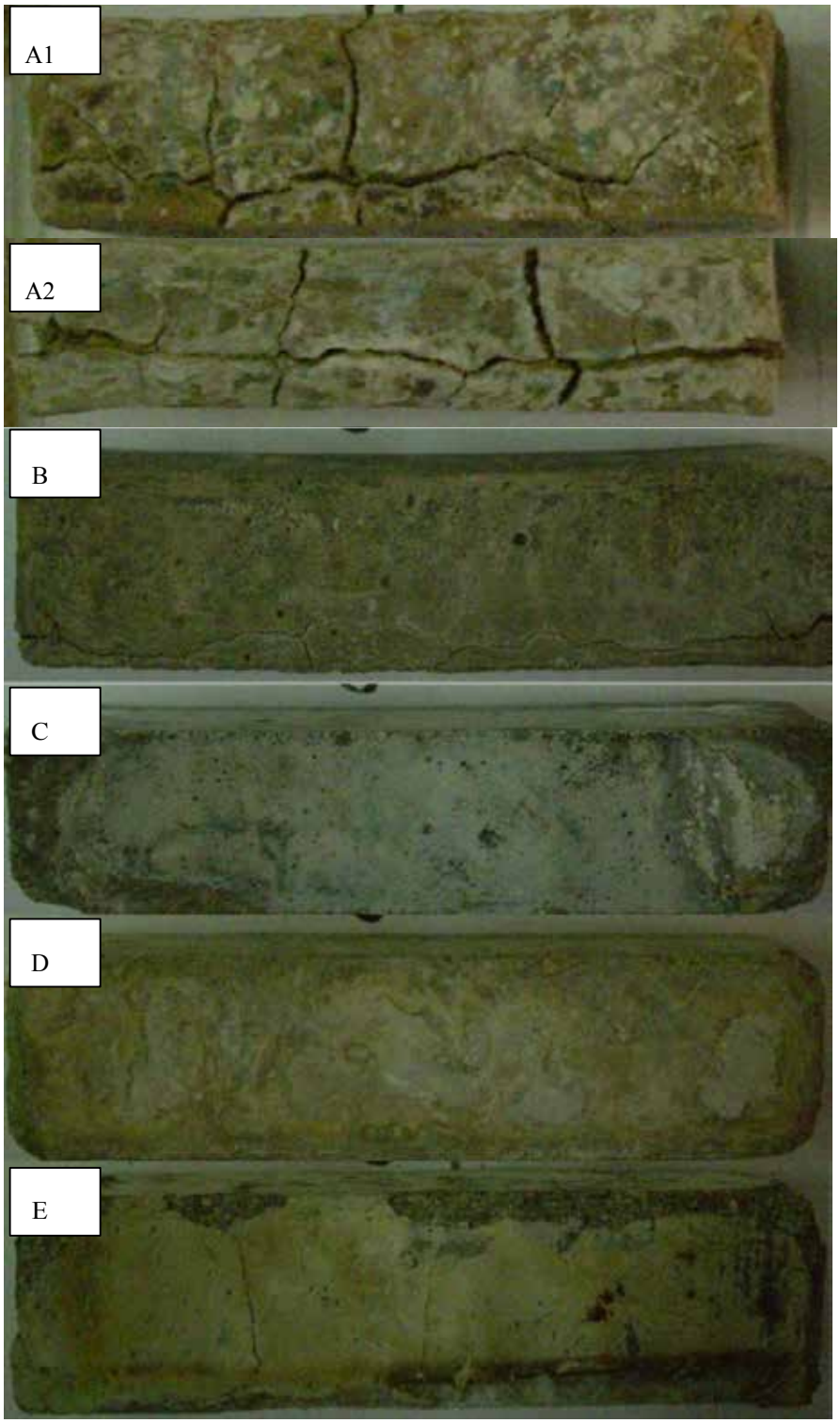


Fig. 1. The blended cement mortars after ten years

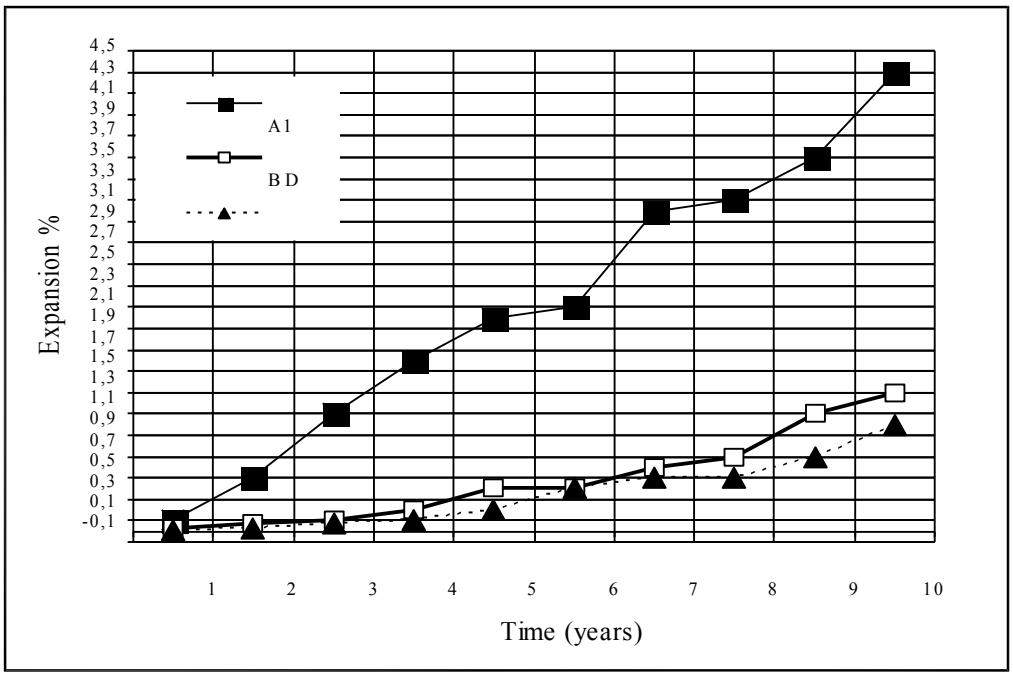


Fig. 2. Expansion time histories for mortar bars (250 Blaine)

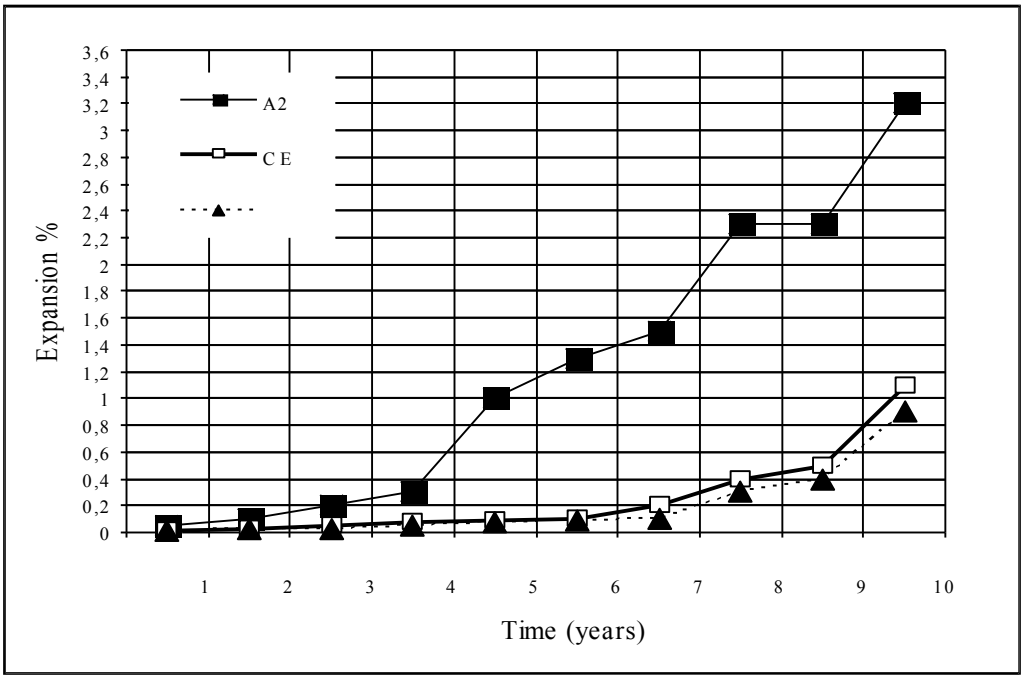


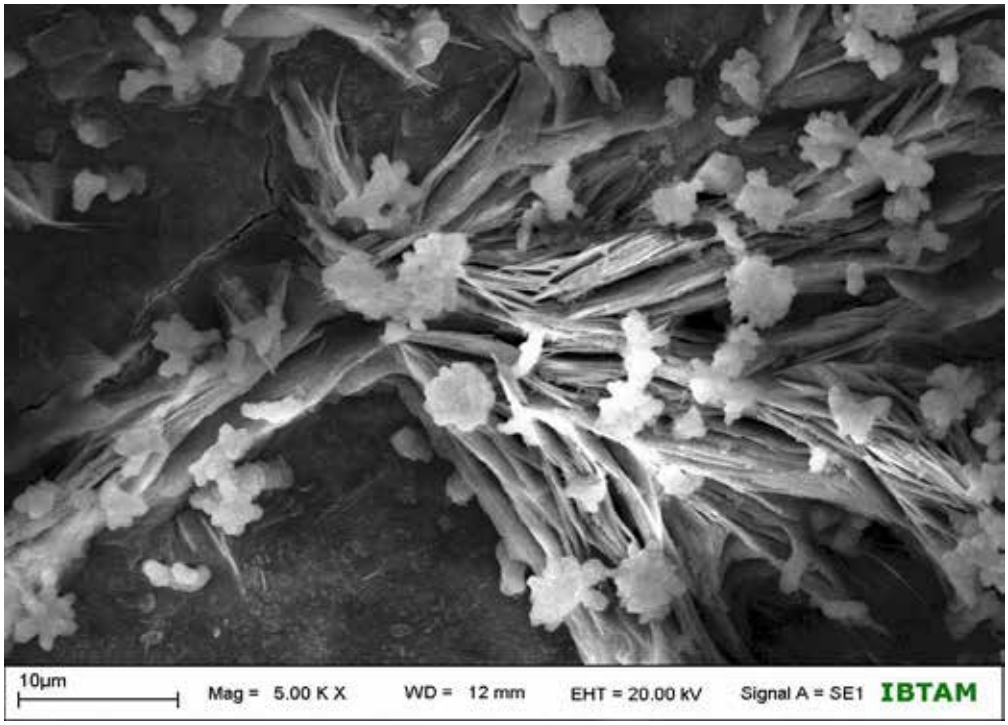
Fig. 3. Expansion time histories for mortar bars (500 Blaine)

3.3 Micromorphology (Microstructure/Fabric) and Mineralogy

3.3.1 Submicroscopy

The crumbling of the A1 and A2 specimens after the 10-year period was most likely due to the formation of the bladed/tabular minerals along cracks and in micro-pores (Fig. 4 and 5). The presence of high amounts of silica, most likely liberated from the solution of quartz grains under high pH conditions, documents the formation of thaumasite, as bladed and wedge clustered radially oriented fibrous crystals, in specimen A1. However, the low amounts of aluminum with calcium may point out to the formation of ettringite together with the well-defined dominant fibrous thaumasite in specimen A2 (Figs. 4 and 5).

The highest durability determined in the 10-year tap water treated A2 specimen seems to contradict the crumbling of the $MgSO_4$ treated A2 specimen. Despite the higher contents of calcium and carbonate ions in the tap water (208 mg/lt), this phenomenon may be attributed to the more active ionic effects of magnesium and sulphate added to the solution. The sulphate in this context maintains the electroneutrality, due to the counterdiffused OH ions, consequently increasing the pH (33). Calcium, in turn, is most likely widely incorporated into the mineral structure, primarily for calcite formation, during the pH-controlled high alkaline curing process, consequently remaining inert throughout the 10-year period. The well crystallised and oriented rhombohedric calcite crystals of uniform shape with rare rounded vaterite (fine popcorn calcite) on quartz and cracked matrix surfaces in specimen B and D respectively, most likely indicate the long-period of curing under constant pH conditions (Figs. 6 and 9). The fine popcorn calcite along with the unstable vaterite may also be the cause for the low durability of the mixed specimens. The increased durability of specimen C to B and E to D, after treatment, is primarily due to the increased fineness of specimens C and E and the relevant fabric development (Table 5). As reported previous study of Binici [6] Blaine specific surface area is the most significant property causing interground specimens to have longer dormant periods (the period in which sulfates have no important effect) than their separately ground counterparts. Moreover, the higher durability in specimen C may be attributed to the reoriented fabric due to the presence of the insitu formed and closely packed/ interlocked coarser aggregates of calcite with gypsum, CSH structures and bundles of thaumasite and/or ettringite fibers (Figs. 7 and 8). However, the increased durability of specimen E may be due to the frequently distributed aggregates of calcite, gypsum and CSH structures which also align on micro-topographic edges of the smooth/vitrified-like matrix surfaces as thick domains (Fig. 10).



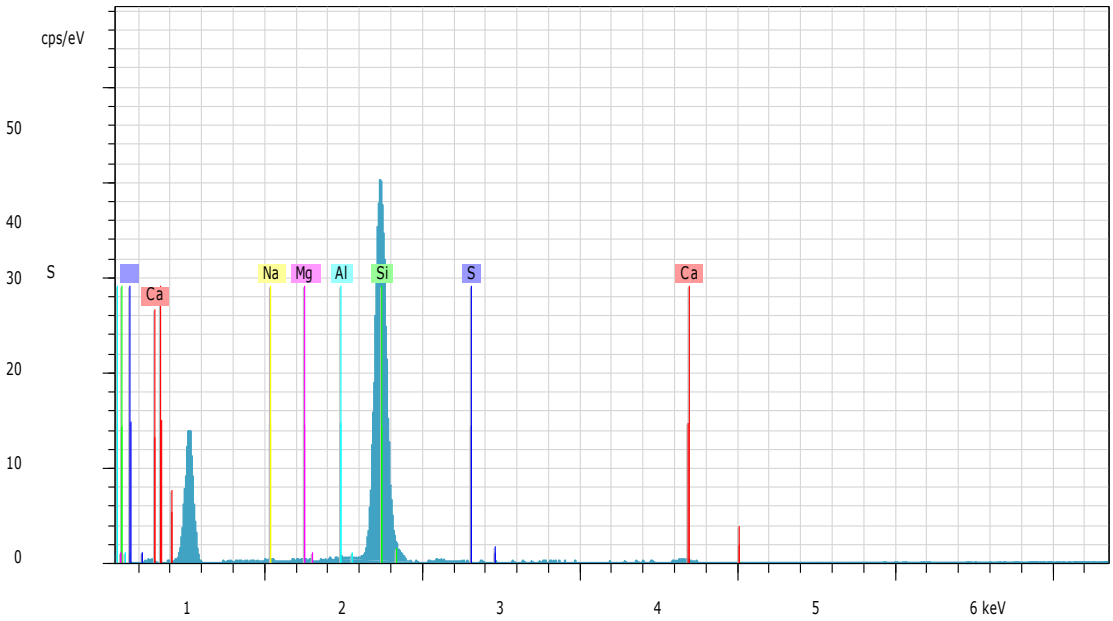
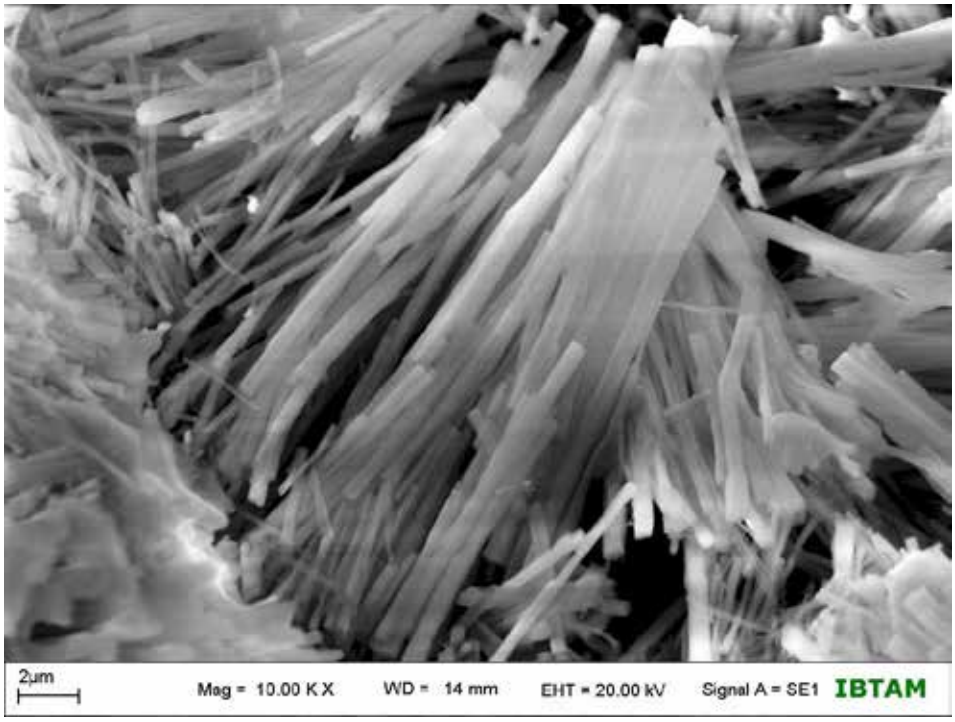


Fig. 4. A1 control specimen cured in magnesium sulphate solution with bladed-radial acicular thaumasite crystals and CSH-gypsum-calcite aggregates in matrix (SEM) (a) and elemental contents by EDAX (b)



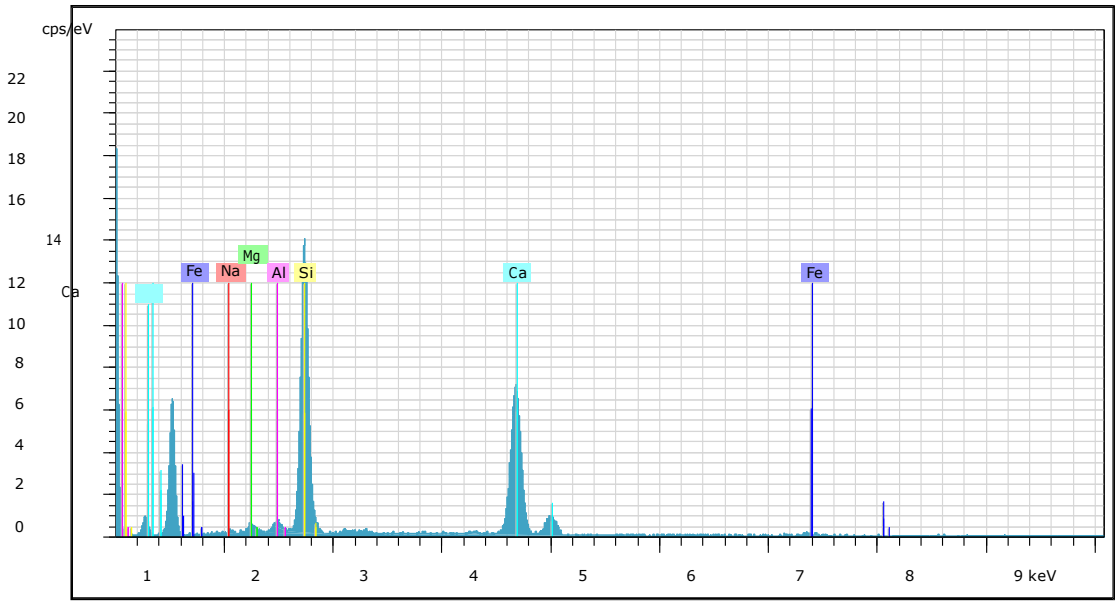
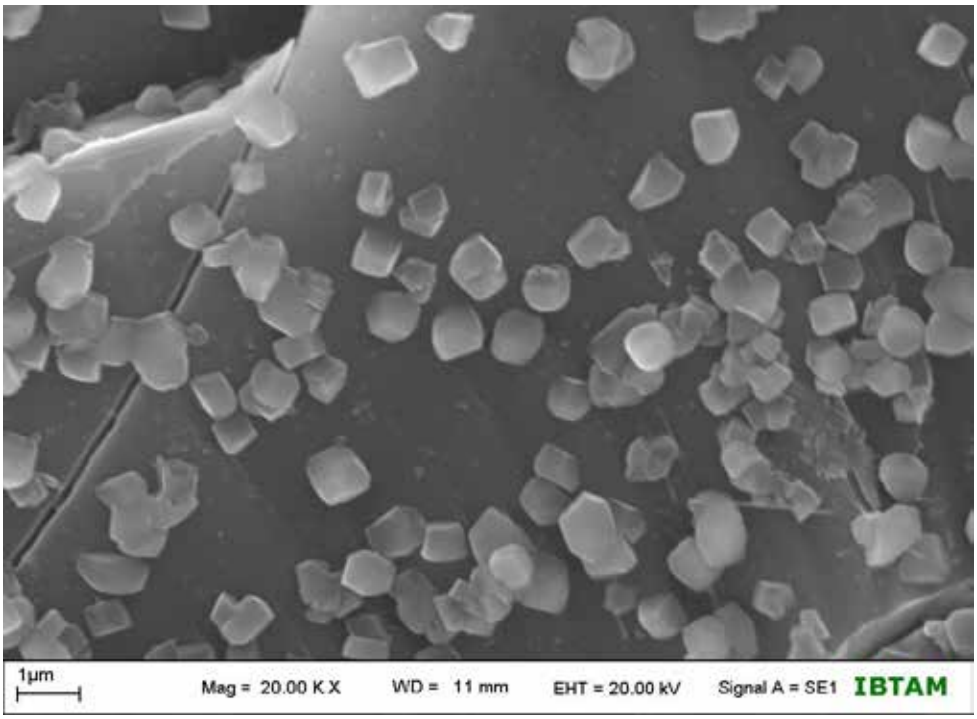


Fig. 5. A2 control specimen cured in magnesium sulphate solution with tabular minerals (SEM) (a) and elemental contents by EDAX (b)



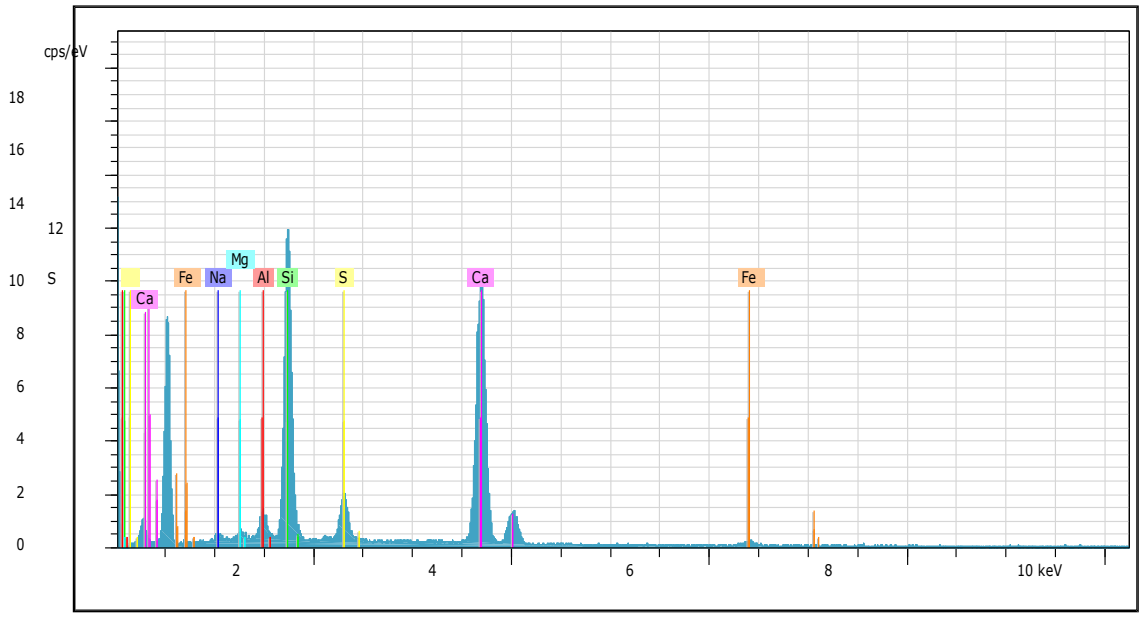
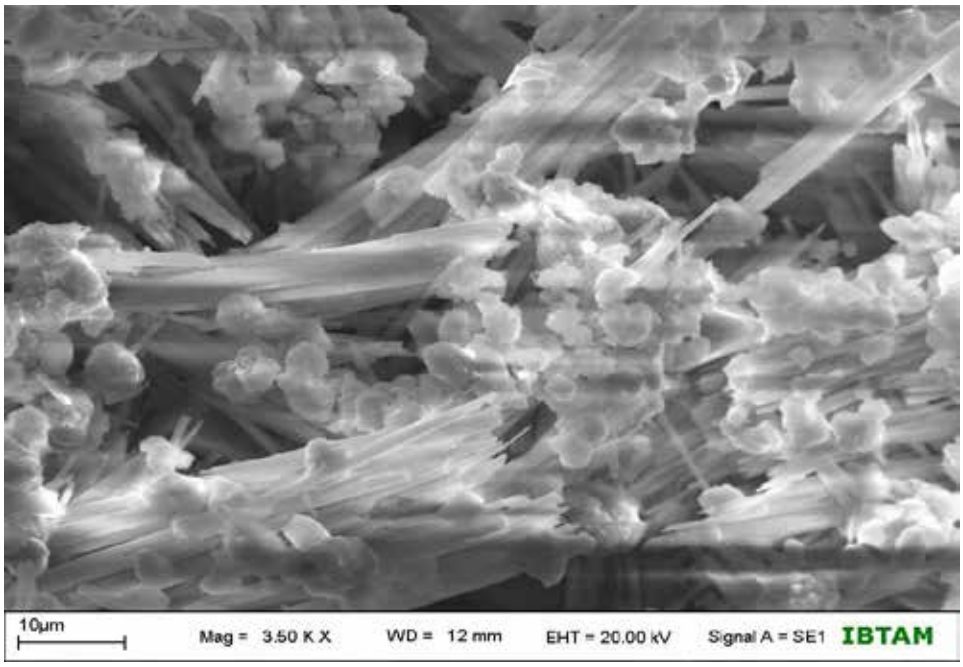


Fig. 6. Specimen B cured in magnesium sulphate solution with very fine 'pop corn' calcite and gypsum formed on quartz surface (SEM) (a) and elemental contents by EDAX (b)



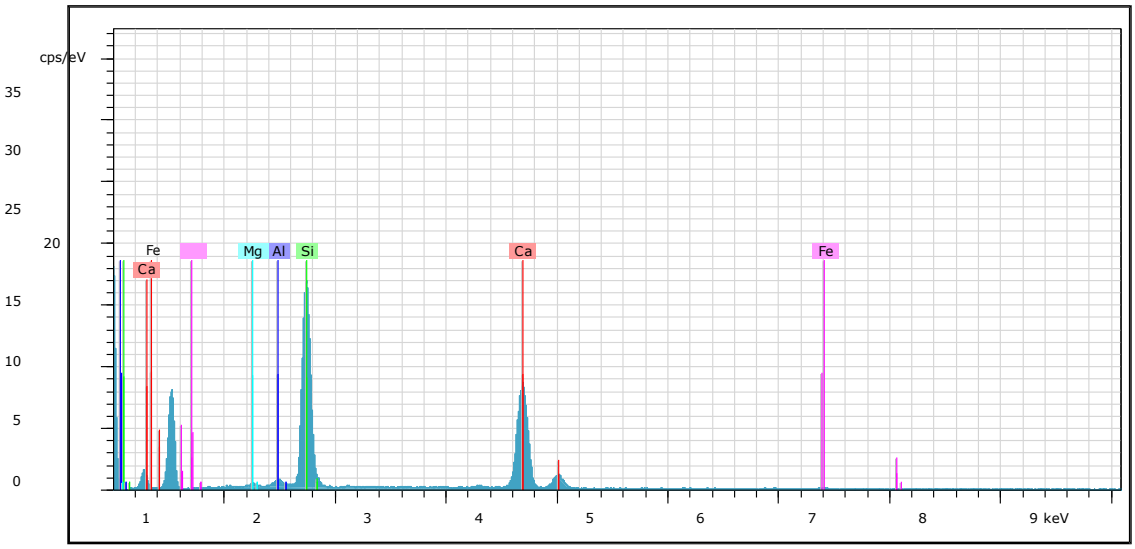


Fig. 7. Specimen C cured in magnesium sulphate solution. Bundles of randomly oriented thaumasite/ettringite fibers are closely packed/interlocked with clusters/aggregates of calcite and CSH structures (SEM) (a) and elemental contents by EDAX (b)

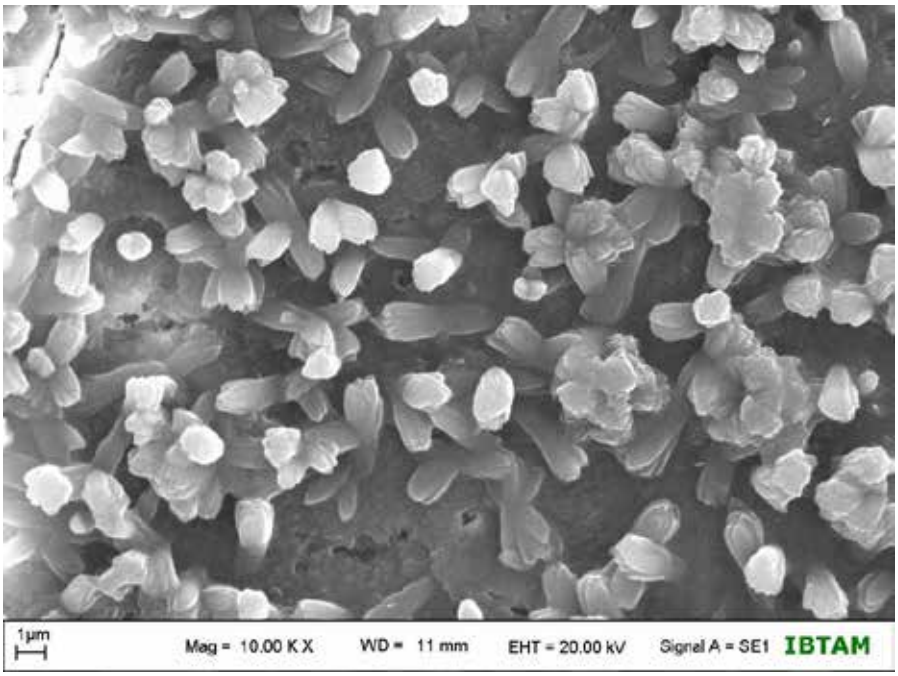


Fig. 8. Individual closely packed/interlocked coarser aggregates of calcite with gypsum, C-S-H structures and bundles of thaumasite and/or ettringite fibers (specimen C)

3.3.2 Polarised microscopy

The thin sections of the selected specimens cured in $MgSO_4$ at room temperature conditions have revealed the presence of the CSH structures and the particular orientations of co-existing thaumasite and ettringite in the concrete blends. Yellowish domains of CSH structures, high first order bright yellow and low second order red to gray/blue thaumasite and grayish ettringite is frequent throughout the matrix of specimen A2 (Fig. 11). Specimen A2 also reveals the presence of the tabular grains of thaumasite and ettringite that are also lining/forming along quartz grains and sinuous cracks [30] (Fig. 12). The flyash spherules of specimen B are also surrounded by in-situ forming thaumasite, ettringite and popcorn calcite as haloes most likely decreasing the strength of the mix as stated by Sibbick et al. [24,30] (Fig. 13).

3.3.3 Mineralogy

There is an increase in ettringite ($3CaO.Al_2O_3.3CaSO_4.31H_20$)/thaumasite ($CaSiO_3.CaCO_3.CaSO_4.15H_2O$) (9.8, 5.6 Angstrom-contemporaneous peaks), ettringite (5.2, 4.7, 3.6, Angstrom), calcite/ettringite (3.8, 3.0 Angstrom-overlapping peaks) and thaumasite (3.5, 3.4 Angstrom) in specimen B (Fig. 14) and especially more prominently in specimen E (Fig. 15) compared to the lower contents in other specimens. The presence of higher amounts of silica and calcium compared to lower

contents of alumina (Tables 5, 6 and Figs. 6, 7, 9 and 11) confirm the formation of thaumasite together with ettringite. Gypsum ($CaSO_4.2H_20$) (7.6 Angstrom) is also simultaneously transformed to ettringite and thaumasite during this process as a sequence of sulphate phase transformation especially in specimen E. The presence of portlandite ($Ca(OH)_2$) (4.9 Angstrom) in some specimens, as a mineral forming during the concrete curing process at low temperatures, may contain evidence of incomplete calcination during the concrete production or incomplete hydration on-going before and/or during the curing process.

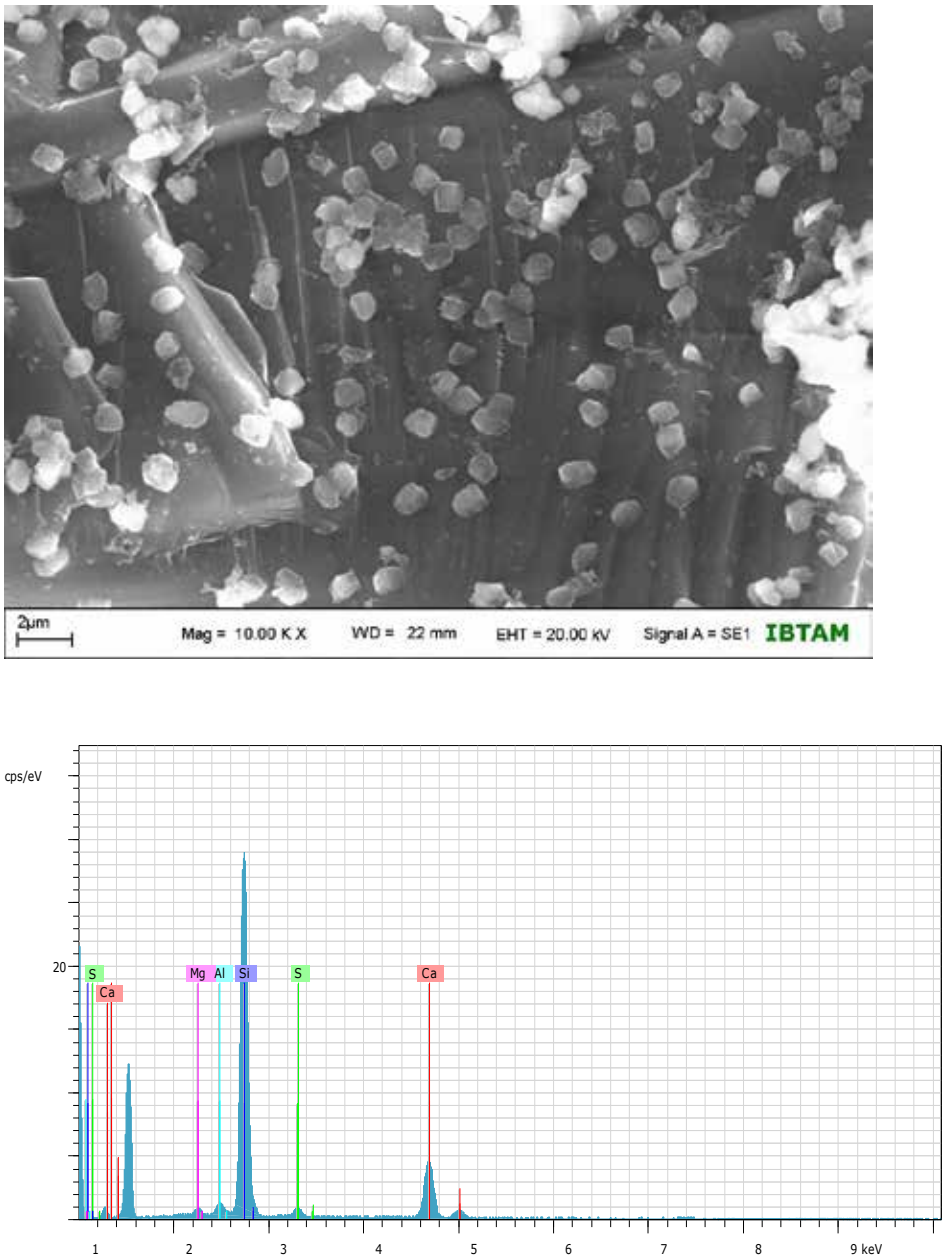


Fig. 9. Specimen D cured in magnesium sulphate solution. Popcorn Calcite on fractured mineral surface (a) and elemental contents by EDAX (b)

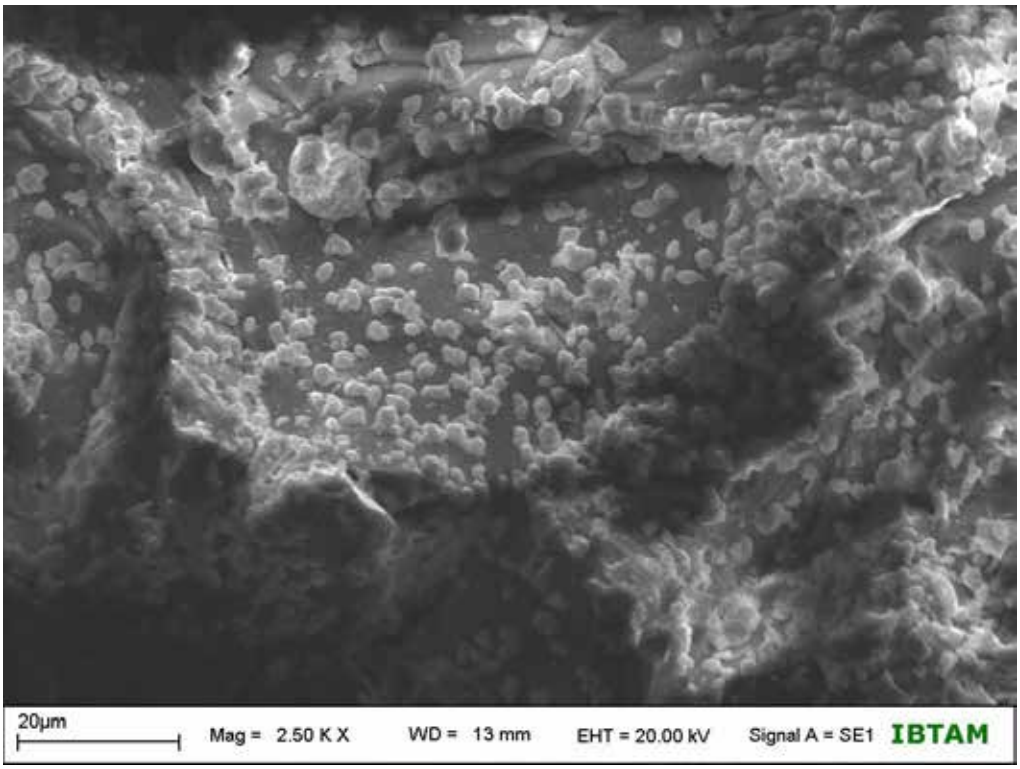


Fig. 10. Specimen E cured in magnesium sulphate solution. Grains of popcorn calcite with aggregates and domains of calcite, gypsum and structures alighning or randomly oriented on fractured and smooth/vitrified-like surfaces (a and b)

Theco-existing peaks of ettringite (9.8 A) and thaumasite (5.6 A) after the 10-year curing indicates an on-going and incomplete process of concretisation, which is ultimately anticipated to reach an ettringite-free thaumasite content. The detection of some of the weak and occasionally overlapping peaks of vaterite (popcorncalcite-polymorph of calcite-$CaCO_3$) (3.55, 2.71, 2.10 Angstrom) which readily alter to calcite may also be the indicators of the beginning of the last-stage reaction as the pH of the cement pore fluids drops from 13 to neutral [30].

All these manifest the on-going transformation of the CSH gels and Ca $(OH)_2$ (portlandite) to ettringite and ultimately to thaumasite. Anorthite ($CaAl_2Si_2O_8$) (4.09 and 3.28 Angstrom) in specimen E is most likely a secondary formation rather than a flyash ingredient. The absence of quartz may be due to it's dissolution in specimen E during the uncontrollable pH process fluctuating between 8 to 13. This may have occurred during the curing process of specimen E that favoured the formation of the calcium and silica rich anorthite and subsequent formation of thaumasite. The vitrified-like surfaces observed by the SEM images of specimen E are most likely part of the quartz grains that resisted dissolution.

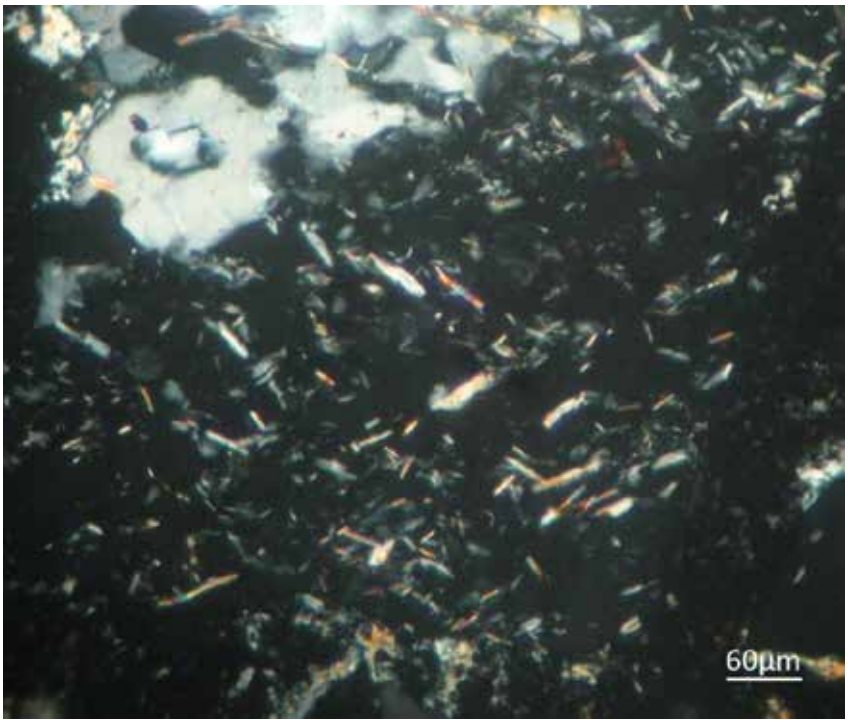


Fig. 11. Yellowish domains of CSH structures, tabular thaumasite (yellowish-red to grayish-blue) and ettringite (grayish) grains in matrix

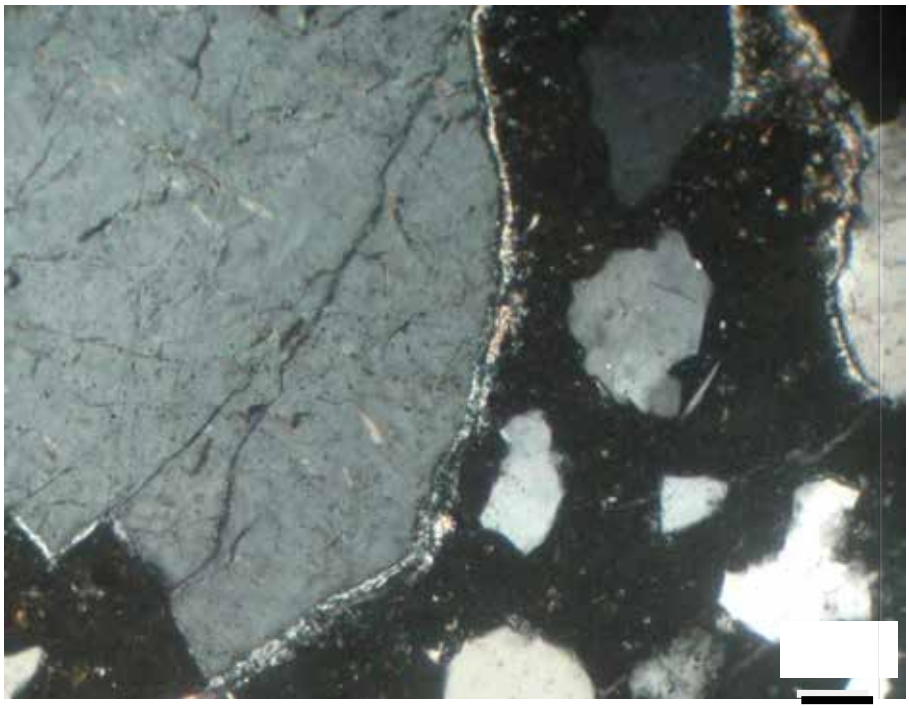


Fig. 12. Domains of thaumasite and ettringite surrounding larger grains and forming along mineral cracks of quartz

Table 5. Major chemical components of samples after detereoration

Sample	Element	Wt %	Atm %	Error
A1	Na	0.40	0.50	0.0
	Mg	0.26	0.31	0.0
	Al	1.13	1.18	0.1
	Si	94.57	95.21	1.7
	S	1.36	1.20	0.1
	Ca	2.28	1.61	0.1
A2	Mg	1.26	1.60	0.1
	Al	2.26	2.59	0.1
	Si	63.53	69.86	1.2
	S	2.86	2.76	0.1
	Ca	30.09	23.19	0.4
B	Na	0.92	1.41	0.1
	Mg	0.97	1.41	0.1
	Al	2.33	3.05	0.1
	Si	26.06	32.86	0.6
	S	2.28	2.52	0.1
	Ca	64.03	56.58	1.0
	Fe	3.42	2.17	0.1
C	Na	0.58	0.84	0.1
	Mg	1.41	1.94	0.1
	Al	1.90	2.35	0.1
	Si	42.75	50.94	1.0
	Ca	50.67	42.31	0.8
	Fe	2.69	1.61	0.1
D	Na	1.50	2.26	0.1
	Mg	1.03	1.46	0.1
	Al	2.99	3.83	0.1
	Si	27.77	34.18	0.7
	S	6.84	7.37	0.2
	Ca	56.76	48.97	1.0
	Fe	3.11	1.93	0.1
E	Mg	0.39	0.56	0.0
	Al	1.15	1.46	0.1
	Si	38.38	46.97	0.9
	Ca	57.91	49.67	0.9
	Fe	2.18	1.34	0.1

Table 6. Total elemental contents of specimen E (XRF)

Components	(%)	Error (%)
SiO_2	48.0780	0.1
CaO	28.1820	0.05
Al_2O_3	4.2417	0.02
SO_3	3.2994	0.02
Fe_2O_3	3.0571	0.02
MgO	1.5575	0.008
TiO_2	0.3683	0.007

Table 6 continued.....

Cl	0.3141	0.006
MnO	0.2031	0.004
Cr_2O_3	0.1664	0.004
K_2O	0.1495	0.002
P_2O_5	0,0945	0.002
Na_2O	0.0863	0.003
SrO	0.0559	0.001
NiO	0.0165	0.001
ZrO_2	0.0126	0.001
ZnO	0.0098	0.001
CuO	0.0074	0.001
L.I	10.1	0.0001

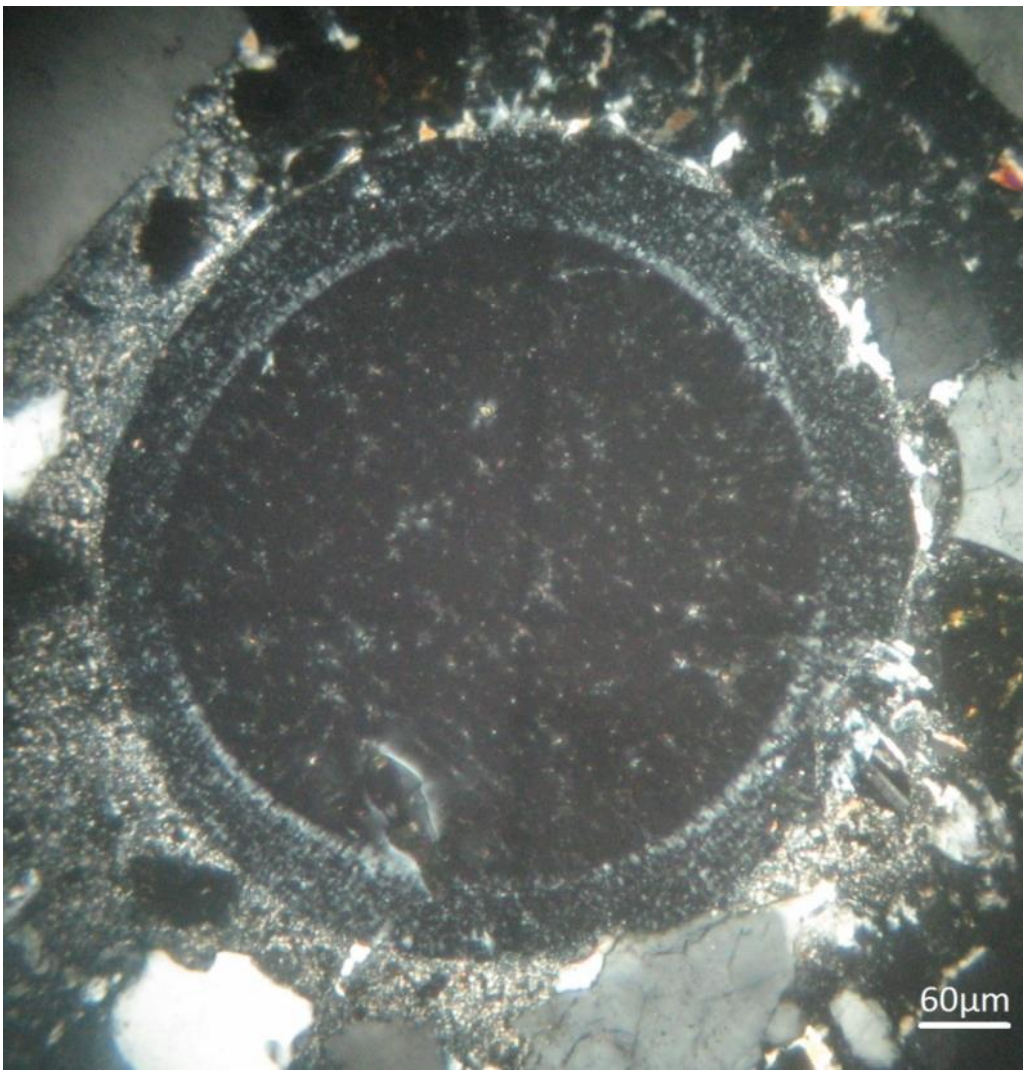


Fig. 13. Thaumasite, ettringite and popcorn calcite surrounding fly ash spherules

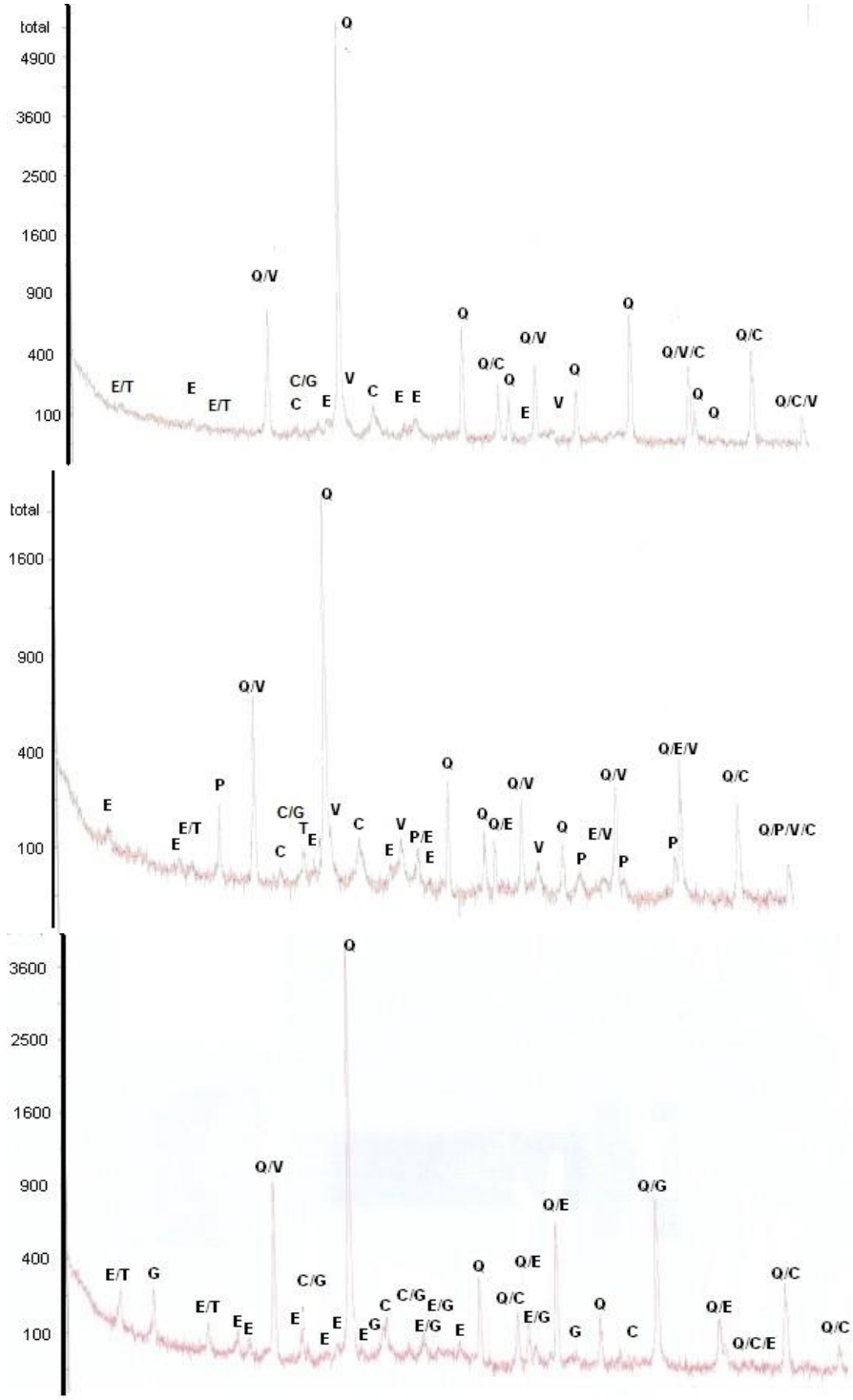


Fig. 14. X-ray diffractograms of the cured specimens (Specimens A1, A2, and B)
(A: Anorthite; C: Calcite; E: Ettringite; G: Gypsum; P: Portlandite; T: Thaumasite; Q: Quartz; V: Vaterite)

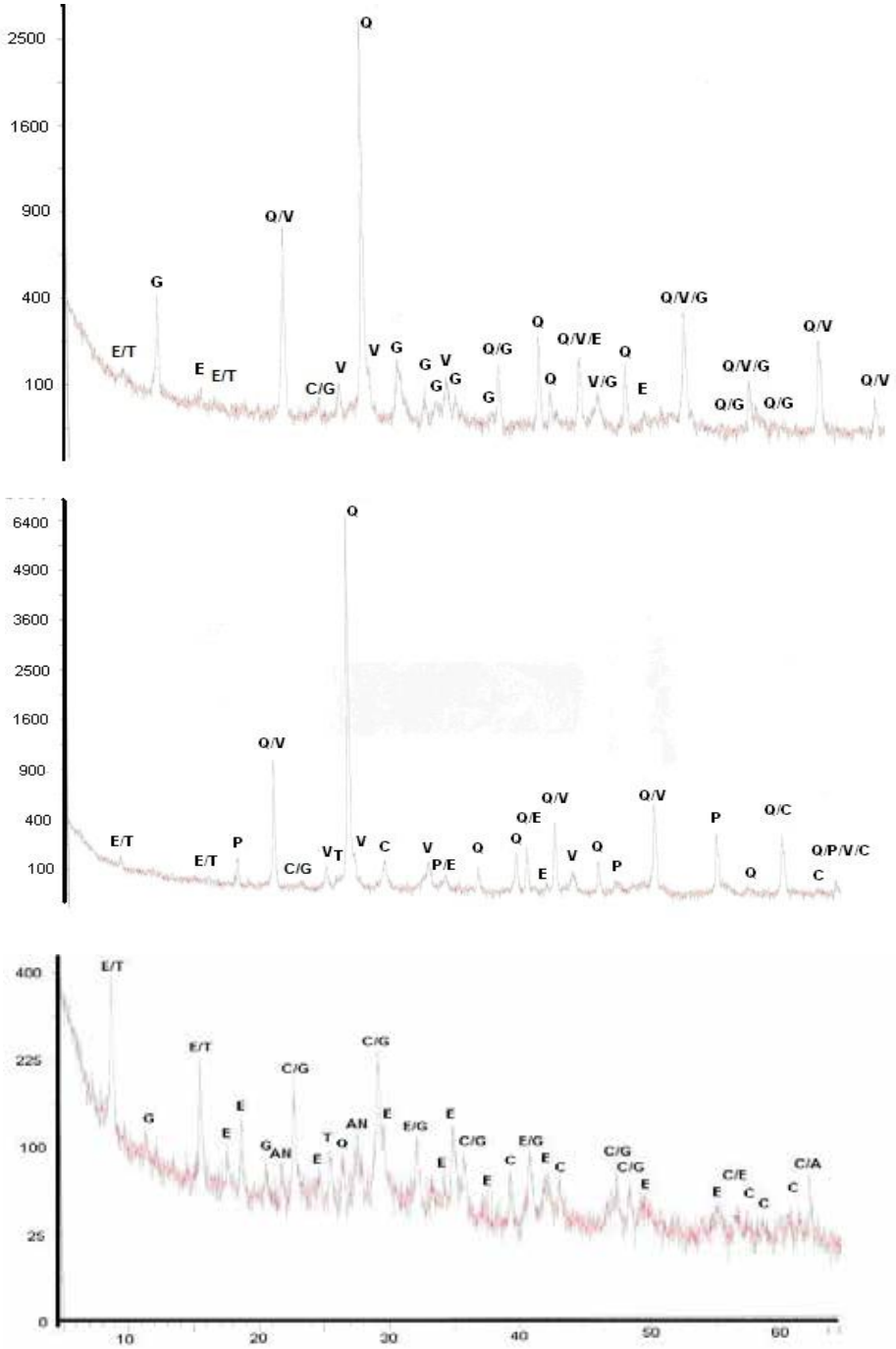


Fig. 15. X-ray diffractograms of the cured specimens (Specimens C, D, and E)
(A: Anorthite; C: Calcite; E: Ettringite; G: Gypsum; P: Portlandite; T: Thaumasite; Q: Quartz; V: Vaterite)

4. CONCLUSION

The study revealed that the,

1. The higher pressure resistance of the C and E specimens compared to the B and D was most likely due to higher CSH gel/aggregate formation together with the co-existing interlocked thaumasite and ettringite crystals.

2. The interground specimen resistance was higher than the separate ground blends, most likely due to the fineness of the material. But the lower resistance of D than E was most probably due to the abundant popcorn calcite distribution and the cracks developed in the former.

3. The use of the ground granulated blast furnace slag and basaltic pumice improved the sulphate resistance of the cement mortars, where specimen E yielded the highest sulphate resistance-highest TSA resistance.

4. The microstructure was modified with the addition of pozzolans. The effect of this was a reduced rate of leaching of the alkali hydroxide from the pore fluid but did not prevent expansion.

5. Despite the numerous studies conducted on the relation of hydration and hydrolysis with reference to cement hardening, the hydration-bound hardening phenomenon coupled with thaumasite morphology and matrix and/or pore space orientations are in need of further investigation. Nevertheless, the presence of thaumasite together with ettringite and portlandite in some specimens reflect the incomplete transformation phase to hydration, i.e., the anticipated complete transformation of ettringite to thaumasite [18-23] and may indicate the continuity of the TSA process in concrete.

ACKNOWLEDGEMENTS

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Modeling of a High Performance Grid Connected Photovoltaic System

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Abstract: This paper presents detailed modelling of a grid-connected photovoltaic (PV) system components. The study is helpful to understand the working principles of the PV system. The performance of the system has been discussed by means of a Matlab/Simulink Toolbox. The results show that the PV system capable of tracking the maximum power point (MPP) quickly and precisely in case of sudden changes in solar radiation, cell temperature, and in case of existence of sand. Under the non-uniform atmospheric conditions, to get a high performance of the PV system, appropriate converters are required to operate at the MPP.

Keywords: photovoltaic system; solar irradiation; Maximum Power Point Tracking (MPPT).

1. INTRODUCTION

Solar energy provides the opportunity to develop electric energy from clean, endless, and green energies [1,2]. A PV cell is a basic unit that generates voltage in the range of 0.5 to 0.8 volts depending on cell technology being used [3,4]. Therefore the solar cells are connected in series and parallel in order to create a solar module depending on the capacity demands [5]. Regardless of the intermittency of sunlight, solar energy is widely available and completely free of cost [6-8]. The efficiency of the PV cells is quite dependent to the environmental and operational conditions. The output power of the PV systems affected by solar radiation, ambient temperature, and sand (dust, clouds, shading, etc.) [9,10]. The cell conversion ranges from 12% up to a maximum of 29% for very expensive units [11,12]. So to extract the maximum possible power from a PV system, tracking the single maximum power operating point is very important to raise the efficient operation of the PV system, and so, MPPT is

one of the most important issues in PV system [13,14]. MPPT methods are various and they differ in terms of complexity, speed of response, and cost [15,16,17,18,19]. A popular method of perturb and observe (P&Q) based on a boost converter as MPPT device is considered in this paper.

In the last few years, the demand for electrical power in Jordan has increased significantly due to developments in the industrial sector and people's standard of living conditions. Solar energy can cover these conditions in the future, and achieve great results due to the location of the Kingdome and the large desert areas. The demand for solar energy, globally, has increased by 20% to 25% over the past 20 years [20]. The electrical system powered by solar arrays requires special design considerations due to the varying nature of the solar power generated resulting from unpredictable and sudden changes in weather conditions, which change the solar radiation level as well as the cell operating temperature. A PV array is interfaced with DC/DC converter to obtain the desired DC voltage by utilizing Maximum Power Point Tracking (MPPT) technique to extract the maximum power, which is converted to alternating current (AC) by an inverter.

The nonlinear output PV characteristics, Power-Voltage (P-V) and Current-Voltage (I-V), are affected by the solar radiation and the temperature. The PV system should always operate so as to extract the maximum power under the variations of solar radiation, while the environment temperature supposed to be maintained at nominal value (250 C), therefore the PV current only depends on solar radiation. The time, required, to reach MPP under variable conditions has to be analysed to evaluate the performance of the PV system [21, 22].

2. PHOTOVOLTAIC SYSTEM MODELLING

2.1 PV Cell Model

A mathematical description of current - voltage terminal characteristics for PV cells is available in the literature. The single exponential equation (1) which models a PV cell is derived from the physics of the PN junction and is generally accepted as reflecting the characteristic behavior of the cell [7].

$$I = I_{ph} - I_s \left\{ \exp \frac{q(V+R_sI)}{NKT} - 1 \right\} - \frac{V+R_sI}{R_{sh}}, \qquad (1)$$

where:

Iph: represents the current generated by the photons (it will be constant if the radiation and the temperature are constants too). The photon generated current will flow out of the cell as a short-circuit current (Isc),

Is: is the panel dark saturation current, in A, which depends strongly on temperature q: Is the electron charge (1.602x10 -19 C),

V: is the voltage across the diode (V),

K: is the Boltzmann's constant (1.381x10 -23 J/K),

T: is the working temperatureof the cell, in Kelvin,

N: ideality factor of the diode,

R_s: is the series resistance in ohm, which models the ohmic losses,

R_{sh}: is the shunt resistance, in ohm, which represents the current leakage.

From the equations, an equivalent circuit can be easily determined, and this aids in the development of the simulation model. This equivalent circuit model is shown in Fig. 1. It includes a current source, a diode, a series resistance and a shunt resistance.

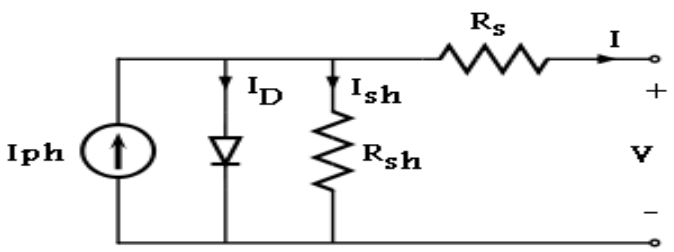

Fig. 1. PV cell equivalent circuit

2.2 The Influence of Solar Irradiation Variation

Based on the above equation, the subsystem of Fig. 1 is obtained. The above model includes two subsystems: one that calculates the PV cell photocurrent which depends on the radiation and the temperature [23].

$$\mathrm{Iph} = [\mathrm{Isc} + \mathrm{Ki}(\mathrm{T} - 298)]\frac{\mathrm{G}}{1000}, \qquad (2)$$

where K_i = 0.0017 A/C0 is thecell's short circuit current temperature coefficient and G is the solar radiation (W/m^2).

2.3 The Influence of Cell Temperature Variation

Like all other semiconductor devices, solar cells are sensitive to temperature, Increase in temperature, reduce the band gap of a semiconductor, thereby effecting most of the semiconductor material parameters. In a solar cell, the parameter most affected by an increase in temperature is the open-circuit voltage. Panel temperatures in the summer in warm climates can easily reach 50°C resulting in a 12% reduction in output compared to the rated output at 25°C. To calculate the exact percentage of losses due to the difference of temperature in Jordan. For the PV module selected in section below (Kyroce KD235XL) the temperature confection for voltage is (-1.33×10^{-1} V°C) and for current is (5.13×10^{-3} A/CO).

The Jordan ambient temperature is about 45CO so it's greater than the STC (standard test conditions) value by 20°C. By calculating the value of the reduction in voltage and current the expected effect of temperature is about 1% of losses in power. The diode reverse saturation current varies as a cubic function of the temperature and it can be expressed as [23]:

$$I_S(T) = I_s [T/T_{nom}]^3 \exp[(T/T_{nom} - 1)E_g/(N.V_t)], \quad (3)$$

where:

I_s is the panel dark saturation current, in A,

T_{nom} is the nominal temperature, equals to 300 K,

E_g is the band gap energy ofthe semiconductor,

V_t is the thermal voltage.

When there is no connection to the PV cell (open circuit), the photon generated current is shunted internally by the intrinsic p-n junction diode, this gives the open circuit voltage (V_{oe}).

In general, for a given solar radiation, when the cell temperature increases, the open circuit voltage V_{oe}, drops slightly, while the short circuit current increases. Figs. 2 and 3 show temperature effect.

2.4 The Influence of Dust and Sands

Dust, Sands, clouds, and snow decrease solar panel efficiency. For our reign in Jordan as Mediterranean climate high altitudes require high tilt in a PV system. A lower fixed tilt angle is recommended to optimize year-round solar. Gain dust generally

tends to fall off with the increase in the tilt angle. The reign of Jordan is almost clear and not dusty or windy so the effect of the dust and soil can be reduced when using a fixed (manual change) title angel is about 3-4%.

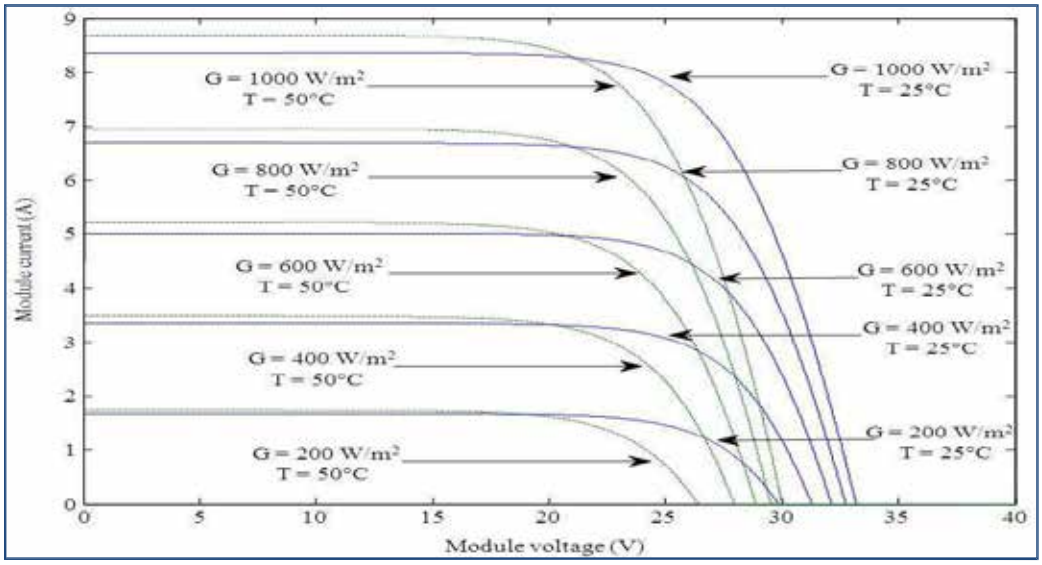

Fig. 2. The I-V characteristic for 25°C and 50°C

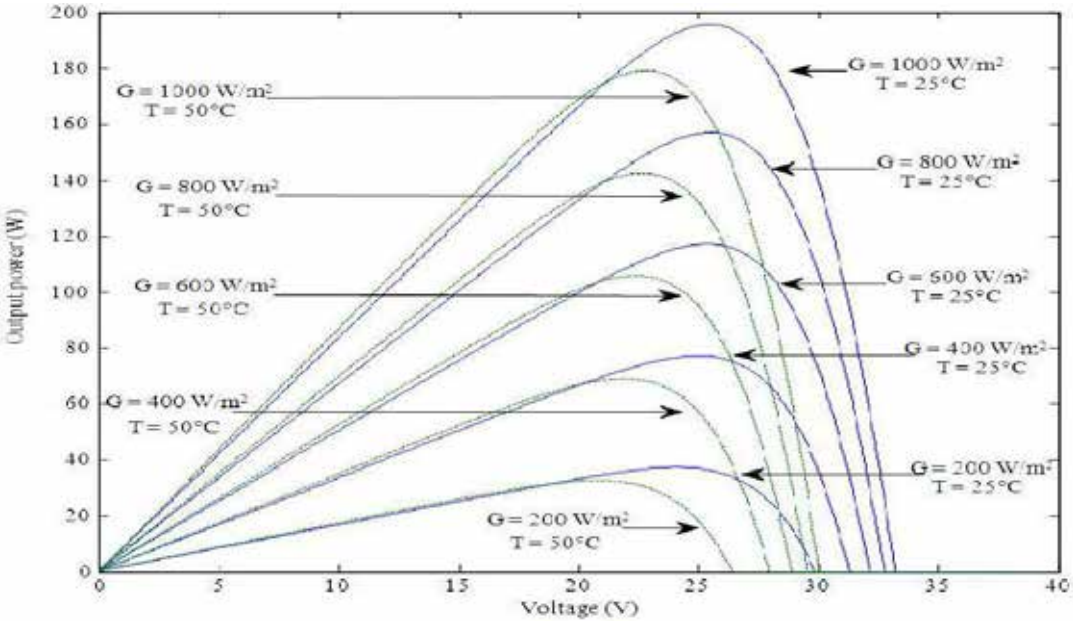

Fig. 3. The P-V characteristic for 25°C and 50°C

2.5 Boost Converter with MPPT Controller and the Voltage Sourced Converter

A DC-DC power, converter boosts the DC power from one voltage level to another higher or lower to the input voltage, has to be added at the output of the

photovoltaic array to achieve the optimum voltage and to implement the Maximum Power Point Tracking (MPPT).

$$Vo = {}^{Vin}\mathbf{j}_{(1 - D)}, \quad (4)$$

where Vin is the input voltage (output voltage of PV array), Vo is the output voltage and D is the duty ratio of controllable switch. With the boost topologies the output voltage could be higher than input voltage. And can vary from 0 to 1, although there is no practical value of D equal to 1 due to voltage limitation issues Fig. 4. Is the configuration of the boost circuit and its control system [10]. In the detailed model, the DC-DC converter boosts DC voltage from 273.5 V to 500 V. Basically, the module current is perturbed by a small increment, and the resulting change in the power is observed. A simple updating algorithm is given as follows: The terminal voltage V and current I of PV arrays am first measured and PV power P is therefore obtained from the product of V and I If the maximum power point Pm is the demarcation point, when V (k) >V (k-1), if P (k)-P (k-1)>0, then the solar cell work in the left section of the curve. To make the operating point close to the maximum power Pm point, need to continue to increase the output voltage V; In contrast, V (k) >V (k-1), if P (k) - P (k-1)<0, then the solar cell work in the right part of the curve, in order to make the operating point near the point of maximum power Pm, require to reduce the output voltage V. With this control algorithm, the operating point of PV arrays can move toward the maximum power point corresponding to different temperature and irradiance. In order to suit the frequency and voltage level requirement of the load, a suitable switching power inverter is used. PV array is connected to the AC grid via a common DC/AC inverter. The inverter is used in current control method with PWM switching mechanism to make the inductance current track the sinusoidal reference current command closely and obtain a low THD injected current. The direct current (DC) link capacitor maintains the solar PV array voltage at a certain level for the voltage source inverter. The single phase inverter with the output filter converts the DC input voltage into AC sinusoidal voltage by means of appropriate switch signals and then the filter output pass through an isolation step up transformer to set up the filter output voltage required by the electric utility grid and load [24].

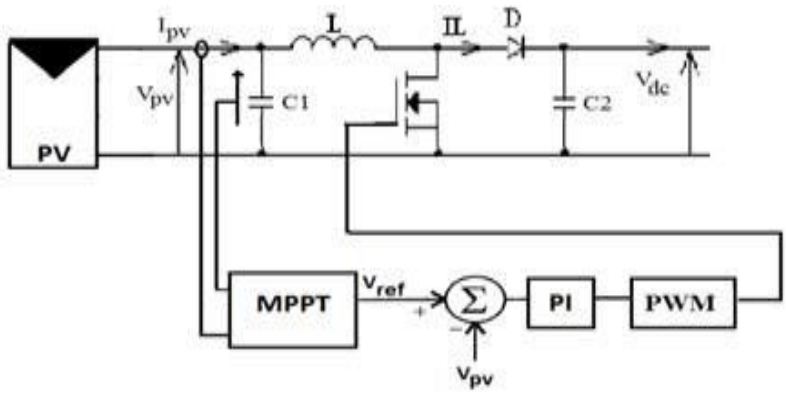

Fig. 4. Boost converter with MPPT controller

3. RESULTS AND DISCUSSION

Fig. 5 shows the system model configuration that will be used to generate electrical energy using PV array, then feed it to a building in Amman (load) as a case study. And the extra power to the grid. The system is composed of two main buses: a DC bus and an AC bus. The PV panels are connected to the DC bus. This power is then converted to AC bus to which the electrical load and the grid will be connected. The annual global solar radiation in Amman-Jordan is about 5.47 kWh/m^2/day. Suppose that the electrical load of the research building is 40 kWh/day. Due to the losses of the system the Electrical load will be El = 1.15 * 40 = 46 kwh/day. The average number of the sunshine of hours in Jordan for the year is set to 9.5 hours per day If the selected PV module is KYOCERA KD235GX solar panel with 235 Wp peak power. The parameters of the PV module used in our study are tabulated in Table 1 and its approximated I-V and P-V characteristics are depicted in Figs. 2 and 3 respectively [15]. PV array size = Electric. Load / sunshine hours 46 / 9.5 = 4.85 kW. Due to the inverter losses PV array size becomes: PV array size = 1.045 * 4.85 = 5.07 KW. The number of PV modules = PV array sizing / peak power of module = 5.07 / 0.235 = 22. If the selected Grid Tie Solar Inverter is GT5.0SP with the specifications in Table 2 Inverter power = 4850 * 0.95 = 4651.15 W. So the number of PV in series = 600/36.9 = 16 modules Number of PV modules in parallel = 22/16 = 2 modules. So the final number of PV panels = 2*16 = 32 modules. The maximum current = (number of PV in parallel) * Isc = (2) *8. 55 = (17.1) A. So number of PV in parallel = 22/8.55 = 2 modules Number of PV modules in parallel = 22/2 = 11 modules. So the final number of PV panels = 2*11 = 22 modules, and the maximum voltage = number of PV in series * Isc = 11*36.9 = 405 V.

The I-V and P-V characteristics for the array and for each module are shown in Figs. 6 and 7, respectively. The duty cycle of the boost is set to 0.5.

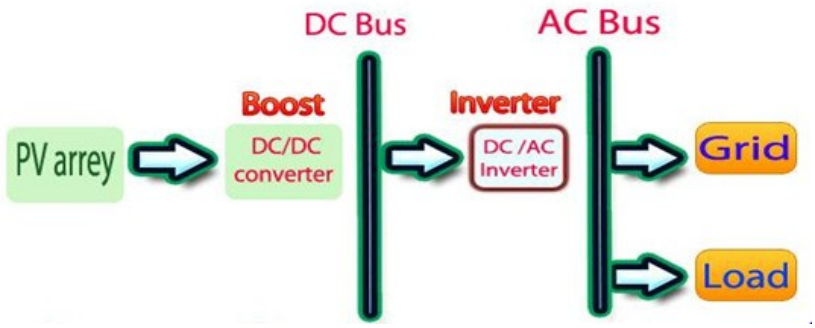

Fig. 5. System model configuration

Table 1. The PV module data

Power peak	235 watt
Maximum power voltage V_{mpp}	29.8 V
Maximum power current I_{mpp}	7.89 A
Open Circuit voltage V_{oe}	36.9 V Short
Circuit current I_{se}	8.55 A
Max system voltage	600 V
Temperature voltage coefficient	$-1.33*10^{-1}$ V/C0
Temperature current coefficient	$5.13*10^{-3}$ V/C0

Table 2. The specification of selected inverter

AC power	5000
AC voltage	240 V
AC current	21 A
Frequency	50 Hz
Maximum DC voltage Vmax	600 V
Maximum DC current Imax	22 A
Maximum efficiency	95%

3.1 The Effect of Irradiation

3.1.1 Irradiation varying in a ramp up/down form

At t=0 sec the radiation is set to 1000 w/m^2 then at t=0.7 sec it decreases with a rate of 1500 w/m^2/sec for 0.5 sec then at t=1.5 sec it increases with a rate of 1500 w/m^2/search for 0.5 sec. As it is shown in Figs. 8 and 9 shows the variation of the PV DC voltage, PV DC current, and the diode current as a result of the radiation variation. Fig. 10 shows the PV output power and the effect of the variation of the radiation. And how the duty cycle decreases to track the PV output power close to the maximum power point of the PV for the given conditions.

3.1.2 Irradiation varving in a step form

At t=0.7 sec a step from 1000 w/m^2 to a 200 w/m^2 has been done as shown in Figs. 11-13 show the variation of the output array voltage and power. It is shown that the output PV current decreases and increases as the radiation decreases or increases. Once the radiation changes sharply consequently the output PV power changed sharply Fig. 13 shows that the duty cycle value follows the changes of the radiation (the response of the MPPT) in order to track the maximum power point that can be attained from the PV array under these conditions.

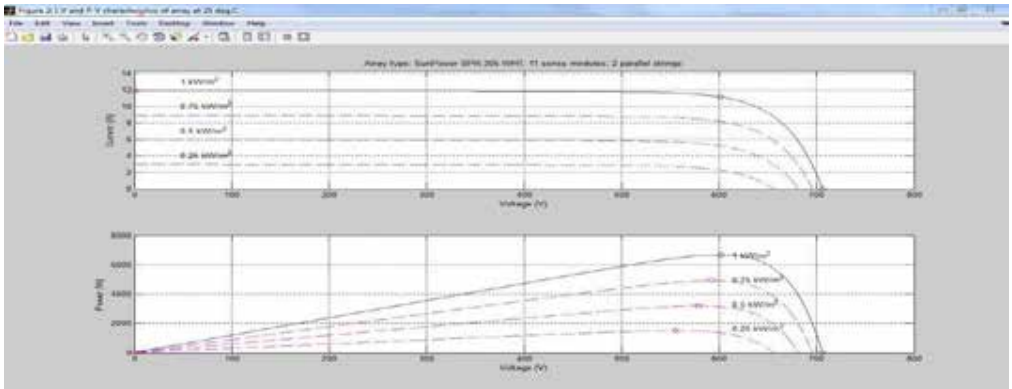

Fig. 6. Array 1-V and P-V characteristics

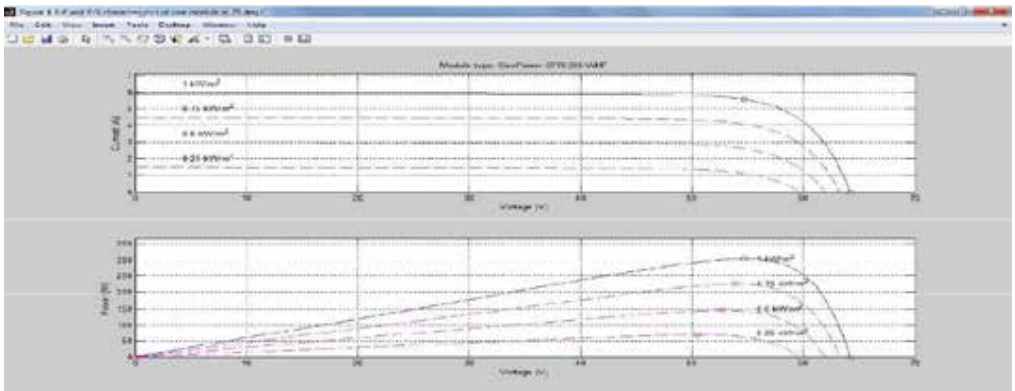

Fig. 7. One module 1-V and P-V characteristics

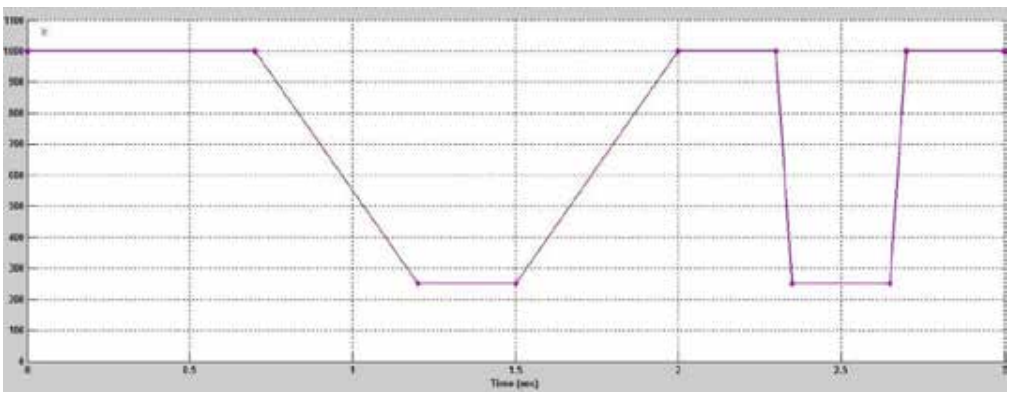

Fig. 8. The radiation as a function of time

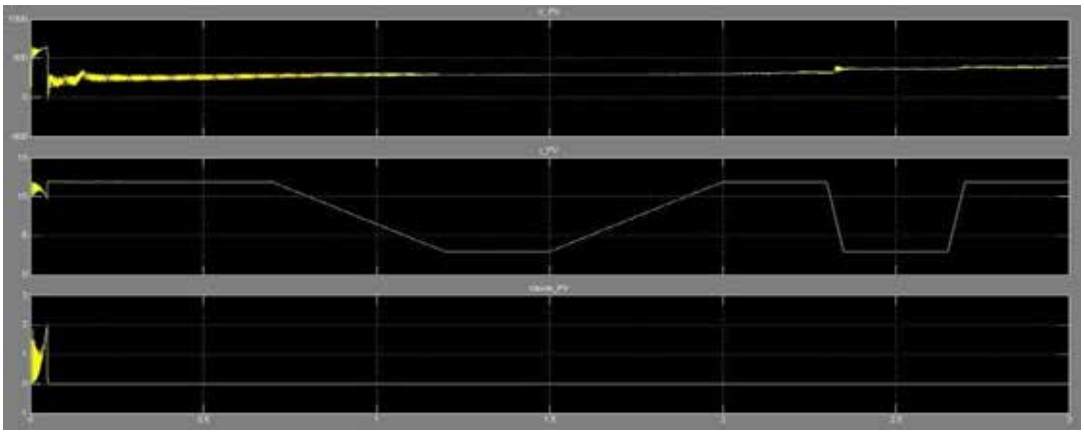

Fig. 9. The output PV-voltage, PV-current, and the PV diode's current

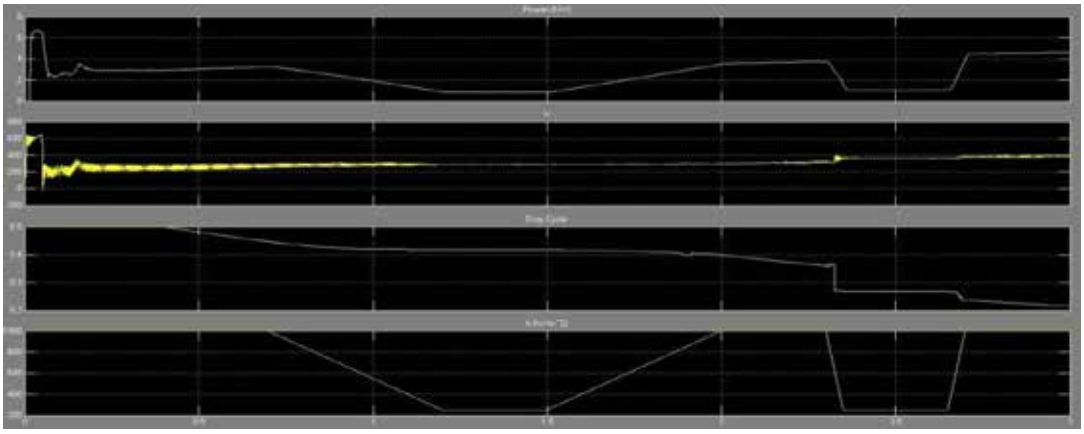

Fig. 10. The Boost converter output mean power, boost converter output voltage, the duty cycle, and the PV array irradiation

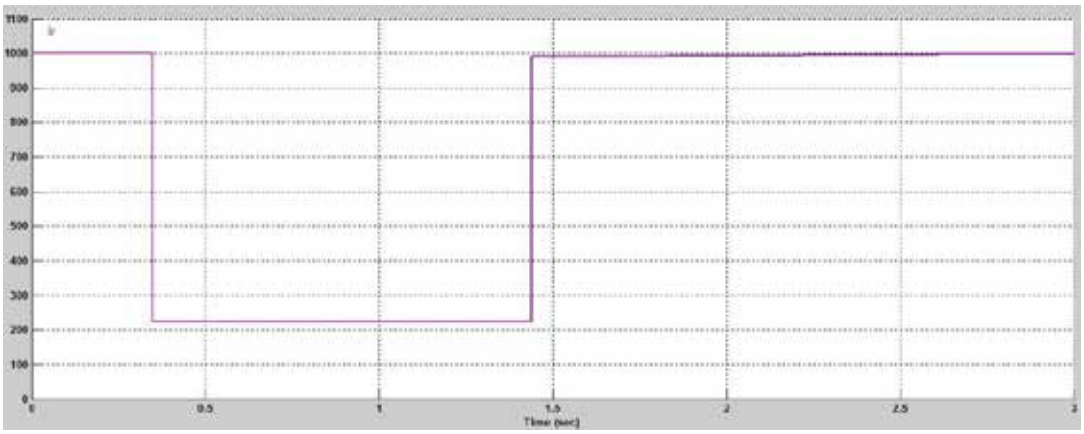

Fig. 11. Step irradiation

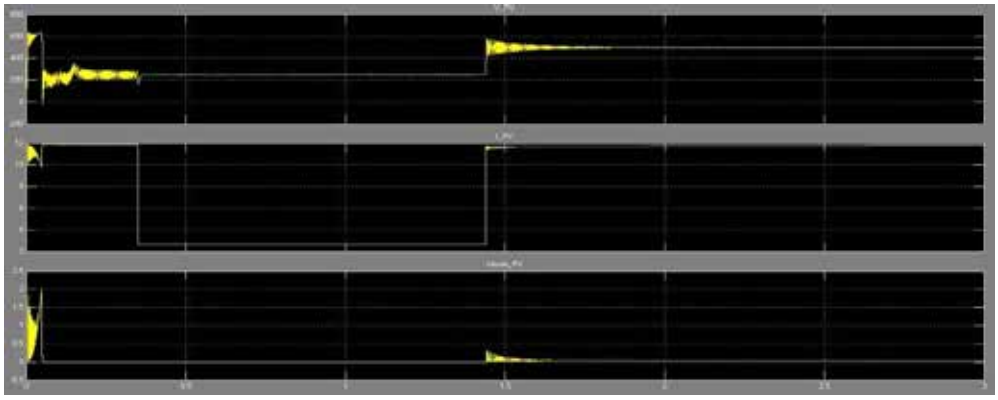

Fig. 12. The boost converter output voltage, output current, and the diode's current

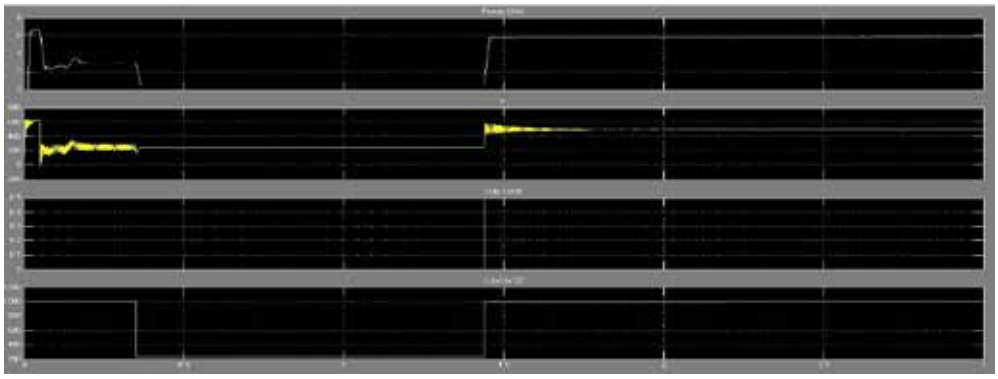

Fig. 13. The boost converter output mean power, output voltage, the duty cycle, and the PV array irradiation

3.1.3 Changing the duty cycle (D) of the boost

The duty cycle set to 0.75 instead of 0.5, and the same parameters of the first case. Fig. 14 shows how the output PV power under such conditions decreases than that of case one.

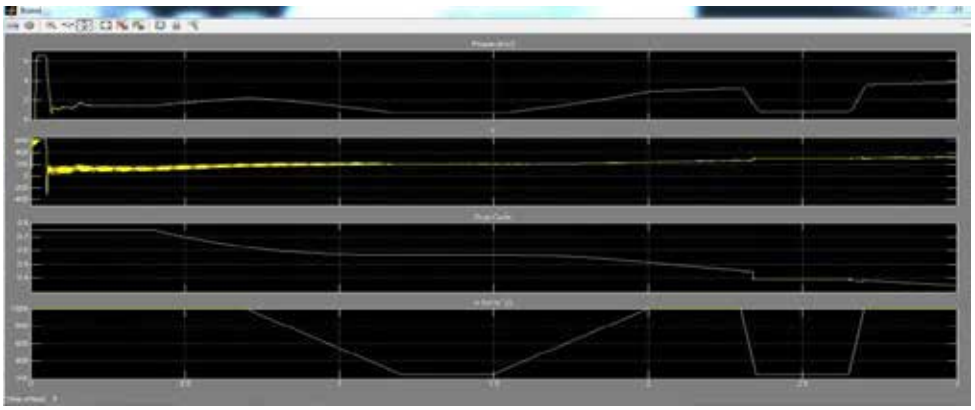

Fig. 14. PV power, boost converter output voltage, duty cycle, and the irradiation

3.1.4 Sand effect on PV array

Sand effect, or any analogue effect like shading, dust, snow, clouds.., e.t.c, can be simulated by adding another signal to the signal of irradiation. As shown in Figs. 15

and 16 shows how the PV current changed following the irradiation variation caused by the sand effect. Leading to a decrease of the output PV power which means minimization of the efficiency and so the performance of the PV.

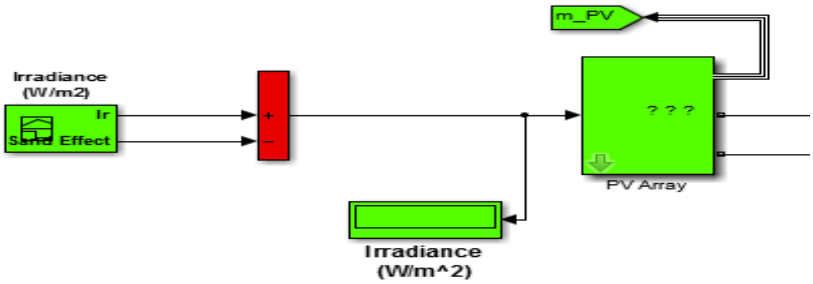

Fig. 15. Sand effect models

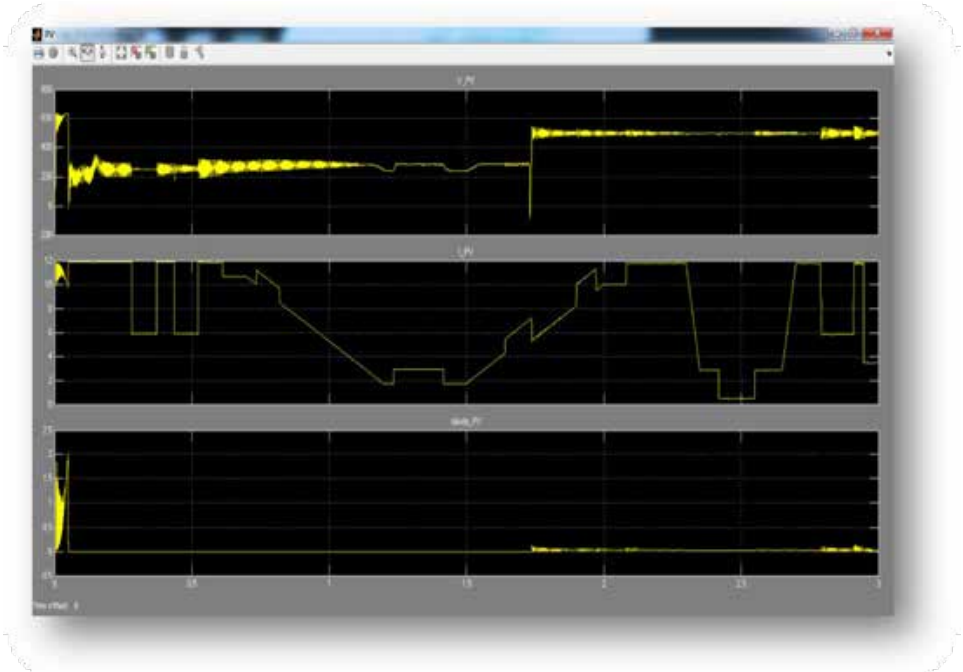

Fig. 16. The PV voltage, PV current, and the diodes current under the sand effect

4. CONCLUSION

The paper presents an approach of modelling a solar PV cell. The model is based on the fundamental circuit equations of a solar PV cell taking the effects of the environmental parameters such as the solar radiation, the cell temperature and the sand effect. The module was simulated on a Matlab/Simulink model using a KYOCERA KD235GX solar panel with 235 Wp peak power, such model would provide a tool to predict the I-V, and P-V characteristics of the solar PV cells and to select the

proper power electronics and the associated control method to track the maximum power point under the changes of the environmental parameters.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Estimation of the State of Insulation of Electric Motors

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Abstract: Parameters of insulation of windings of an electric motor with the time of operation and number of repairs deteriorate. The performed review of methods and means of control of the technical state of isolation provides an opportunity to consider that existing technologies and control methods do not fully ensure the high reliability of the control results. The main drawbacks are:

- there is no possibility to predict the appearance of defects;
- the need for installation of additional control equipment;
- the techniques discussed are used only for permanent modes, but not for continuous monitoring systems.

The method of estimating the residual life of winding isolation work is proposed, which takes into account the dynamics of thermal processes in an electric machine and allows to calculate the residual life of insulation work. The starting modes of the electric motor are considered, since they have the greatest influence on heating the elements of the winding.

Keywords: electric motor, windings, overheating, service life, temperature, cooling, heating constant.

Оценка состояния изоляции электрических двигателей

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Аннотация: Исследованы и проанализированы методики определения ресурса работы изоляции электрических двигателей. Выявлены недостатки, которые влияют на качество оценки изоляции. Определено, что для достоверного определения состояния изоляции электродвигателей необходимо вводить в алгоритм расчетов реальную температуру изоляции, которая в рассматриваемых методиках берется усреднённой, как температура всей обмотки в целом. Предложенная методика позволяет учесть неравномерность нагрева элементов двигателя и с большей точностью определить ресурс работы изоляции.

Ключевые слова: электрический двигатель, обмотки, перегрев, ресурс работы, температура, охлаждение, постоянная нагрева.

1. Введение

В настоящий момент электромеханическое оборудование Украины преимущественно состоит из электрических машин (ЭМ), которые были введены в эксплуатацию более 25 лет тому назад, и их текущее техническое состояние и остаточный ресурс работы вызывают большую заинтересованность, поскольку массовое обновление оборудования связано с большими материальными затратами.

В последнее время интенсивно ведутся работы по созданию разных систем мониторинга состояния электромеханического оборудования, целью которых являются вывод исследуемого объекта в ремонт по значению его текущего технического состояния. Известно, что большинство отказов ЭМ связано с разными видами повреждения изоляции ее обмоток. Поэтому актуальным являются вопросы определения текущего технического состояния изоляции электрической машины.

2. Цель и задачи исследования

Система планово-предупредительных ремонтов (ППР) предусматривает проведение периодических испытаний надежности работы изоляции, наиболее распространенные из которых - это испытания повышенным напряжением промышленной частоты, испытание изоляции постоянным напряжением, измерение сопротивления изоляции мегомметром. Все эти методы требуют вывода машины из производственного процесса. Таким образом, видно, что такие методы контроля состояния изоляции не имеют надлежащего эффекта, поскольку, во-первых, нуждаются в выводе машины из производственного процесса; во-вторых,

методика испытаний имеет разрушающий характер (дефектные участки определяются путем пробоя изоляции); в-третьих, такие испытания не гарантируют безотказной работы изоляции в межремонтные промежутки времени. Таким образом, актуальным становится развитие и внедрение методов неразрушающего контроля изоляции ЭМ.

Целью работы являются исследования и оценка существующих подходов к определению состояния изоляции электрических машин и разработка метода оценки ресурса работы изоляции, который бы учитывал режимы работы электрического двигателя и неравномерность нагрева материалов его конструкции.

3. Анализ современных методов оценки остаточного ресурса изоляции электрических машин.

Для оценки ресурса изоляции электродвигателей в настоящее время применяется метод частичных разрядов (ЧР). Частичный разряд – это искровой разряд очень малой мощности, которая возникает внутри изоляции или на ее поверхности в оборудовании среднего и высокого напряжения [1]. С течением времени периодически повторяемые ЧР разрушают изоляцию, приводя, в конце концов, к ее пробою. По обыкновению, разрушение изоляции под действием ЧР происходит на протяжении многих месяцев, и даже лет. Таким образом, регистрация ЧР, оценка их мощности и повторяемости, а также локализация места их возникновения, позволяют своевременно определить повреждения, которые развиваются, и принять необходимые меры относительно их устранения.

Недостатком существующих методик и приборов для фиксации ЧР есть то, что они разработаны для тестирования машины, выведенной из производственного процесса. Некоторые из них также нуждаются в частичном разборе машины, или установление большого количества датчиков. Таким образом, на данный момент не создана эффективная методика и приборы для контроля состояния изоляции ЭМ по величине и интенсивности ЧР.

В работе [2] предложен метод контроля изоляции обмоток низковольтных двигателей, который включает нагревание обмоток, измерение сопротивления изоляции и сравнение его с предельными значениями. При уменьшении сопротивления изоляции ниже предельного значения делается вывод о наличии необратимых дефектов изоляции. В процессе нагревания определяют скорость изменения поверхностной проводимости и сравнивают ее значение с заданным. При превышении скорости делают вывод о наличии увлажнения изоляции.

Такой метод контроля нуждается в знании двух предельных значений сопротивления изоляции, которые берутся из статистических данных определенной группы двигателей. Его основным недостатком является то, что с его помощью можно определить лишь существующие дефекты изоляции, и он не может применяться для прогнозирования ее состояния и возникновение дефектов.

В [3] было предложено осуществлять беспрерывный контроль состояния изоляции работающих ЭМ без вывода их из эксплуатации с помощью комбинации метода ЧР и акустического метода. Установлено, что в результате прохождения импульса тока через канал, где происходит ЧР, в канале выделяется большое количество энергии (порядка 0,1-1,0 Дж на каждый сантиметр длины канала). С выделением энергии связанно скачкообразное увеличение давления в окружающем газе – возникновение цилиндрической ударной волны. Происходит быстрое расширение канала ЧР, со скоростью порядка тепловой скорости атомов газа [4]. По мере продвижения ударной волны фронт отходит от границ канала, все больше сглаживаясь, и на определенном расстоянии от источника ударная волна превращается в акустическую (звуковую) волну небольшой амплитуды. Возникновение ударных волн объясняет звуковые эффекты, которые сопровождают искровой разряд: характерное потрескивание. Недостатком этого метода является необходимость установки дополнительного акустического оборудования. Также, возникает проблема выделения звуковых сигналов исследуемого оборудования от сигналов соседних устройств и естественных помех.

Предполагается, что основным фактором, который влияет на старение изоляции, является температура. В [5] исследуется старения изоляции в зависимости от нагрева и охлаждения обмотки во время пуска, поскольку при пусковых режимах происходит наиболее интенсивное снижение ее ресурса. Данный метод предполагает, что пусковые режимы, в основном, определяют срок службы изоляции, но не учитывает процессов, которые происходят при постоянном рабочем или нерабочем состоянии машины, что является недостатком. Этот метод нуждается в дополнении для возможности полноценного контроля состояния изоляции ЭМ, а не только обмоток турбогенераторов.

Известны методы выявления дефектов межвитковой изоляции, которые базируются на анализе пофазной несимметрии токов. В работе [6] предложен метод проверки исправности обмоток короткозамкнутых асинхронных двигате-

лей (АД), при котором нет необходимости в отключении оборудования. Для контроля исправности обмоток короткозамкнутых АД предложено использовать функциональные зависимости мгновенных значений фазных токов статора или их соотношений. Установлено, что для полностью исправных двигателей исследуемая зависимость представляет собой правильный круг. При возникновении дефекта происходит искажение круга. Так, возникновение дефекта короткозамкнутого ротора (КЗР) приводит к образованию кольца, при возникновении дефекта обмотки статора зависимость представляет собой эллипс, а степень развития дефекта можно определить по изменению диаметров большой и меньшей осей эллипса, а от того, какая фаза повреждена, зависит направление наклона зависимости.

Предложен метод диагностики обмоток статора и ротора ЭМ в рабочем режиме на основе анализа пофазной несимметрии токов. Алгоритм основан на том, что возникновение дефекта в ЭМ сопровождается изменением одного из параметров режима свыше допустимого, или происходит незначительное изменение нескольких параметров режима, но их взаимные изменения не отвечают изменению рабочего режима, то есть являются несовместимыми.

Это позволяет выявлять определенные виды повреждений обмоток ЭМ при организации наблюдения за работающей машиной. Однако они не предоставляют возможности прогнозировать появление дефектов (происходит лишь фиксация уже существующих), а также прогнозировать остаточный ресурс изоляции.

В настоящее время приобрел распространение метод определения технического состояния электродвигателей по спектральному анализу потребляемого тока [7]. Физический принцип, положенный в основу этого метода, заключается в том, что любые возбуждения в работе электрической и/или механической части электродвигателя приводят к изменениям магнитного потока в зазоре электрической машины, и, соответственно, к слабой модуляции потребляемого тока [8]. Недостатком метода является возможность лишь фиксации следствий, а не выявление причин повреждений, невозможность прогнозирования ресурса изоляции.

Таким образом, очевидно, что существует необходимость создания метода контроля состояния изоляции обмоток ЭМ, который отвечал бы следующим требованиям:

- учет всех эксплуатационных параметров работы ЭМ;
- учет влияния параметров окружающего среды;
- учет предпускового состояния ЭМ;
- учет влияния процесса пуска на изоляцию;
- предоставления достоверной информации о текущем состоянии изоляции;
- предоставления прогноза остаточного ресурса работы изоляции.

Относительная влажность воздуха влияет на увлажнение изоляции во время простоя ЭМ (особенно на машинах, которые эксплуатируются на открытом воздухе), что приводит к изменению ее сопротивления. Таким образом, при прикладывании к изоляции обычного рабочего напряжения увеличится вероятность пробоя. Чтобы предотвратить негативные последствия, необходимо контролировать увлажненность изоляции перед пуском с помощью измерения ее сопротивления или величины угла диэлектрических потерь $\mathrm{tg}(\delta)$. При необходимости нужно проводить сушку обмотки путем прикладывания сниженного напряжения.

Скорость старения изоляции зависит от энергетических процессов, которые происходят в ЭМ. К этим процессам относятся, прежде всего, тепловые процессы – передачи энергии при нагревании и охлаждении твердого тела, которые, преимущественно, происходят во время пуска - остановки и изменения нагрузки. При определении допустимости перегрузки по условиям нагревания необходимо выходить не из допустимых температур, а из сохранения срока службы изоляции, поскольку часть времени машина работает с меньшими, чем рабочие, нагрузками, за счет чего в другие моменты времени возможные перегрузки.

В основу расчетов ресурса изоляции ЭМ положен анализ процессов нагрева. При анализе процессов нагрева - охлаждения ЭМ первоочередной интерес вызывает значение температуры изоляции (элемента, который непосредственно расположен на активной части машины – проводниках отдельных обмоток), поскольку большой мерой именно от температуры изоляции большой мерой зависит безотказность работы машины. Через относительно небольшую постоянную нагрева изоляции, процесс ее нагрева можно считать аналогичным нагреву меди. Таким образом, при нагревании машины из холодного состояния, в первую очередь, греется медь и, а потом и вся конструкция [9]. Пренебрегая изменением теплоемкости, нагрев меди обмотки можно считать постоянным. В

то же время, в процессе нагревания стали меняются условия теплоотвода, а соответственно, и величина теплоотдачи меди и изоляции. При снижении нагрузки температура изоляции будет определяться не реальными потерями, а процессами теплообмена внутри машины.

Значения температуры изоляции могут значительно превышать рабочие значения для данного класса изоляции, поэтому ее ресурс будет исчерпываться значительно интенсивнее, чем, если бы расчеты выполнялись для значения рабочей температуры обмотки. Аналогично процесс нагрева будет происходить и при кратковременных перегрузках: медь и изоляция будут греться быстро, хотя температура всей обмотки повысится на меньшее значение. При охлаждении машины через процессы теплообмена, который в ней происходят, изоляция и медь будут охлаждаться с постоянной охлаждения всей конструкции ЭМ.

Таким образом, рассмотренные подходы для определения остаточного ресурса работы изоляции в зависимости от температуры обмотки не являются достаточно достоверными, поскольку они не учитывают реальную температуру изоляции.

4. Разработка математического алгоритма определения остаточного ресурса изоляции

Срок службы изоляции ЭМ при ее постоянной температуре описывается уравнением Вант-Гоффа-Аррениуса [10]:

$$t = T_b \times e^{-b \times \Theta},$$

где T_b – базовый срок службы при Q=0°C;

b – коэффициент, который зависит от свойств изоляции, отвечает сокращению срока службы вдвое на каждое 10°C повышения температуры (для изоляции класса B коэффициент b=0,069^{0}C^{-1}).

Снижение ресурса изоляции за время работы t при сменной во времени температуре Q:

$$\Delta R = \int_0^t \frac{1}{t} dt = \frac{1}{T_b} \int_0^t e^{b\Theta(t)} dt. \quad (1)$$

Для практического применения интерес представляет собой относительное уменьшение ресурса:

$$\Delta R_в = T_b \times \Delta R .$$

Уравнение нагрева твердого тела имеет вид [32]:

$$\Delta P dt = \alpha F \Delta \vartheta dt + cGd\vartheta ,$$

где *DPdt* - энергия электрических потерь, которые выделились за время *dt*;

$\alpha F \Delta \vartheta dt$ – отведенная от тела за тот же время тепловая энергия;

$cGd\vartheta$ – тепловая энергия, которая идет на повышение температуры тела (в устойчивом режиме $d\vartheta = 0$).

Для вычисления температуры меди, необходимо знать мгновенные потери мощности в данный момент времени:

мгновенные потери в меди равняются:

$$\Delta P_м(t) = 3\left(I(t)\right)^2 R ,$$

относительные мгновенные потери к постоянным потерям:

$$\frac{\Delta p_c(t)}{\Delta p_{c,ном}(t)} = (0{,}061 + 0{,}039 \times k_f(t)) \frac{k(t)_u^2}{k(t)_f^2} ,$$

где $k(t)_f = \frac{f(t)}{50}$, $k(t)_u = \frac{u(t)}{u_{ном}}$ – отношение текущего значения частот и напряжений к номинальному соответственно.

Средняя температура охлаждающего воздуха внутри ЭМ в момент времени исчисляется по формуле [11]:

$$\vartheta_o(t) = \vartheta_{вх}(t) + \frac{\Delta\theta_в(t)}{2} ,$$

где:

$$\Delta\theta_в(t) = \vartheta_{вых}(t) - \vartheta_{вх}(t) = \frac{k_в \times \sum P_{гр}(t)}{1100 \times Q_в(t)} ,$$

где $\vartheta_{вх}, \vartheta_{вых}$ – значение температуры воздушного потока на входе и на выходе машины соответственно;

$k_в$ – коэффициент, который учитывает величину потерь в машине, которые отводятся основным охлаждающим потоком $Q_в$ в зависимости от системы охлаждения;

$\sum P_{гр}(t)$ – суммарные греющие потери (в стали и меди) в данный момент времени;

$Q_в$ – объем продуваемого воздуха через машину;

$1100 \frac{Дж}{м^3 \times К}$ – удельная объемная теплоемкость воздуха при нормальных условиях.

Следует заметить, что при изменении режима работы машины (нагрузки, скорости и т.д.) меняются и условия ее охлаждения.

Таким образом, для точного вычисления текущего остаточного ресурса изоляции обмоток ЭМ, необходимо знать точное превышение температуры именно изоляции (а не всей обмотки) над допустимой.

Очевидно, что температура меди (изоляции) и всей обмотки в процессе нагревания будут разными из-за разных значений постоянных нагрева конструктивных элементов электрической машины. В процессе моделирования получены графики изменения температур меди и обмотки при нагревании во время запуска двигателя (рис.1). Моделирования проводилось для двигателя АИР80В4 мощностью 1,5 кВт с определенными допущениями: характер процесса теплоотвода предполагался устойчивым, при нагревании меди учитывались потери лишь в ней (как основные греющие). Постоянные нагрева меди, обмотки и постоянные охлаждения имели разные значения.

При пуске двигателя, когда потери в меди являются большими, температура меди (соответственно, и изоляции), увеличивается очень быстро. При достижении номинального режима работы ЭМ, температура обмотки продолжает расти, а меди, достигши определенного критического значения, начинает падать с постоянной охлаждения машины. Через определенное время устанавливается

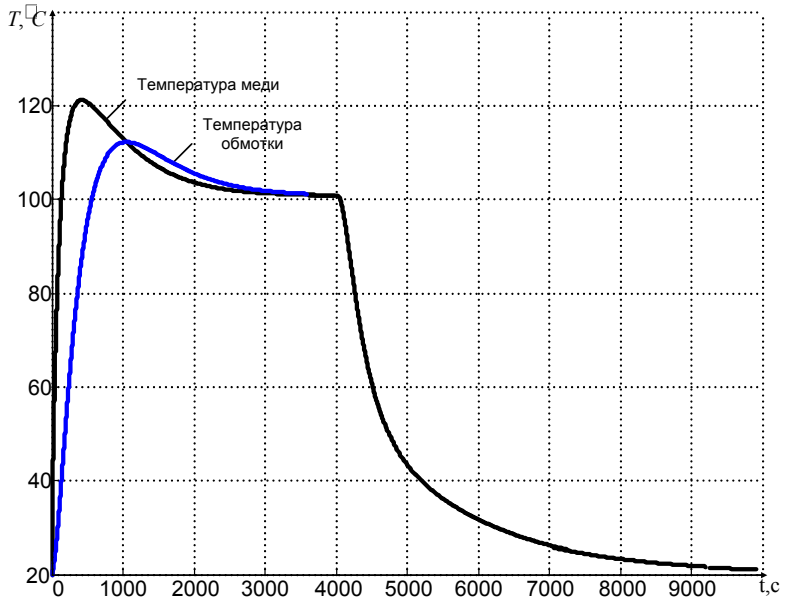

Рис. 1 – Зависимости температуры меди и обмотки от времени в пусковом режиме двигателя

постоянная температура меди и обмотки. После отключения двигателя происходит охлаждение всей системы ЭМ с одной постоянной времени. На рис. 2 приведен график износа ресурса в зависимости от текущих условий. Видно, что во время нагревания изоляции до максимальной температуры (которая превышает рабочую), ресурс будет уменьшаться относительно быстро. За время пуска и достижения установленной температуры (0-2000с) ресурс изоляции снизился на величину $4{,}6 \times 10^{-6}$, а за время работы при номинальных параметрах – на $2{,}1 \times 10^{-6}$. За время охлаждения после остановки ресурс изоляции снижается незначительно.

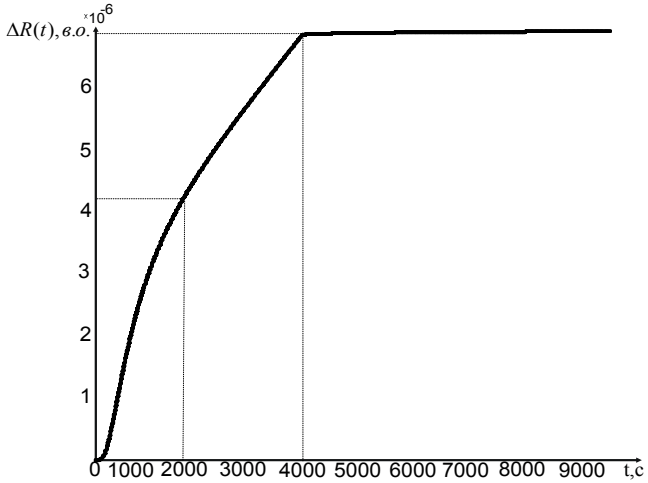

Рис. 2 – Текущее снижение ресурса

Выводы. Анализ существующих методов контроля состояния изоляции обмоток ЭМ, проведенный в работе, показал, что имеющиеся методы имеют определенные недостатки – учет одних эксплуатационных параметров и пренебрежения другими, сложность диагностического оборудования, необходимость вывода диагностируемой машины из производственного процесса и т.д. Сделан вывод о необходимости создания метода, который учитывал бы все текущие параметры эксплуатации ЭМ и процессы преобразования, которое в ней происходят. Авторами предложен собственный алгоритм определения остаточного ресурса изоляции электрической машины.

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Genetic Logging Models of Terrigenous Facies

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Abstract: When studying the facies nature of sand bodies by the methods of geophysical well studies, the method of self-polarization potentials has the greatest informativeness, however other types of logging such as gamma ray logging, apparent resistance method, neutron gamma-ray logging, neutron logging, acoustic, gamma-density logging and others.

The main requirement of applying geophysical well studies method for the study of sand layers with the help of qualitative logging genetic models of terrigenous facies is the relationship of the shape of the log to the change in the granulometric composition of the clastic material, the porosity and the content of clay particles in the rock.

Keywords: facia, log, curves, layer, flow, bar, beach.

Генетические каротажные модели терригенных фаций

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Аннотация: При изучении фациальной природы песчаных тел методами геофизических исследований скважин (ГИС) наибольшей информативностью обладает метод потенциалов собственной поляризации (СП), однако могут использоваться и другие виды каротажа, такие как гамма-каротаж (ГК), метода кажущегося сопротивления (КС), нейтронный гамма-каротаж (НТК), нейтронный каротаж (НК), акустический (АК), гамма-гамма-каротаж плотностный (ГГК-П) и другие. Основным требованием применения метода ГИС для изучения песчаных пластов с помощью качественных каротажных генетических моделей терригенных фаций является связь формы каротажной кривой с изменением гранулометрического состава обломочного материала, пористости и содержание в породе глинистых частиц.

Ключевые слова: фациа, каротаж, кривые, пласт, поток, бар, пляж.

Выведение. При фациальной интерпретации материалов ГИС необходимо оценивать влияние на форму каротажных кривых не только седиментологических (гранулометрического состава, пористости, глинистости), но и мешающих факторов, к которым относятся: влияние минерализации пластовых вод, химического состава бурового раствора, характера проникновения фильтра промывочной жидкости в пласт, соотношение диаметра скважины и мощности пласта, присутствия в прискважинной зоне пласта остаточной нефти, аппаратурных погрешностей и др. Если влияние мешающих факторов велико, то геофизик должен решить вопрос о целесообразности использования каротажной кривой для целей фациального анализа. Методика анализа фаций терригенных отложений с помощью каротажных генетических моделей прошла практическую апробацию на тысячах пластов, многими исследователями при изучении различных обстановок осадконакопления, включая процедуру тщательной увязки каротажной информации с данными гранулометрии пород опорных разрезов. Поэтому условие обязательного обоснования в каждом новом районе типовых генетических каротажных моделей фаций по данным исследования керна, нам представляется чрезмерным.

Средства и методы. Системы изучения и прогнозирования фаций песчаных тел, требуется привлечение, кроме данных ГИС, результатов гранулометрии, палеогеографического и сейсмостратиграфического анализов.

На рис. 1 приведены качественные генетические каротажные модели терригенных фаций, обобщенные и усовершенствованные авторами, для песчаных тел потокового, барового происхождения и пляжевых отмелей (рис. 1). Отметим, что каждому типу фаций присущи только ей свойственные гидродинамическая активность водного потока и последовательность смены палеогидродинамических режимов во времени.

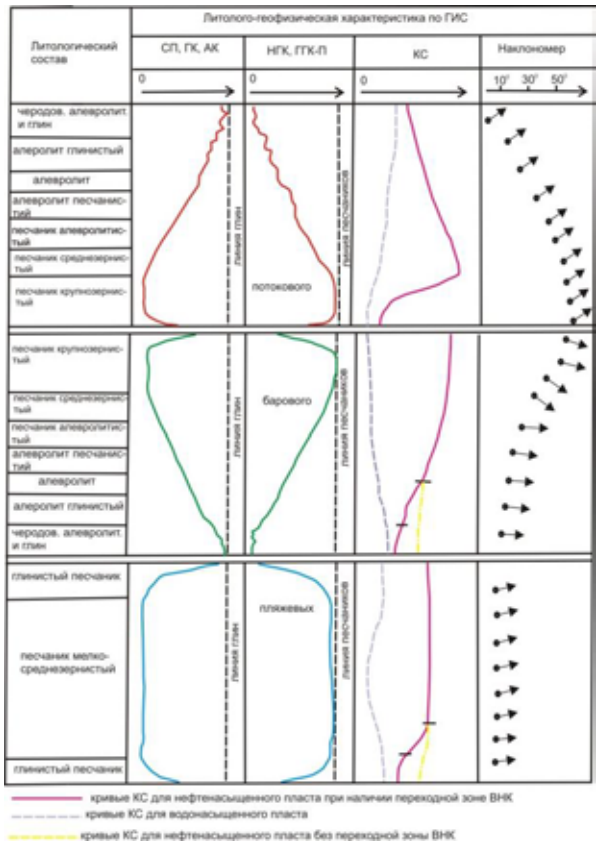

Рис. 1. Качественные каротажные генетические модели терригенных фаций для пластов потокового, барового генезиса и пляжевых отмелей. Условные обозначения: 1 - кривые КС для нефтенасыщенного пласта при наличии переходной зоны ВНК; 2 - кривые КС для водонасыщенного пласта; 3 - кривые КС нефтенасыщенного пласта без переходной зоны ВНК

Песчаные тела фаций потокового генезиса (русла рек, протоки дельты, зоны течений и др.) характеризуются разнозернистым составом осадков при закономерном уменьшении крупности материала снизу вверх по разрезу и увеличении глинистости и алевролитовой составляющей в том же направлении.

Важны также особенности контакта потоковых образований с подстилающими и покрывающими породами. На подстилающих породах отложения этих фаций залегают с размывом (действие палеопотока) и поэтому имеют резкий контакт у своего основания и плавный, постепенный контакт с покрывающими породами. Для песчаных тел фаций потокового типа в поперечном разрезе характерна выпуклая нижняя поверхность и плоская или близкая к ней верхняя поверхность. Поэтому важно определить какая часть песчаного тела вскрыта исследуемой скважиной. Отмеченные особенности внутреннего строения пласта потокового типа и его связи с окружающими породами обуславливают форму (поведение) каротажных кривых и наклонограмм. Проанализируем влияние седиментологического фактора на показания различных методов ГИС.

Метод СП. Наибольшая интенсивность водного потока в основании пласта здесь отражается в конечном счете на получении конусообразной формы кривой СП, расширяющейся от линии глин к нижней части песчаного тела вследствие увеличения крупности минеральных зерен и эффективной пористости, а также уменьшения глинистости в этом направлении (рис. 1). Снижение значений $\Delta U_{\text{СП}}$ (или $\alpha_{\text{СП}}$) к кровле пласта свидетельствуют об ослаблении активности водных масс, когда увеличивается количество алевролитовых и глинистых частиц в осадке и образуются заглинизированные песчаники, алевролиты и глины.

Метод ГК. Для этого метода также характерны конусообразная форма каротажных кривых напротив песчаных пластов потокового типа. Физическое обоснование такой формы кривой ГК заключается в том, что уменьшение числа алевритовых и глинистых частиц в подошве пласта приводит к снижению радиоактивности этой части разреза. Это четко прослеживается на показаниях ГК, для которых характерны максимальные значения естественной радиоактивности в кровле и минимальные - в подошве пласта.

Методы АК, НГК. Более сложна фациальная интерпретация диаграмм акустического (АК) и нейтронного гамма-каротажа (НГК). Эти методы, как известно, отражают общую пористость терригенных пород. Поэтому здесь важное значение приобретает изучение соотношения между значениями пористости глинистой и песчано-алевритовой составляющих внутренней структуры самого пласта. В геологической практике при этом могут быть встречены следующие 2 случая (что зависит от истории диагенеза и катагенеза породы): 1) пористость глинистых частиц (закрытая пористость) превышает пористость песчаной фракции

(открытая пористость) и тогда общая пористость песчаного пласта потокового генезиса будет увеличиваться снизу вверх по мере увеличения числа глинистых частиц к кровле. Такая картина типична для отложений продуктивной толщи (ПТ) многих площадей Южно-Каспийской впадины (ЮКВ), в разрезе которых широко развиты аномально высокие поровые давления, что позволяет сохраниться высокопористым глинистым агрегатам вследствие замедления процессов уплотнения пород. Поэтому форма кривых АК и КНК здесь будет конусообразной относительно линии глин, а кривой НГК - воронкообразной (показания НГК обратно пропорциональны общей пористости) относительно линии песчаников (рис. 1); 2) закрытая пористость глинистых частиц меньше открытой пористости песчаной фракции. В этом случае общая пористость породы по вертикали пласта будет уменьшаться снизу-вверх и поведение кривых АК и НГК будет обратной первому варианту.

Метод КС. Как известно, в песчано-глинистых породах кажущееся удельное сопротивление, измеренное электродными установками (потенциал- и градиент-зонды, экранированные зонды) и с помощью индукционных зондов, является функцией многих факторов: удельного сопротивления самой породы, геометрической структуры её порового пространства, диаметра скважины, удельного сопротивления промывочной жидкости, геометрии зондовых установок и др. В настоящее время имеется различный палеточный материал для перехода от значения кажущегося удельного сопротивления к удельному электрическому сопротивлению проницаемых (в зоне проникновения и в неизменной части) и непроницаемых пластов. При геологической интерпретации материалов ГИС данные электрического каротажа привлекают для оценки литологического состава отложений выделения коллекторов, определения характера их насыщения, оценки пористости и нефтегазонасыщенности пластов, а также определения их фациальной принадлежности.

Однако, анализ различных методических подходов геологической интерпретации данных электрического каротажа указывает на недооценку роли седиментологического фактора при определении геологических свойств терригенного разреза [1, 2.]. Так, например, сложившаяся практика оценки характера насыщения песчаных коллекторов по результатам качественной интерпретации кривых электрического каротажа была разработана и эффективна только для песчаников, образовавшихся в пляжевых отмелях, которые характеризуются

равномерным распределением по пласту размеров минеральных зерен, эффективной пористости и глинистости. Однако авторы пришли к выводу, что изменение кривых удельного сопротивления напротив песчаного пласта зависит как от характера его насыщения, так и от генезиса, что до сих пор не принимается во внимание при геологической интерпретации данных электрометри.

При водонасыщении песчаного пласта потокового генезиса форма аномалий на кривой КС будет изменяться в зависимости от соотношения электрических проводимостей глинистой и песчаной компонентов и характера изменения эффективной пористости в пределах самого пласта. В рассматриваемом фациальном типе песчаного пласта эффективная пористость закономерно увеличивается к подошве и если влияние электрической проводимости глинистых частиц невелико, то удельное электрическое сопротивление пласта будет уменьшаться к подошве, а форма кривой КС относительно нулевой линии будет воронкообразной. Однако в некоторых случаях, ввиду сильного влияния сосредоточенных в кровле хорошо проводящих глинистых частиц, наименьшие значения КС могут наблюдаться в кровле пласта и затем постепенно увеличиваться к подошве. Тогда кривые КС приобретают конусообразную форму Однако на практике, как правило, поверхностная проводимость глинистых частиц на показания электрического каротажа влияет мало, что особенно характерно для площадей ЮКВ. Тогда форма кривых КС целиком будет отражать распределение эффективной пористости в пласте.

В нефтенасыщенном песчанике потокового происхождения максимальные значения удельных сопротивлений будут наблюдаться в подошвенной части пласа ввиду того, что здесь имеется наибольшая эффективная пористость и минимальная глинистость, а это приводит к максимальному объемному нефтенасыщению. При наличии переходной зоны ВНК в нижней части подошвы пласта снижение КС будет соответствовать уменьшению его нефтенасыщенности.

Метод ГГК-П. При анализе кривой гамма-гамма каротажа, показания которого связаны с плотностью пород, необходимо прежде всего уяснить соотношение между плотностями глинистых частиц и песчаной фракции. Для площадей ЮКВ, например, характерен случай, когда объемная плотность глинистых частиц меньше чем у песчаной составляющей. При этом наблюдается увеличение плотности от кровли к подошве пласта, что и находит отражение в воронкообразной (относительно линии песчаников) форме кривой ГГК-П.

Пластовый наклономер. На наклонограмме потоковые фации выделяются из следующих признаков [3]: в пределах русла (зоны течений) угол падения пластов (внутренняя косослоистость) плавно увеличивается от кровли к подошве песчаного интервала. Кроме того, ограничительной чертой потоковых фаций является взаимно-перпендикулярный характер распределения падений на полярных графиках частот азимутов углов падения. Для отложений песчаных баров изменение зернистости по вертикали происходит от более грубой в кровле песчаного тела до более тонкой в подошве, что объясняется активной гидродинамикой волн. В результате баровые песчаные тела имеют четкий контакт с покрывающими породами и постепенной переход к подстилающим пластам. Отмеченные признаки находят отражение в конфигурации каротажных кривых различных методов ГИС и особенностях наклонограмм (рис. 1). Физическое истолкование формы кривых ГИС здесь аналогично тому, как это было сделано выше, для пластов потокового генезиса. По наклонограмме песчаные тела барового типа характеризуются закономерным уменьшением наклона косослоистых серий от максимального в кровле пласта до регионального падения в подошве. Напротив, наклонограмма отложений перекрывающих песчаный бар показывает увеличение угла структурного падения при приближении к кровле песчаного бара. Важным признаком отложений барового типа является одномодальное распределение падений на полярных графиках частот азимутов, построенных для участка разреза, включающего баровые отложения и нижнюю часть перекрывающих пород.

Фации песчаных тел пляжевых отмелей генетически связаны с зонами накопления песчаников в активных в гидродинамическом отношении и стабильных условиях. Это приводит к тому, что они бывают сложены песчаным материалом, максимальные и средние диаметры минеральных зерен которого не испытывают резких изменений и равномерно распределены в целом по пласту. В связи с этим каротажные кривые большинства методов ГИС имеют симметричную форму с Наклонограммы для этих песчаных тел не будут выделяться от вмещающих пород, так как внутри песчаных отложений отсутствует косая слоистость и, следовательно, углы их структурных падений совпадают с таковыми для перекрывающих и подстилающих отложений. Одной из терригенных фаций с равномерным распределением размера минеральных частиц по пласту являются гли-

нистые породы. Они относительно легко идентифицируются по каротажным кривым различных методов ГИС. Так, например, по методу СП глины выделяются по слаболитифицированной или прямой форме кривых СП в области положительных значений амплитуд, которые характеризуют области пассивной гидродинамики с однообразными условиями осадконакопления глинистых частиц. Разделение глинистых пород на элювиальные, континентальные и морские по данным ГИС возможно только в комплексе с другой геолого-геофизической информацией (сведения о геологии и палеогеографии изучаемого района, результаты сейсмостратиграфического анализа и др.). Среди морских глинистых осадков по ГИС довольно надежно различаются глубоководные и мелководные глинистые породы. Первые из них характеризуются однородным составом, что отражается на плавности каротажных кривых. Мелководные глины, в том числе и дельтовые, имеют микрослои, обогащенные песчано-алевритовым материалом, которые обуславливают зубчатый облик каротажных кривых.

Результаты. Следует отметить, что наиболее сложный случай возникает при фациальном анализе с помощью каротажных генетических моделей фаций дельтовых комплексов, для которых характерны разнообразные условия осадконакопления терригенных пород. Формы каротажных кривых методов ГИС здесь не всегда отчетливо отражают различия между фациями отложений дельтовых проток, прирусловых отмелей и авандельты (подводной части дельты). Характерна зазубренность многих каротажных кривых, что связано с наличием в песчаных телах прослоев алевролитов и глин. Поэтому, в связи с трудностями реконструкции обстановок осадконакопления дельтовых комплексов при проведении фациального анализа, наряду с данными ГИС, привлекаются результаты палеогеографических, палеотектонических и сейсмостратиграфических исследований. Рассмотренные качественные модели каротажных фаций широко используются при фациальном анализе терригенных отложений. Однако более надежное определение генезиса терригенных осадков по данным ГИС осуществляется с помощью количественных каротажных моделей фаций (ККМФ) [4]. Актуальность применения ККМФ на практике связана с тем, что во многих случаях, вследствие влияния различных геолого-технических факторов (например, процесса разработки), проведение фациального анализа по форме каротажных кривых весьма затруднительно. Но самое главное это то, что применение ККМФ способствует повышению достоверности фациального анализа при исследовании

сложных разрезов, таких, например, как дельтовые комплексы. Количественные каротажные модели фаций, отражают количественные изменения геолого-геофизических параметров, характерные для различных типов фаций. Поэтому ККМФ основаны на результатах послойной количественной интерпретации материалов ГИС. При исследовании терригенных разрезов в качестве параметров, характеризующих фациальную природу песчаных тел, приняты глинистость и эффективная пористость прослоев, а также компонентные оценки их литологического состава [4]. Для фациального анализа могут привлекаться также оценки водонасыщенности пластов [244], но они менее информативны. Одной из составных частей ККМФ, приведенных на рис. 2, служит график зависимости $\alpha_{\text{СП}} = f(\eta_{\text{гл.РК}})$ который носитназвание графика литологии, петрофизическое обоснование и технологию построения которого были детально рассмотрены нами. Так как эффективная пористость и глинистость прослоев определяются по данным ГИС после введения различных поправок за влияние мешающих факторов, то анализ изменения этих параметров дает возможность осуществлять более точную фациальную интерпретацию исследуемого разреза. На графике литологии точки, соответствующие прослоям различного гранулометрического состава и, следовательно, разного литологического типа терригенных пород, занимают вполне определенное. Для установления генезиса песчаного пласта важно оценивать последовательность залегания прослоев различного литологического состава, а также их глинистость и эффективную пористость. Для решения этой задачи как раз и необходим анализ графиков зависимости $\alpha_{\text{СП}} = f(\eta_{\text{гл.РК}})$.

Выводы.

- для песчаников потокового генезиса в подошвенной части пласта характерны максимальная и минимальная глинистость;

- для баровых песчаных тел эти признаки относят к кровельной части пластов;

-для песчаников пляжевого происхождения - к середине пласта;

- следует разграничивать общую методику фациального анализа по данным ГИС, которая строится на системном подходе и предшествует количественная интерпретация промыслово-геофизических материалов;

- а также интерпретация постседиментационных преобразований пород, и методические приемы проведения фациального анализа с использованием генетических каротажных моделей фаций, которые различаются в зависимости от литологического типа исследуемого разреза.

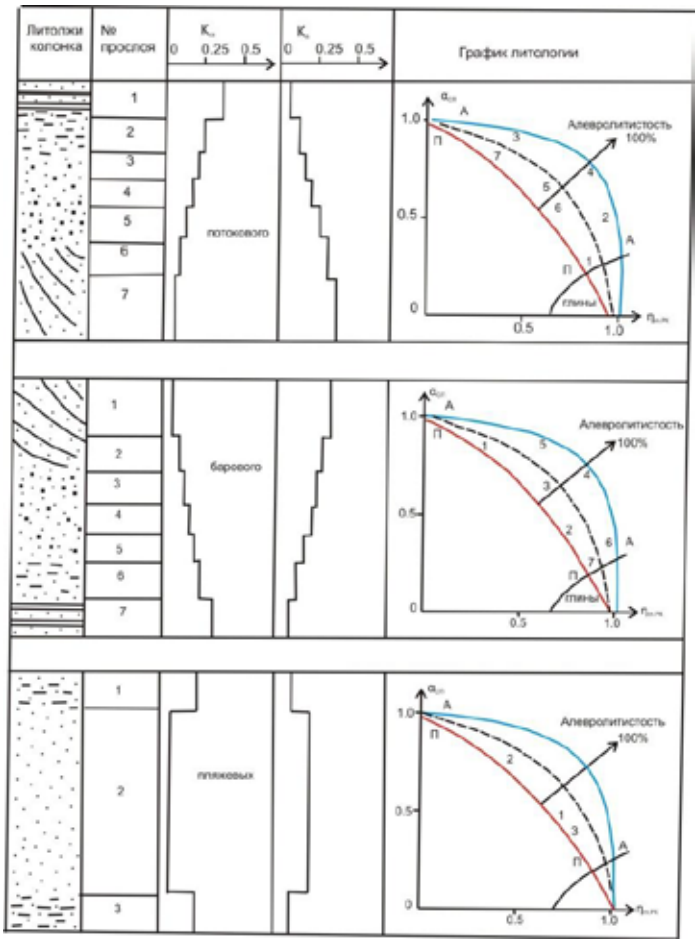

Рис. 2. Количественные каротажные модели фации для пластов потокового, барового генезиса и пляжевых отмелей (А - Алевролиты, П - песчаники).

а) 1 - чередование прослоев алевролитов и глин; 2 - алевролит глинистый; 3 - алевролит; 4 - алевролит песчанистый; 5 – песчаник алевролитистый; 6 - (мелко) среднезернистый песчаник; 7 – крупнозернистый песчаник,

б) 1 - крупнозернистый песчаник; 2 - (мелко) среднезернистый - песчаник; 3 - песчаник алевролитистый; 4 - алевролит песчанистый; 5 - алевролит; 6 – алевролит глинстый; 7 - чередование прослоев алевролитов и глин, в) 1,3 - песчаники глинистые; 2 – песчаник.

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Examples of Reconstruction of Sedimentation Environments of Productive Strata in Azerbaijani Areas According to Geophysical Studies of Wells

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Abstract: Facies interpretation of well logging data allows to establish the peculiarities of sedimentation conditions on local sites of separate regions that differ from each other in the genesis of precipitation. It is known that the basin in the Pliocene age of the productive stratum throughout the entire time of existence was distinguished by a complex coastal relief influenced by delta systems (including underwater parts) of rivers. All this makes it difficult to reconstruct the sedimentation environments in some areas, despite the fact that the general regularities of the sedimentation of the Pliocene sediments have been identified and studied for the basin of the South Caspian basin.

Keywords: facies, South Caspian basin, productive strata, basin, log, terrigenous formation.

Примеры реконструкции обстановок осадконакопления продуктивной толщи на площадях Азербайджана по данным геофизических исследований скважин

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Аннотация: Фациальная интерпретация данных геофизических исследований скважин (ГИС) позволяет установить особенности условий осадконакопления на локальных участках отдельных регионов, отличающихся друг от друга генезисом осадков. Известно, что бассейн в плиоценовую эпохи продуктивной толщи (ПТ) на протяжении всего времени существования отличался сложным береговым рельефом, на который оказывали влияние дельтовые системы (в том числе подводные части) рек. Все это затрудняет реконструкцию обстановок осадконакопления на отдельных участках, несмотря на то, что для бассейна Южно-Каспийской впадины (ЮКВ) выявлены и изучены общие закономерности процесса осадконакопления плиоценовых отложений.

Ключевые слова: фация, Южно-Каспийская впадина, продуктивная толща, бассейн, каротаж, терригенная формация.

Введение. Качественные и количественные генетические каротажные модели терригенных фаций и методика фациальной интерпретации данных ГИС служат для реконструкции обстановок осадконакопления отложений ПТ некоторых участков ЮКВ. Как известно, регион Каспийского моря подразделяется на три крупных геоморфологических элемента: мелководный - северный и два глубоководных - средний и южный [2]. К последнему из них приурочена ЮКВ, строение которой и прилегающих к ней областей к настоящему времени хорошо изучено геологическими, геофизическими, геохимическими, гидрогеологическими и другими методами. Вышеуказанные крупные геоморфологические элементы дна Каспийского моря отделены друг от друга подводными перемычками: Мангышлакским и Апшеронским порогами. Наиболее сложный геоморфологический облик характерен для Южного Каспия. Следует отметить, что вся ЮКВ региональными разрывными нарушениями разбита на множество разномасштабных тектонических блоков [3].

Осадочный чехол ЮКВ по характеру дислоцированности слоев подразделяется на два структурных этажа: мезозойско-палеогеновый и плиоцен - чет-

вертичный. Исследование особенностей тектонического развития всей территории ЮКВ показывает, что средне - плиоценовые отложения заслуживают особого внимания, так как они, в основном, определяют структурную характеристику осадочного разреза, и именно с этой частью осадочного чехла связаны основные промышленные скопления углеводородов [4]. Отложения среднего плиоцена, представляющие собой терригенную формацию, носят название ПТ на западе и красноцветной толщи (КТ) - на востоке. Характерным для этих толщ является отсутствие специфической фауны. Разрезы этих толщ (ПТ и КТ) представлены, в основном песчано-глинистой фацией. Причем разрез КТ более песчанистый и неоднородный, чем разрез ПТ. Изучение литофациального состава и ассоциации минералов, встречающихся в разрезе ПТ позволило выделить на территории Азербайджана четыре типа терригенных разрезов: кубинский, апшеронский, кобыстано - прикуринский и южный [2,3].

Средства и методы. В первой половине плиоценовой эпохи ПТ осадконакопление шло за счет питающих провинций, в строении которых принимали участие породы с богатым содержанием кварца. Эти провинции располагались к северу от Хачмазского реликта, выделенного А.А. Ализаде (1960). Они представляли собой как низменности, так и плато и возвышенности, образовавшиеся в результате тектонических движений, происходивших вплоть до конца понтического времени. Необходимо отметить, что своим развитием бассейн был обязан не только прогибанию дна, но и впадению в него крупных рек, режим которых контролировался, главным образом, климатическими факторами. Последние влияли на изменение количества воды в реках и скорость их течения. Основными водосборными артериями в это время были: Палео-Кура, Палео-Волга, Палео-Узбой, а также Палео-Араз, Палео-Пирсагат, Палео-Урал, Палео-Эмба, Палео-Сулик, Палео-Терек и другие.

Общей характерной особенностью средне - плиоценовых отложений ЮКВ является их ритмичность. Как известно, для выделения седиментационных ритмов используют три принципа их строения: симметричное, верхнее - асимметричное и нижнее - асимметричное. По принципу верхней асимметрии И.И. Потаповым (1947) в разрезе ПТ Апшеронского полуострова было выделено семь крупных ритмов. Границы между этими ритмами должны соответствовать перерывам в осадконакоплении, и в подошве каждого ритма должны присутствовать следы размыва регрессивной части предыдущего ритма.

Расчленение среднего плиоцена ЮКВ было сделано А.В. Никишиным [5], который исходил из представлений о нижней (ранней) асимметрии осадочных ритмов. Согласно этому принципу наиболее мористые, тонкодисперсные осадки отлагались в начале трансгрессивной фазы ритма, перекрывая практически одновременно грубозернистые отложения регрессивной серии предыдущего ритма (часто с размывом и стратиграфическим или фациальным несогласием). Позднее А.В. Никишиным была составлена схема ритмичности среднеплиоценовых отложений и выделены три структуры - Апшеронская, Челекенская и Гарадагская. При этом весь разрез плиоцена расчленяется на семь асимметрично построенных ритмов, границами между которыми служат резкие переходы от песчаников к глинам.

Изучением ритмичности (цикличности) плиоценовых отложений ЮКВ по данным сейсморазведки и ГИС занимался П.З. Мамедов [3], который дал характеристику некоторых сейсмоциклов, выделяемых в разрезе ПТ. Им также были описаны палеодельтовые формации, в том числе авандельтовые и склоновые клиноформы на Туркменском шельфе и севере ЮКВ. Таким образом, ритмичность (цикличность) отложений ПТ тесно связана с тектогенезом рассматриваемого региона, когда происходило интенсивное воздымание горных сооружений и резкие, периодически повторяющиеся опускания изолированного средне - плиоценового осадочного бассейна.

На рис. 1 отмечены те участки, где были проведены интерпретация материалов ГИС и работы по реконструкции обстановок осадконакопления терригенных пород ПТ. Территории I и II относятся к Нижнекуринской депрессии, которая приурочена к восточной части Куринского межгорного прогиба, а III территория к Апшероно-Прибалханской зоне поднятий (рис. 1).

На начальном этапе по каротажным кривым кажущегося удельного сопротивления (КС) и самопроизвольной поляризации (СП) стандартного электрического каротажа было произведено детальное расчленение VII горизонта ПТ в разрезе выбранной опорной скважины № 98 площади Пирсагат. При этом было выделено четыре пачки (I, Ia, II, III). Следует отметить, что III-я пачка стратиграфический соответствует VIIa горизонту. Выделенные пачки неоднородны по литологическому составу. Так в составе I пачки нами выделяются 8 пластов, в Ia - 3 пласта, во II-ой - 5 пластов и в III-й - 3 пласта. Далее пласты были разбиты на

Рис. 1. Обзорная схема расположения исследуемых структур в ЮКВ. 1 - установленные залежи нефти; 2 - установленные залежи газа и газоконденсата; 3 - выявленные структуры; I, II, III - участки, где проводилась фациальная интерпретация материалов ГИС

более мелкие прослои, соответствующие отдельным выраженным аномалиям на кривых СП и КС. Так, например, в составе I пласта III-й пачки выделяется 3 прослоя (а, б, в), 2-го пласта этой же пачки - 7 прослоев (а - к) и, наконец, 3-го пласта - 8 прослоев. Затем проводилась детальная корреляция и это позволило судить об особенностях строения и размещения отдельных песчаных тел и непроницаемых глинистых разделов в VII горизонте ПТ изучаемого участка ЮКВ. Всего были скоррелированы и детально изучены разрезы следующих скважин: № 51, 93, 86, 97, 98, 84, 94, 90, 91, 85, 88, 84,104, 87, 99, 95 площади Пирсагат; № 13, 5, 2, 7, 8, 30, 3, 4 площади Хамамдаг-дениз; № 11, 26,27,25,34,28,32 площади Гарасу; № 15, 17, 16, 8, 20, 4, 9 площади Санги-Мугань; № 3, 1, 18 площади Аран-дениз.

Результаты. Использовался подход, основанный на циклическом анализе осадконакопления, а также метод корреляции по кривым изменения геологических параметров, который предусматривает сопоставление разрезов по характерным точкам и интервалам кривой изменения градиентов порового давления

с глубиной и последующую увязку границ выделенных геологических объектов. С этой целью по результатам оценок литологического состава пластов и прослоев по данным ГИС выделялись элементарные циклиты, которые затем объединялись согласно Ю.Н. Карогодину в циклиты более высокого ранга (темциклиты и регоциклиты,). При выделении циклитов автор придерживался энергетической концепции (Попов В.И.), в соответствии с которой начало каждого цикла связано с возрастанием энергии движения вещества. Крупные циклы отражают ритмичное развитие глубинных физико-химических процессов и являются тектоническими циклами, а менее крупные циклы обусловлены климатическими изменениями. Кроме того, началу цикла соответствуют осадки, связанные с максимальным разрастанием поднятий и, следовательно, с наибольшей регрессией моря, а к середине и концу цикла - осадки, связанные с максимальным расширением впадин и с наибольшей трансгрессией. Это отражается на литологическом составе и зернистости образующихся осадков. В начале каждого цикла (ритма) отлагаются более крупнозернистые осадки песчаной и гравелитовой размерности, образовавшиеся под действием различного рода потоков (речных, вдольбереговых течений, турбидитных и т.д.). К концу циклов преобладают тонкие осадки (глинистые), сформировавшиеся в неритовой зоне.

На кривых КС начало цикла отмечается, как правило, увеличением удельных сопротивлений. В то же время грубозернистость осадков отражается на кривой СП большими отклонениями от линии глин [4]. Следует отметить, что существование в разрезах различного рода циклитов (ре -, репро - и процикли-тов) говорит о самых различных взаимно-противоположных тенденциях развития ритмичности и вещественных её проявлений в отложениях ПТ изучаемого района. В этом случае удобнее проводить границы пластов по началу регрессий, так как это отвечает максимальному нарастанию энергии движения осадков и подчеркивается предшествующим перерывом и денудацией отложений. Данное обстоятельство находится в полном соответствии с фациальным законом Вальтера-Усова, который устанавливает, что постепенная миграция горизонтальных фациальных зон может сменяться внезапным перемещением, вследствие чего и возникают перерывы в горизонтальной и вертикальной последовательности осадков.

Исходя из энергетической концепции ритмичности терригенных отложений, в качестве дополнительных коррелятивов были привлечены данные об изменении градиентов аномально высоких поровых давлений с глубиной, определенных по данным ГИС с помощью зависимости градиентов поровых давлений с глубиной по скважинам: 96 площади Пирсагат, 5 площади Хамамдаг-море, 25 площади Гарасу, 15 площади Санги-Мугань, 3 площади Аран-дениз. Отложения VII горизонта ПТ здесь достаточно четко выделяются характерным минимумом (рис. 2). Этот факт интерпретируется как увеличение песчанистости разреза и соответственно определяет начало регрессии, которое приводит к отложению прибрежных осадков в высокоэнергетической гидродинамической среде.

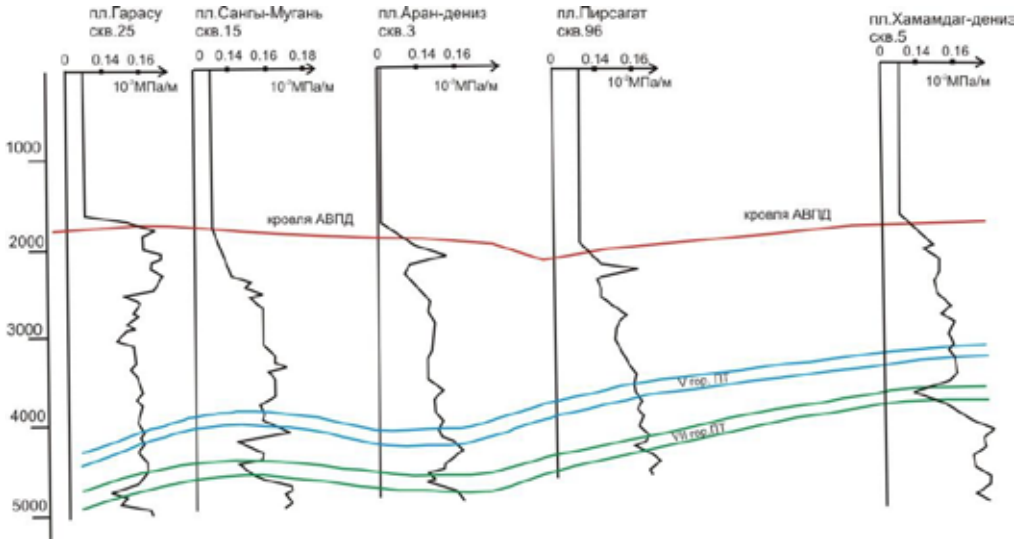

Рис. 2. Корреляционная схема изменения градиентов поровых давлений в разрезах скважин №96 площади Пирсагат, №5 площади Хамамдаг-дениз, №25 площади Гарасу, №15 площади Санги-мугань и №3 площади Аран-дениз

Итак, применяя вышеуказанные способы корреляции разрезов, удалось с большей степенью детальности построить корреляционные схемы распространения пачек и пластов в разрезе VII горизонта ПТ вдоль продольных и поперечных профилей изучаемых структур. В качестве примера составлена корреляционная схема пачек и пластов VII горизонта ПТ, выделенных по данным ГИС вдоль линии продольного профиля, проходящего через площади Хамамдаг-де-

низ, Гарасу, Санги-Мугань и Аран-дениз (рис.3). Кроме того, в таблице приведены сведения о глубинах кровель и мощностях пачек, выделенных в VII горизонте ПТ изучаемого участка площади.

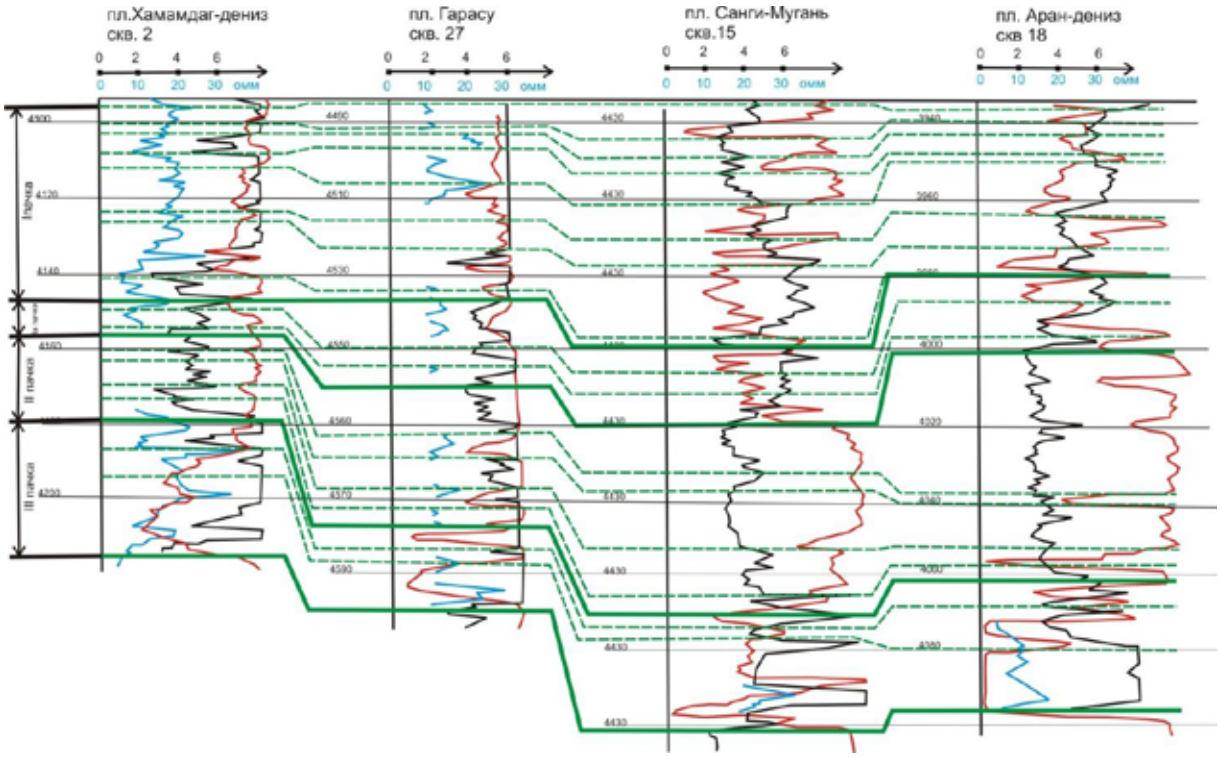

Рис. 3. Корреляционная схема по отложениям VII горизонта ПТ по скважинам 2 площади Хамамдаг-дениз, 27 площади Гарасу, 15 площади Санги-Мугань, 18 площади Аран-дениз

Таблица

Глубина кровли и мощности, выделенных по данным ГИС пачек VII горизонта ПТ площадей Пирсагат, Хамамдаг-дениз, Гарасу, Санги-Мугань, Аран-дениз

№ № скважин	Глубина кровли / мощность [м]				Мощность VII гор. ПТ, м
	I пачка	Iа пачка	II пачка	III пачка	
пл. Пирсагат					
51	3237/25	3262 /4	3266 / 27	3293/21,5	77.5
93	3642,5 /27,5	3670 /5	3266/ 27	3707 / 17	76,5
86	3749 / 32	3781 / 14	3795/25	3820 / 27,5	98,5
97	3739,5 /25,5	3765/ 13	3778/31	3809/30	99,5
98	3624 / 36	3660/ 11	3671/26,5	3697,5/41,5	115,0
84	3885,5 /42,5	3928/ 19	3947 / 27,5	3974,5/ 15	104,0
94	3660/32	3692/ 15	3707 /37	3744 / 36	120,0
90	3542 / 33,5	3575,5 / 12,5	3588/37,5	3625,5 /25,5	109,0

91	3524 /38	3562/ 11,5	3573,5 /31,5	3605 / 16	97,0
85	4055 / 22,5	4077,5 /7,5	4085 / 24	4109/28	82,0
88	4348,5 /31	4379,5 /5,5	4385 /34,5	4419,5 /33,5	104,5
83	4038 / 29	4067 / 12	4079/25,5	4104,5/29,5	96,0
104	3605 / 37,5	-/-	3642,5 / 18,0	3660,5/46,5	102,0
87	3886,5 /32	3918,5/18,5	3937/ 27	3964/38,0	115,5
99	4105/49	4154/5,5	4159,5 /42	4194,5/23,5	120,0
96	4296 / 33	4329/3	4332/33	4365/22	91,0
Хамамдаг-дениз					
13	3544,0/30,0	3574,0 / 16,0	3590,0 / 42,0	3632,0/ 13,5	101.5
5	3705,5 /47,5	3746/ 13,5	3759/36,5	3796/24,0	114,4
2	4097,0 / 50,5	4147,5/9,5	4157/23,0	4180/36,0	119,0
7	4082,0 / 42,0	4124,0/20,0	4144,0/26,0	4180/43,5	131,5
8	3980 / 28,0	4008,0 /25,0	4033/51,0	4084,0 / 14,0	118,0
30	4553,0/32,0	4584,0 / 13,0	4598,0 / 18,0	4616,0/24,0	87,0
3	4037,0/43,0	4080,0/5,5	4085,5 /24,5	4110/25,0	98,0
4	4339 / 23,0	4362/ 11,0	4373 /-	-	-
Гарасу					
11	4040,0/47,0	4087,0 / 23,0	4110,0/58,5	4168,5/31,5	160,0
27	5396/ 51,0	5447 / 23,5	5470,5 / 34,5	5505 /25.0	134,0
26	5380/ 42,5	5422,5 / 22,5	5445 /44,0	5489/24,0	133,0
25	4710/43,0	4753/28,0	4781 /46,0	4827 / 36,0	153,0
34	3250 / 24,0	3250,5 /3,5	3284/40,0	3324 / 19,0	93,0
28	5520/ 37,0	5557,0/ 11,5	5568,5 / 15,5	5584,0/30,0	94,0
32	4018/ 35,0	4053 / 10,0	4063 / 52,0	4115/19,0	116,0
Санги-Мугань					
1	4426 / 64,0	4490/21,0	4511 / 50,0	4561 /31,0	166,0
17	3898 / 52,0	3950/ 12,5	3962,5 / 46,5	4009/45,0	156,0
16	4146/61,0	4207 / 20,0	4227 / 42,0	4269/34,0	157,0
8	4072 / 38,0	4110/9,0	4119/36,0	4155 /24,0	107,0
20	5102,5/57,5	5160,0/16,0	5176/62	5238 / 15,0	150,5
4	4881,0/58,0	4939,0 / 14,0	4953/ 55	5008/28,0	145,0
9	4082 / 49,0	4131/8,0	4139/33,0	41172/28,0	118,0
Аран-дениз					
3	4593 / 40.0	4633 /25	4658/48,0	4706/32,0	145,0
1	3912/46,0	3958/20	3978 / 59,0	4037 / 30,0	155,0
18	3932/43,0	3975 /20	3995/60,0	4055/34,0	157,0
7	4211/62,0	4247/ 15	4288/61,0	4340/28,0	166,0
18	3932/43,0	3975 / 20	3995/60,0	4055 / 34,0	157,0
7	4211/62,0	4247/ 15	4288/61,0	4340 / 28,0	166,0

Как показал анализ всех геолого-геофизических материалов и результатов опробования только антиклинальным строением рассматриваемых площадей и тектоническими факторами нельзя объяснить получение притоков воды из отложений VII горизонта ПТ в одних скважинах и приток нефти 200 т/сут только в одной скважине № 25 площади Гарасу.

В связи с этим важное значение имеет установление фациальной природы исследуемых отложений, что осуществлялось с помощью количественных каротажных генетических моделей фаций терригенных пород, а также методики их

фациального анализа. В разрезе исследуемого VII горизонта по данным ГИС были выделены и прослежены следующие типы фаций: потоковые (фации русел рек, дельтовых проток и зон течений), баровые, пляжевых отмелей, мелководно-морские глинистые и другие.

Как указывалось выше, более достоверное определение генетического типа терригенных отложений по данным ГИС осуществляется с помощью количественных генетических каротажных моделей фаций, в том числе и путем использования векторных диаграмм взаимоотношений литотипов пород.

С этой целью проводится количественная интерпретация материалов ГИС. В результате чего определялся литологический состав терригенных пород, их коллекторские свойства и нефтегазонасыщенность, а также строятся график литологии и некоторые диаграммы взаимоотношений литотипов. Как показало сравнение графиков литологии по отдельным скважинам исследуемых площадей в направлении с запада на восток происходит увеличение алевролитистости и глинистости разреза, что указывает на местоположение источника сноса терригенных частиц в западной и северо-западной частях ЮКВ.

Данные корреляции разрезов скважин, результаты литологического, циклического и фациального анализа послужили основой для реконструкции палеогеографической обстановки отложений VII горизонта ПТ.

На рис. 4 показана карта равных мощностей песчаных тел потокового типа для II пачки VII горизонта ПК, которая является основным нефтегазоносным объектом на площади Пирсагат. Анализ, представленный на рис. 4. позволил установить, что в период формирования III-й пачки в исследуемом районе существовала дельта крупной реки равнинного типа, т.е. здесь был древний аккумулятивный шельф. Очевидно появление многочисленных дельтовых каналов и проток было связано с ее пологими наклонами и малыми глубинами прибрежной части бассейна, в котором формировалась дельта.

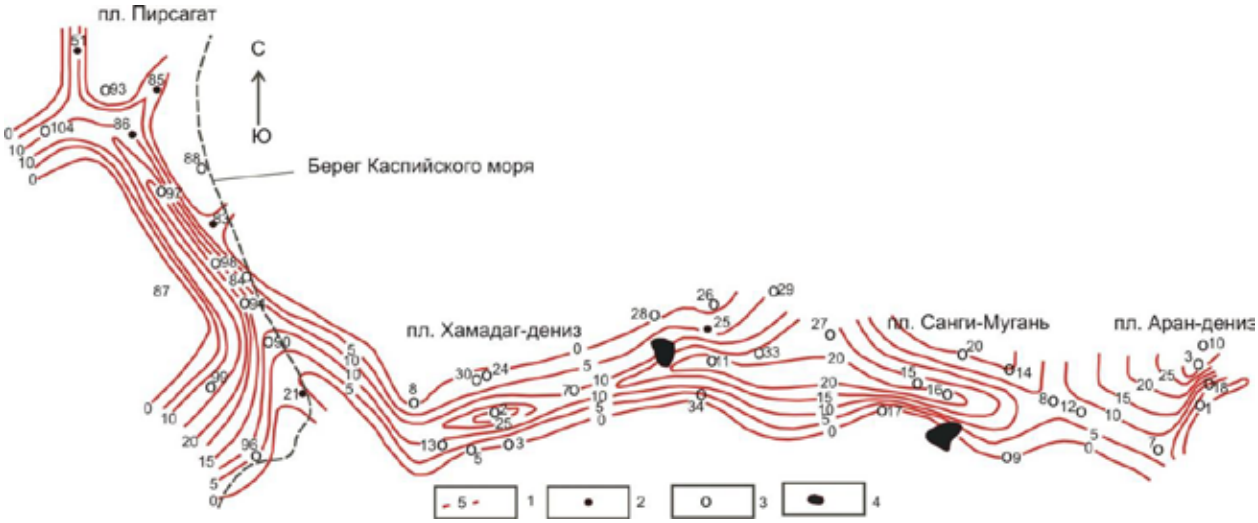

Рис. 4. Карта равных мощностей песчаных тел потокового типа III пачки VII горизонта ПТ для площадей Пирсагат, Хамамдаг-дениз, Гарасу, Санги Мугань и Аран-дениз. 1 - мощность песчаного тела потокового типа; 2 - скважины, давшие продукцию; 3 - сважины давшие воду; 4 - грязевой вулкан

На дельтовую обстановку осадконакопления указывает замещение грубозернистых осадков алеврито - глинистыми отложениями, образовавшимися в заливах и дельтовых озерах, или отложениями барового типа, сформировавшимися из обломочного материала, выносимого через дельтовые протоки (русловые каналы). Зоны развития наиболее грубозернистых песков здесь приурочены к центральным частям выделенных русловых каналов. К краям песчаных тел мощность пород-коллекторов сокращается вплоть до полного выклинивания. По всей вероятности в районе площади Аран-дениз направление основной дельтовой протоки изменяется на северо-восток. Изучение пространственного размещения песчаных коллекторов потокового генезиса в разрезе III пачки VII горизонта ПТ позволило объяснить результаты опробования этой пачки на рассматриваемых площадях. При этом установлено, что нефтяные залежи здесь связаны с зонами выклинивания русловых отложений, и в то же время центральные части русловых каналов (дельтовых проток) являются обводненными вследствие разрушения («промывки») залежи углеводородов.

Таким образом, результаты фациальной интерпретации материалов ГИС позволили сделать вывод, что получение продукции из объектов III пачки VII горизонта ПТ в скважинах площадей Пирсагат, Хамамдаг-дениз, Гарасу и Санги-Мугань связано с литологической ловушкой, образовавшейся благодаря выклиниванию русловых (потоковых) отложений. Перспективы нефтеносности III-й пачки VII горизонта площади Аран-дениз не столь велики, однако для окончательного суждения необходимы исследования дополнительных скважин. Подтверждением этому служит положительная оценка нефтеносности этой пачки в скважине № 3 данной площади по результатам количественной интерпретации материалов ГИС.

Другой участок (II, рис. 1) ЮКВ, где проводились работы по реконструкции условий осадконакопления отложения ПТ по данным ГИС относится к площади Кюрсангя, приуроченной к Нижнекуринской депрессии.

Площадь Кюрсангя в тектоническом отношении вначале представлялась как единое антиклинальное поднятие. В дальнейшем было установлено, что Кюрсангинская складка, испытывая ундуляцию оси в районе грязевого вулкана, образует два самостоятельных поднятия - северное и южное, разделенные неглубокой седловиной. Геологическое строение обеих поднятий осложнено двумя продольными разрывами, которые разделяют складку на три основных блока, причем центральный блок опущен по сравнению с северо-восточным и юго-западными блоками. Кроме того складка осложнена также рядом поперечных нарушений. Если отложения I-VI горизонтов представлены, в основном, песчано-алевритовыми разностями, то в VII-X горизонтах преобладают глинистые породы, которые, однако, ниже XI горизонта снова обогащаются песчаным материалом. При этом наблюдается увеличение песчанистости по площади от крыльев к своду складки. Основные залежи нефти здесь приурочены к первым семи (I-VII) горизонтам ПТ, которые относятся к группе сводовых, разбитых на самостоятельные блоки. Залежь в XIII-м горизонте ПТ (скв. № 84, 87) является литологически ограниченной, окруженной со всех сторон непроницаемыми породами. Применение методики фациальной интерпретации материалов ГИС, позволило получить иное толкование строения залежи в VI горизонте ПТ, а также детально изучить строение залежей углеводородов, приуроченных к I, II, III и VII горизонтам ПТ на площади Кюрсангя-Южная. С этой целью в разрезах скважин вдоль выбранных профилей и в интервалах глубин, соответствующих вышеуказанным

горизонтам ПТ, было произведено детальное расчленение разреза, а также определены по данным ГИС литологический состав пород, их глинистость, пористость, нефте-газо-водонасыщенность и разделены пласты, содержащие подвижный и связанный флюид.

Вследствие чрезвычайно малого отбора керна детальная корреляция разрезов вышеуказанных скважин осуществлялась с помощью разных каротажных кривых. Следует отметить, что о возможности прослеживания пластов песков, песчаников и глин по электро каротажу (КС, СП) в разрезах площадей Нижнекуринской впадины отмечалось ещё в 1972 году К.А. Исмайловым с соавторами, которыми была доказана близость оценок песчанистости разреза по каротажу и керну. Авторами же произведена более детальная корреляция разрезов скважин, требующая привлечения в дополнение к стандартному каротажу кривых гамма-каротажа и нейтронного-гамма каротажа. В качестве базовой была выбрана скважина № 99 площади Кюрсангя-Южная, разрез которой был сначала разделен на пачки, затем на основные пласты и, наконец, некоторые из них были разбиты на отдельные однородные по каротажным кривым прослои, минимальная мощность которых составляла 0,6 м.

Проводимые исследования позволили более детально расчленить разрезы скважин во всем диапазоне литотипов отложений ПТ - от песчаников до алевролитов и глин. По статистическим оценкам эффективной пористости изученных коллекторов было установлено, что имеется довольно четкое различие пористости для нефтенасыщенных коллекторов и для неколлекторов, поровое пространство которых заполнено связанной водой. В то же время наблюдается явление расхождения в значениях пористости водонасыщенных пород, залегающих выше и ниже водо-нефтяного контакта (ВНК). Различие же в пористости для нефтенасыщенных и водонасыщенных пластов объясняется как избирательным заполнением углеводородами лучших коллекторов при их миграции, так и замедлением различных диагенетических процессов при замене вод углеводородами. Кроме того, было отмечено, что нефтенасыщенными коллекторами горизонтов ПТ являются алевролиты, песчанистые алевролиты и алевритистые песчаники. Следующим шагом интерпретационных работ является детальное прослеживание выделенных песчано-алевритовых и глинистых пластов по линии выбранных профилей и определение местоположения поверхностных ВНК в залежах нефти. На месторождении Кюрсангя-Южная, как и для площадей антиклинальной зоны

Пирсагат-Дашлы, для целей корреляции были использованы оценки поровых давлений по данным ГИС. Здесь были построены карты распределения максимальных градиентов поровых давлений в глинистых отложениях различных горизонтов и карта распределения поровых давлений в вертикальном сечении разреза площади. Это позволило получить следующую характеристику геодинамики поровых флюидов на рассматриваемой площади. Кровля зоны АВПД во всех изученных скважинах отмечается в верхнем апшероне. В разрезе площади выделяется ряд максимумов и минимумов, которые могут служить реперами при площадной корреляции [6,7].

Исследования показали, что фации, слагающие разрез I горизонта ПТ на площади Кюрсангя-южное, меняются от свода к крыльям. Так в скважине № 90 разрез ПТ преимущественно сложен фациями русел рек (дельтовых проток) или зон течений, причем для них характерен разнозернистый состав осадков при увеличении алевролитовой составляющей снизу вверх по разрезу. С подстилающими отложениями (глинами) эти фации имеют резкий контакт у своего основания. Все это отражается на конфигурации кривой СП (качественные каротажные модели фаций) и подтверждается количественными оценками соотношения песчаного и алевритового материала в пластах по данным ГИС (количественные каротажные модели фаций). В скважине № 519 тип фаций, в основном, сохраняется, однако разрез здесь выражен алевролитами и по кривой СП отмечается появление фаций пляжевых отмелей. Разрез I горизонта в скважине № 86 представлен большей частью фациями пляжевых отмелей, однако в интервале 3032-3056 м на кривой СП отчетливо выделяется фация прибрежных баров, которая характеризуется увеличением песчанистой составляющей снизу вверх по разрезу. В скважине № 99 мощность I горизонта ПТ минимальная, он сложен преимущественно фациями прибрежных баров. В скважине № 64, расположенной на юго-западной крыльевой части складки, I горизонт ПТ имеет наибольшую мощность, он полностью водонасыщен и сложен фациями пляжевых отмелей. II горизонт ПТ в скважинах № 90 и 519 представлен фациями прибрежных баров (в верхней части) и фациями пляжевых отмелей (в нижней части). Последним типом фаций сложены также разрезы I горизонта в скважинах № 86 и 99, тогда как в скважине № 64 разрез этого горизонта выражен фациями прибрежных баров. Нефтегазоносность II горизонта ПТ была подтверждена только

при опробовании пластов в скважине № 90, представленных фациями баров, эти фации обладают повышенными коллекторскими свойствами.

Разрез III горизонта ПТ в скважине № 90 сложен, в основном, фациями прибрежных баров. В скважине № 519 разрез этого горизонта представлен фациями пляжевых отмелей преимущественно алевритового состава с ухудшенными коллекторскими свойствами. Аналогично сложен разрез III горизонта ПТ и в скважине № 86. Увеличение мощности этого горизонта и появление фаций потокового типа наблюдается в скважине № 99, тогда как в скважине № 64 разрез III горизонта сложен, в основном, фациями прибрежных баров.

При изучении литолого-фациальных особенностей VI горизонта ПТ на основании всех геолого-геофизических данных была проведена корреляция разрезов скважин № 99, 86, 85, 88, 83 в результате чего был построен профильный разрез (рис. 5) [6].

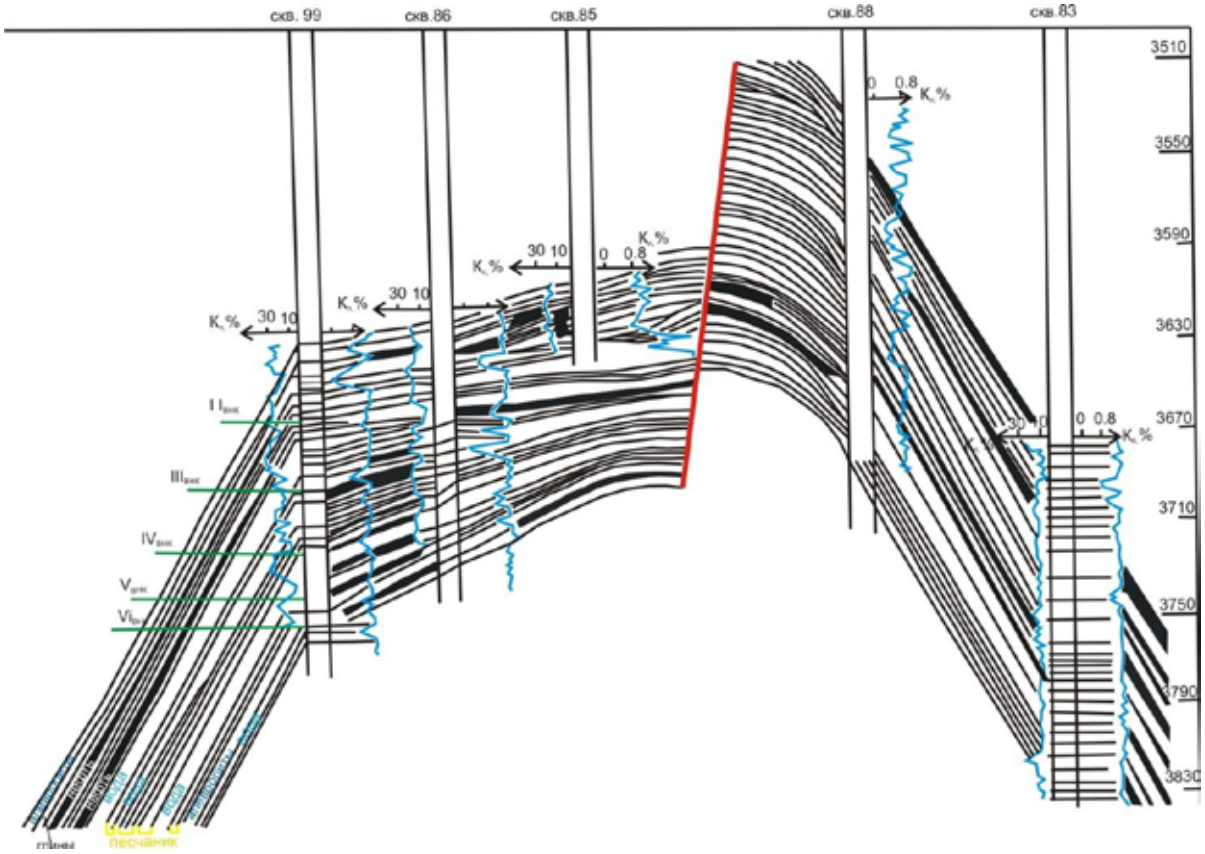

Рис. 5. Профильный разрез VI горизонта площади Кюрсангя-южная по материалам ГИС. 1 - песчаник; алевролит; 3 - глины; 4 - нефть; 5 - вода

Разрез VI горизонта по соотношению песчано-алевритовых и глинистых пород, коллекторским свойствам и распределению флюидов по вертикали можно разбить на 6 пачек. Разделами между II, III, IV, V и VII пачками служат как глинистые породы, так и непроницаемые песчано-алевролитовые разности со «связанной» водой, т.е. неколлектора. I-ая нефтяная пачка, выделенная только в скважине № 85, состоит из двух пластов-коллекторов, отмеченных под номерами № 2 и № 6. Пласт № 2 является песчаным алевритом, его мощность составляет около 1 м и он хорошо прослеживается без изменений мощности во всех скважинах на линии рассматриваемого профиля. Мощность же пласта № 6 в районе скважины № 85 претерпевает аномальное увеличение до 16 м, тогда как в других скважинах, указанных на профильном разрезе, она колеблется в пределах от 1,5 до 3 м.

Анализ формы песчаного тела, изучение формы кривой СП (рис. 6 а) с помощью качественных каротажных моделей фаций, а также использование оценок литологического состава, пористости и водонасыщенности пластов по результатам количественной интерпретации материалов ГИС показало, что в районе скважины № 85 генезис выделенного песчано-алевритового тела (пласт № 6) можно интерпретировать как фацию одного из ответвлений русла древней дельты реки Палео-Куры. Характерным для такой фации является увеличение песчаников к подошве песчано-алевролитового тела, эффективная пористость которых несколько выше, чем у алевролитов, залегающих в кровле пласта. Песчано-алевритовые коллекторы, слагающие разрезы других пачек по генезису, интерпретируются как фации пляжевых отмелей, т.е. песчаных тел, образующихся вблизи берега моря (рис. 6 б).

Фации слагающие разрез VII горизонта ПТ, меняется по направлению от свода к крыльям. Так в скважине № 415 в верхней части разреза прослеживаются хорошо выраженные на кривой СП фации русел или зон течений, а в подошве горизонта - фации пляжевых отмелей.

В скважине № 487 в кровле VII горизонта появляются фации прибрежных баров и отмелей, в средней части - русловые отложения, которые переходят к подошве рассматриваемого горизонта в фаций пляжевых отмелей. Аналогично интерпретируются и фации, слагающие разрезы VII горизонта скважин № 20 и 94 площади Кюрсангя-южная. Таким образом, результаты фациальной интер-

претации данных ГИС показали разнообразие обстановок осадконакопления пород ПТ на изучаемой площади. При этом было установлено наличие взаимосвязи между коллекторскими свойствами пород и типами фаций, что позволяет

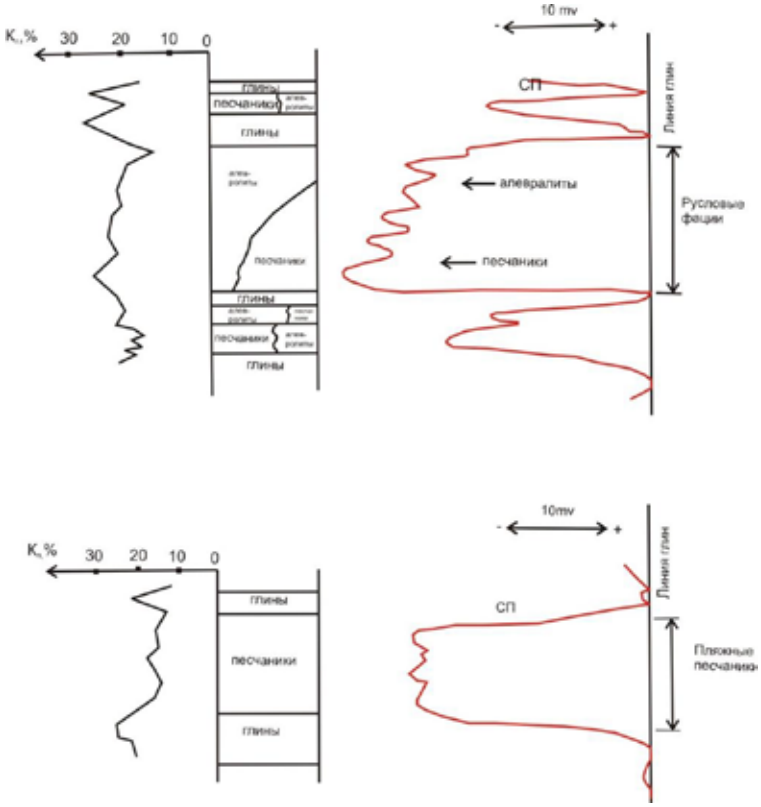

Рис. 6. Типы фаций русел древней дельты (а) в интервале глубин 3613,5-3631 м скважины №85 и пляжевых отмелей (б) в интервале 3746-3755 м скважины №83 площади Кюрсангя-южная.

во-многом объяснить различие в дебитах нефти по скважинам, расположенным в контуре залежи. Так, например, получение хороших дебитов нефти из отложений VI и VII горизонтов ПТ в скважинах, расположенных в присводовой части структуры, связано с распространением здесь русловых отложений, являющихся прекрасными коллекторами. Фациальными изменениями пород ПТ можно объяснить также выявленную закономерность в расположении зон с сопоставимыми условиями бурения на площади Кюрсангя-южная. Удалось установить, что чем ближе скважина размещается к своду складки, тем выше располагается первый высоконапорный объект, представленный, как правило, русловыми отложениями.

Определение отложений ПТ на другом участке ЮКВ (участок III на рис. 1), т.е. на морском месторождении Гюнешли, проводилось с целью изучения взаимосвязей между давлением пластовых флюидов и фациальной принадлежностью пород. Как известно, без учета геофлюидальных давлений трудно понять развитие различных геологических процессов. Если связь между характером распределения геофлюидальных давлений в разрезе и его нефтегазоносностью изучалась многими исследователями, то характер взаимосвязи между величинами давлений и составом пород практически не изучался. В продуктивной толще месторождения Гюнешли по литологическим особенностям выделяются два типа терригенных разрезов. Так отложения свиты «перерыва», подкирмакинсой, кирмакинской песчанистой и низы балаханской свиты характеризуются повышенным содержанием песчано-алевролитовой фракции и карбонатного цемента в коллекторах с незначительной глинистостью. Свиты кирмакинская, надкирмакинская глинистая и верхние свиты верхнего отдела ПТ характеризуются преобладанием алевролитовой фракции над песчаной, а также относительно высоким содержанием глинистого материала и незначительной карбонатностью.

С помощью разработанных качественных и количественных каротажных моделей фаций и методики фациальной интерпретации данных ГИС, была проведена оценка фациальной природы терригенных пород в разрезе плиоцена площади Гюнешли. Корреляция здесь происходит по отличительным признакам - последовательности появления максимумов и минимумов на кривой $\eta_{пор} = f(\text{H})$, которые и позволяют выделять сопоставляемые геологические объекты. В разрезе площади Гюнешли выделяются и хорошо коррелируются две зоны АВПД. Одна зона, локальная, приурочена к IV-VIII горизонтам и имеет сравнительно небольшие значения градиентов поровых давлений. Другая - протяженная, резко дифференцирована и приурочена к отложениям, залегающим ниже «свиты перерыва» (т.е. к отложениям свит надкирмакинская глинистая, надкирмакинская песчаная, кирмакинская, подкирмакинская, калинская. Породы «свиты перерыва» характеризуются региональным минимумом градиентов поровых давлений, что говорит о регрессии бассейна осадконакопления. Сравнительный анализ особенностей протяженной зоны АВПД по скважинам рассматриваемой площади указал на некоторую тенденцию увеличения градиентов поровых давлений

в центральной части складки. Литологический состав, глинистость, пористость и нефтегазонасыщенность отложений площади Гюнешли изучались по результатам интерпретации данных ГИС. Прежде всего было установлено, что градиенты поровых давлений снижаются в тех интервалах разреза, где среди глинистых пластов развиты песчаные тела потокового происхождения. Это объясняется хорошими коллекторскими свойствами рассматриваемых отложений, что дает возможность существенно разгрузить поровые давления в контактирующих с ними глинистых пластах. В то же время, несмотря на хорошие коллекторские свойства русловых отложений, из-за отсутствия зон выклинивания, они оказались непродуктивными, что, по-видимому, связано с разрушением залежей углеводородов (возможно под воздействием пластовых вод).

Выводы. В заключении отметим, что рассмотренные примеры по реконструкции обстановке осадконакопления терригенных отложений ПТ на отдельных участках ЮКВ не противоречат сложившимся представлениям о генезисе этой толщи, состоящей как из шельфовых, так и дельтовых типов осадков. Накопленная в среднем плиоцене мощная серия обломочных пород ПТ образовалась в результате не только прогибания дна бассейна осадконакопления, но и впадения в него крупных рек, режим которых контролировался климатическими факторами. В плиоценовую эпоху ПТ, в связи с общим поднятием Куринской впадины, большой размах приобретают денудационные процессы мощных толщ континентальных конгломератов и других пролювиально-аллювиальных отложений, образовавшихся вокруг Большого и Малого Кавказа. Это обеспечило поступление огромного количества обломочного материала в западную часть ЮКВ, где существовал сравнительно мелководный бассейн седиментации с компенсированным осадконакоплением.

Было установлено, что пористость в коллекторах начинает формироваться на стадии раннего диагенеза в условиях нисходящих колебательных тектонических движений. Которые приводят к увеличению глубины бассейна и накоплению тонкодисперсных частиц. Накопление тонкодисперсных частиц происходит по нашему мнению за счет повышение давления, создаваемого столбом воды и движением ее в поровом пространстве. Это создает благоприятные условия для отложений карбонатов кальция.

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Production and Use of Elastomers Complex Catalysts of the Polymerization Process

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Abstract: Research results of the capacity of foam polymer sorbents on the basis of multicomponent polymer mixtures for heavy metals, experimental data on the establishment of the effect of the ratio of polymer components, temperature, and pH of the medium on the regularity of the change in the sorption capacity have been presented. The real possibility of the chemical modification of the foam polymer sorbents has been shown with the aim of achieving high results in increasing the sorption capacity for a number of heavy metals.

Keywords: immobilization, polyaminoacids, poly amide – amines, acrylo-nytrylein, transition metals compounds.

Experts in filed of catalysis were searched the ways creation of catalysts by now type, combining the merits of homogen and heterogen metal-complex catalysts.

These catalyst it is proposed to call “hybrid phase”, but the essence of phenomenon is more accurately expressed by term “immobilized catalysts” [1,2].

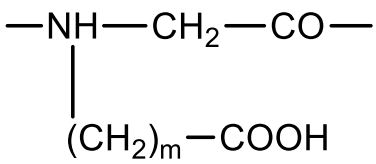
Immobilization in use of metal-complex catalysts includes limitation transition metals compounds by means of reaction with functional groups of polymer reagents.

Creation of immobilizated catalyst pursue an aim important not only in partical but also in theoretical aspects.

Personally, receive of stable catalysts with good reproduction activity, selectivity, which easily are separated from products of reaction.

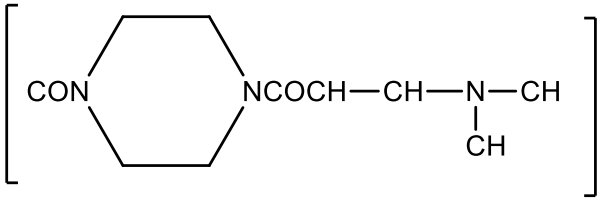
The initiated radical polymerization and copolymerization of 2 – oxyethyl methacrylate are enough studied [3]. The polymer carriers on base of acryl and metacryl acids ethers in form of macropore swelling granules find many – sided use. To that type it is follow to attribute the products of cation copolymerization of vinyl and acryl ethers copolymers of vinyl acetate and glycidyl alcohol, containing epoxy groups [4, 5].

The polyaminoacids by total formula



have a great significance in reactions of immobilization, from which the polyglutamine acid where (m=2), poly – L – cizin, poly – L – gistydine are often used.

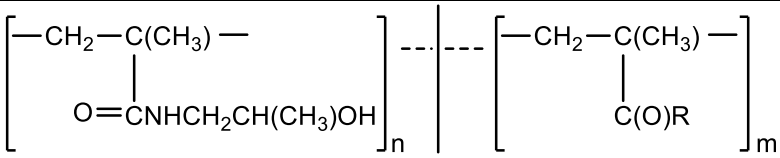
By authors of works a new type of polymer carriers – poly (amide–amines)

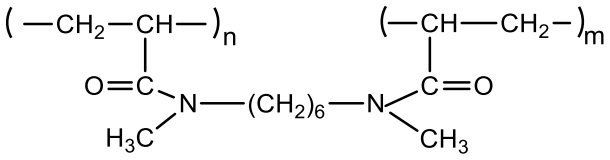
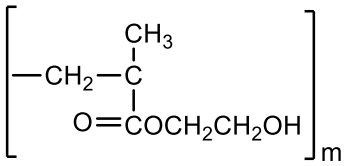
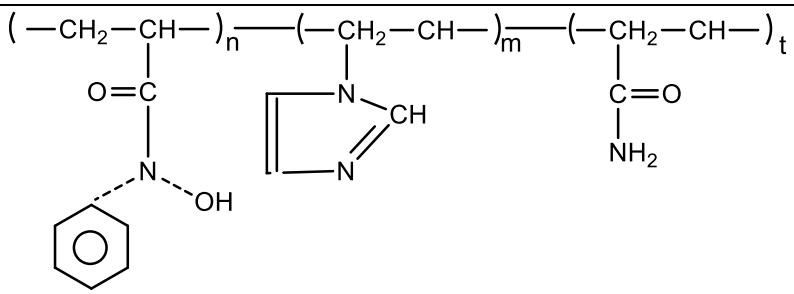
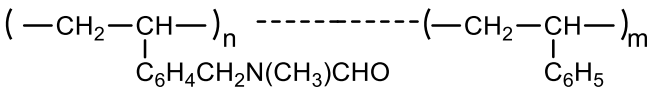
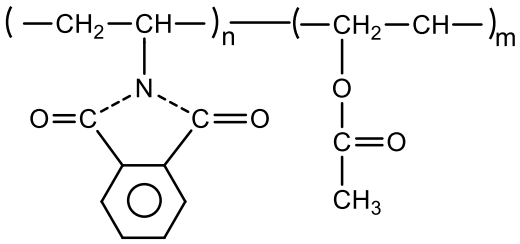
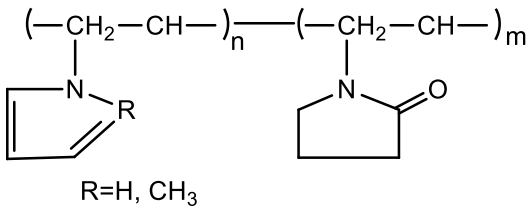


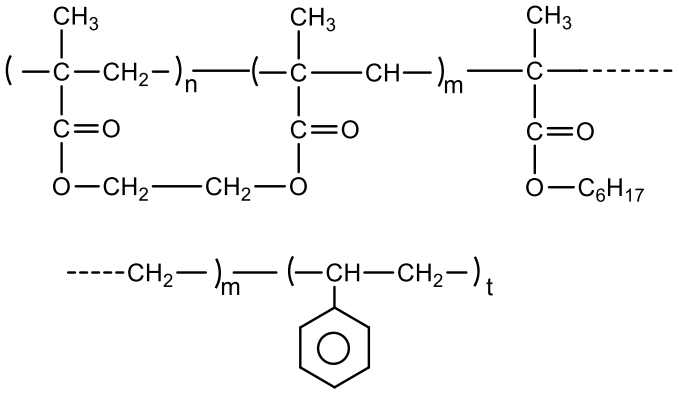
have been synthesized.

Series of polyfunctional carriers are shown at the table.

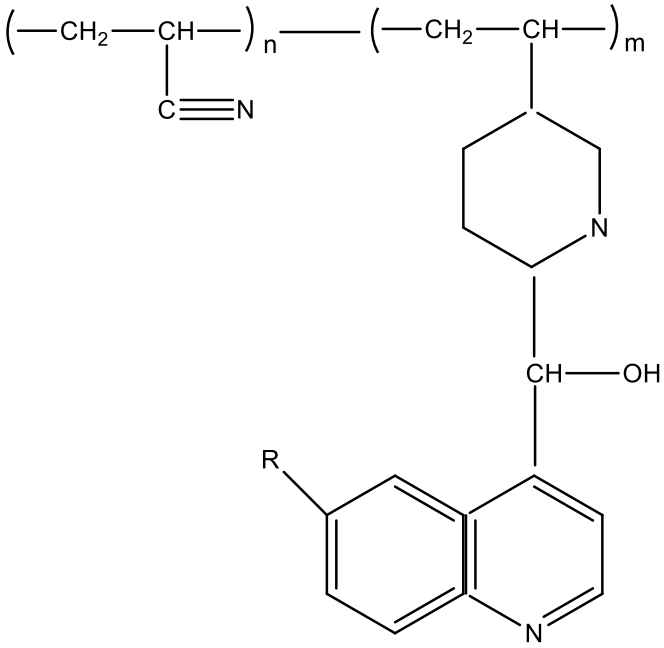
Some O- and N- containing polyfunctional carriers

Carrier	Structure	Lite-rature
Copolymer based on hydroxypropyl methacrylamide	 R=OH, H, NH, CH_3, COOH, CH_2, C_6H_5	[8]

Copolymer of methacrylate with N,N'-dimethylhexy-met-hylenediacrylamide		[9]
Copolymer of N-ethyl-N'-(2-methacryloyletyl)-n-phenylenediamine with 2-hydroxyethyl methacrylate		[10]
Copolymer of N-phenylacryloyl hydroxamate, 1-vinyl of 2-methyl-imidazole and acrylamide		[11]
Copolymer of N-methyl-N-(n-vinylbenzyl) formamide and styrene		[12]
Copolymer of N-vinylphtalimide with vinyl acetate		[13]
Copolymer of 1-vinylimidazole (or 1-vinyl-2-methyl-imidazole) with 1-vinylpyrrolidone-2	 R=H, CH_3	[14]

Copolymer of ethylene glycol dimethacrylate, 4-vinylpyridine and 2-ethylheximethacrylate		[15]

The interesting polymer carriers are also the products of radical copolymerization of alkaloids of quinine bark with acrylonytryle chloroform



where R=H, CH_3O.

Distribution of ion metals on carrier is studied, the peculiarity immobilization of heterocycles are revealed [18]. On example copolyerization of ethylene display of these effects in catalyst was considered. The base distinctive features of polymerization processes under influence of metals are discussed. It have been shown that stability of immobilized catalytic systems in base connect with braking of coordinated processes of disintegration in coordination sphere of transition metal. On initial stage of the works by fixing of complexes the tendency to immobilization of complexes, being the catalysts in solutions was displayed.

The Wilkinson catalysts $(PPh_3)_3PhCl$ and hydroformilation catalysts $PhH(CO)(Ph_3)_2$, which may be heterohemizated by use of surface phosphine ligands [19] are on example.

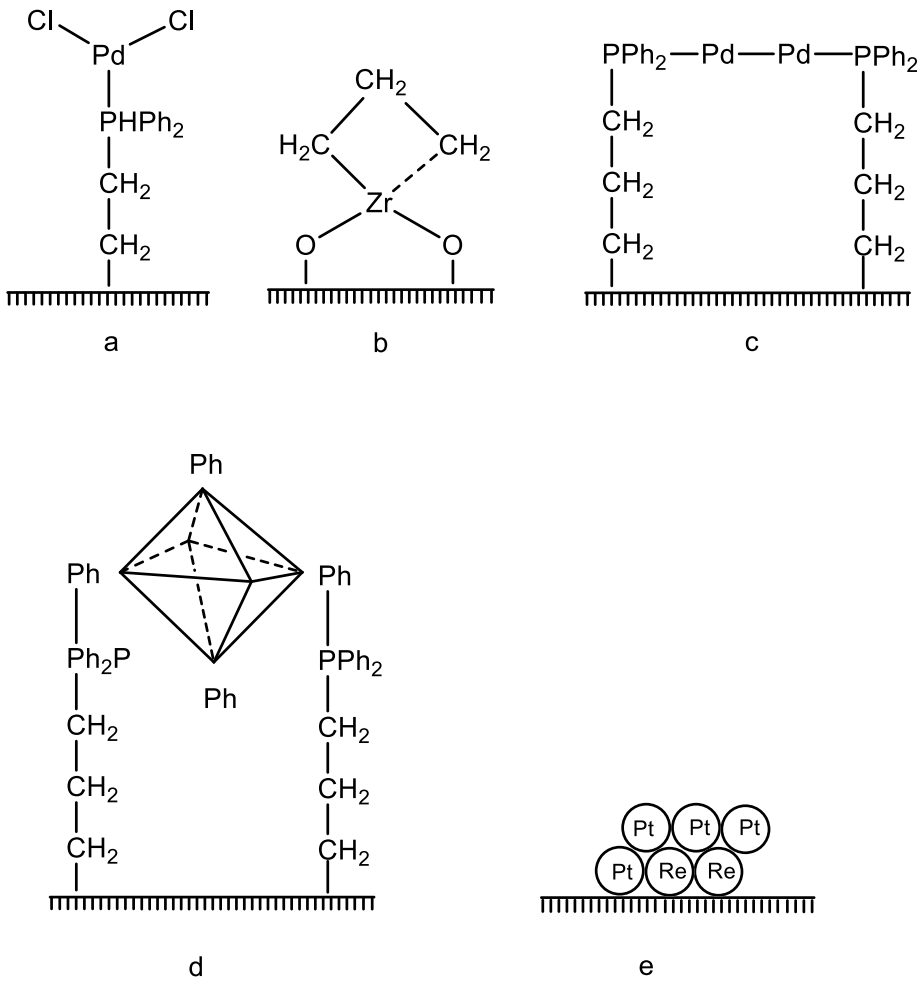
But as far as development of works it became more obvious that the base direction in research of catalysts, containing the complexes at carriers is goal - directed synthesis of surface compounds, composition of which don't have the direct analogs among known solved catalytic systems.

One more advantage of catalysts, containing fixed complexes – its big " accuracy " by comparison with traditional heterogen systems.

In principle, concentration of active centers in it may be equal concentration of transition metal which give an additional possibilities for research of catalytic reactions mechanism by use of physical methods.

Complexity of fixed complexes composition create the continuous series by transition from catalysts – mononuclear complexes to traditional catalysts [20].

The following scheme illustrates this approach:



a – fixed monomolecular complex; b – fixed binuclear complex;

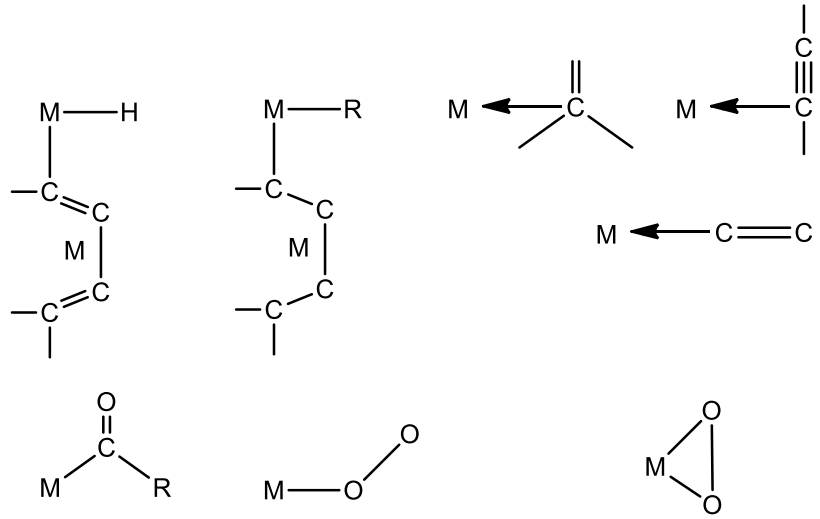
c – fixed cluster complex with appointed number of metal atoms;

d – fixed cluster with unappointed number of metal atoms;

e – disperse particles of active companent.

Synthesis and catalytic use of fixed mononuclear complexes (look scheme a) is the most well developed field of new direction in catalysis. The catalysts of that type give an additional possibilities for classification of catalytic reactions mechanism study of ligands influence on catalytic properties, conducting of complicated reactions on centers of different functionality.

Mechanism of reactions, catalized by mononuclear complexes may include formation of different intermediate compounds, the analogs of which are well known among stable complexes [20]:



By achievement of high concentration of active centres by fixing of complexes it is a success to trace for its conversions on surface in reaction conditions and by that to reveal a mechanism. It is known that as bionuclear fixed complex the centres, in which two atoms of metals connect between each other directly over bridge ligands in presence of solved cluster glue complexes are implied (look scheme b). It may be expected, that these complexes by comparison with mononuclear are able to conduct reactions by more complicated mechanisms on account of simultaneous activation of different parts of reacting molecule.

Moreover, unlike form mononuclear complexes, on catalytic activity of which on the whole the thermodynamical factors influence, an activity of binuclear complexes must depend from its structure.

However the amount of possible intermediate formations is insufficient for proceeding of reaction series. Some reactions, which are easily realized on metal catalysts weren't discovered in presence of solved complexes of compounds. To it, for example, the catalytic hydration of carbon oxide, hydrohenolysis of C – C bond, disproportionation of cyclohexane in benzene and cyclohexane are related.

According to Muetertize [21] by interaction of reagents with clusters it can be expect the same intermediate formations,which can arise also by adsorbtion of cluster complexes on metals surface. The series of possible analogues between cluster complexes and metal particles is registered.

In presence of cluster complexes (look scheme c) it is be a success to realize a whole series reactions [22]: hydrogenitation of the butylenes, omorins and carbon oxide, oligomerization of acetylenes and butadiens, but in spite of variety reactions, it is necessary to notice that catalysis by cluster glue complexes in solution have significant limitations.

By fixing of metalorganic compounds on lowvalent surface ions of IV – VII groups elements with following decomposition of surface formations it is possible to receive super dispers particles, containing unappointed number of metals atoms (look scheme d). These are an active centers of high-temperature catalytic conversion of hydrocarbons [22,23] synthesis of that kind particles allow to receive centres of different composition and to study the reasons action of so called modifying additions on properties of VII group metals in different conversion of hydrocarbons. In result development of different methods synthesis of surface formations as the centres proceeding of catalytic reactions the limits between separate types of catalysts on carriers became unstable. For example, it is difficulty to clearly delimit the catalysts containing fixed glues, which include from several atoms up to some dozens atoms, receiving over surface metal organic compounds.

Catalysts- compounds of dispers particles of active component may be (look scheme e) prepared by decomposition of surface fixed complexes. That kind catalysts are close to systems, received by traditional methods, alhough may have the more homogenous composition and morel high activity. By using of that kind catalyst, it is a success to increase the field study of influence of particles size up to 10 A^0 and less on catalytic properties.

At the last time the series of untraditional methods immobilization of metal complexes have been developed. It are characterized by reduction of stoges number, composing the fixing process, for example by combination for the stage synthesis of polymer and immobilization of transition metals compounds, receive of metal complexes simnetaneously with its immobilization and etc. At present time the research in these directions are intensively developed.

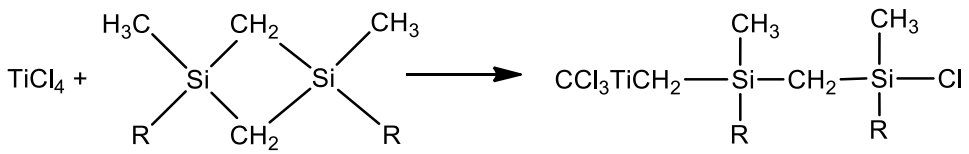
The structure, phase composition and temperature conduct of polybutadions samples, synthesized on binuclear metal complex systems and immobilizated on solid carrier. It have been determined that the samples of polybutadion with structure present itself the mixture of 1,4-trans-and 1,4-cis-homopolymers, whereas 1,2-links are distributed in macromolecules of 1,4-transpolymer by accidental law. It have been shown, that structure [13] 1,4-trans-polybutadion is in principle three phase and contain crystal, amorf and low molecular form of mezomorf phase component.

Comparatively not long ago at the first time the successful synthesis of polybutadien on piled on silica gel titanium magnesium catalysts (TMC) and on the same catalysts, modified by metal organic compounds of Ni or Ir (TMC-1). These catalysts are characterized by essentially more high activity by comparison with usually used in polymerization processes:

The cinetic of ethylene polymerization in medium of n-heptane, toluene and ethyl chloride in presence of benzyl derivatives of titanium $(C_6H_5,CH_i)_n$ Ti X_m, where X- are groups C_6H_5,Cl and OC_2H_5; n=2-4, m=1-2 and polymerization of ethylene and propylene under action of silicon titanium organic catalysts, 2,2 4,4-tetramethyl-4-chlor-2,4-decilbutyltitaniumtrichloride.

The high stability of silicon titanium containing catalyst is noted, which don^t lose activity during some month by keeping of it in inert atmosphere by room temperature. Activity of these catalysts is importantly increased by processing of them by diethyl aluminium chloride [24].

The catalysts 2,2,4,4-tetramethyl-4-chlor-2,4-desil butyl titanium chloride (1) and 2,4-dimethyl-2,4-diethyl-4-chlor-2,4-dicsilbuthyl titanium trichloride (2) have been received with yield>90% by reaction



Where R=CH_3 (1) and R= (C_2H_5) (2).

The influence of transition metal nature of piled titanium and vanadium magnesium catalysts on molecular-mass characteristics of ethylene co-polymers with branched α L-olefine, containing tertiary carbon atom in L- position to double bond, which have been received in conditions of ion-coordination polymerization in suspension regine.

Copolymers, containing up to 5% mol links of co-monomers are characterized by linear structure with branching conditioned only by alkyl substituent of L-olefine.

Tye polymerization of isobutylvinyl ester and L- methylstyrene under action of $SuCl_4$, absorbed on polystyrene and coordinated by methyl ethyl ketone have been studied. It have been shown, that polymerization proceed by cation mechanism.

By data of IR- and UF-spectroscopy, $SuCl_4$ is coordinated on phenyl rings of polystyrene and is complexed with methyl ethyl ketone by carbonyl group. The mechanism initiation of polymerization under catalyst action have been considered.

At the last decade by combined condensation of metals vapour and organic compounds the colloid solution of metals series, for example Au, Ag, Cu, Pb, Al, Iu [25] have been received. The received results shown that the catalytic propertics of colloid metals are comporative or exceed the catalytic properties of known glue catflysts.

Information about catalytic activity of similar systems are limited by individual works [26-28],where catalystis is fixed on example of reactions.

Known for corresponding metals, in compact state, although there are data that colloid metals, prepared by traditional way may be active in polymerization reaction.

The catalytic properties of received colloid systems have been studied on example of reaction addition of carbone tetrachloride to hexen-1.

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The Methods and Forms of Ecological Safety

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Abstract: The article devotes to decision of questions by ecological safety at enter prices in correspondence with international standards ISO 14001 and OHSAS 18001. The different enter prices in sphere ensuring of ecological safety, the ecological safety, environment protection, united system of management.

Keywords: the ecological safety, standards ISO 14001 and OHSAS 18001, environment protection, united system of management.

В настоящее время повышение экологической безопасности производственно-хозяйственной деятельности человека является огромной проблемой. Необходимость защиты природы и человека от потенциальных источников загрязнений, воздействий создающих угрозу всей экологической системе привели к возникновению и развитию новой формы взаимодействия общества и природы - обеспечения экологической безопасности личности, населения, территории.

Закон Азербайджанской Республики от 8 июня 1999 года №678-IQ «Об охране окружающей среды» определяет правовые, экономические и социальные основы охраны окружающей среды. Цель Закона заключается в обеспечении экологической безопасности в области охраны экологического равновесия окружающей среды, устранении вредного воздействия хозяйственной и другой деятельности на природные экологические системы, сохранения биологического разнообразия и рациональной организации природопользования [1].

Применение комплекса мер правового, организационного, экономического характера исключают или сводят к минимуму возможность опасного воздействия на природные объекты, а также на человека.

Бездумное использование человеком природных ресурсов возрастает с ростом населения и без соответствующих мер их защиты и восстановления приводят к загрязнению окружающей среды и непоправимым изменениям в биосфере. В связи с этим обеспечение экологической безопасности является важ-

нейшей проблемой современности [2]. Для сохранения природы требуется изменения сложившихся представлений о неизменности ее и необходимости развития у каждого человека экологического сознания, экологической культуры. Эту задачу решает создание фундамента знаний, и высшее образование является важным звеном для развития экологической культуры и воспитания. В связи с этим в вузах необходимо качественно изменить требования к профессиональной подготовке студентов.

Деятельность человека и стихийные природные катастрофы являются источниками экологической опасности. Последствия чрезвычайных ситуаций в природе управляются и решаются на государственном уровне в связи с их масштабностью, то предотвращать и ликвидировать последствия хозяйственной деятельности человека могут сами предприятия. Именно на предприятии начинается и реализуется поэтапный процесс воздействия на экосистему.

Какое промышленное предприятие считается экологически безопасным? Это такое предприятие, деятельность которого не угрожает качеству окружающей среды, безопасно для здоровья работников и соответствует государственным нормам. К сожалению, не все предприятия имеют совершенные методы и технологии производства для уменьшения выбросов, сбросов и отходов производства. Да, основное внимание на предприятиях уделяется техническим и технологическим аспектам для обеспечения экологической безопасности. Практические наблюдения выявили, что для повышения уровня экологической безопасности производства технических и технологических решений недостаточно, необходимо улучшать систему управления руководства. При формировании системы управления предварительно определяют участок, на который будет направлено управленческое воздействие. Непосредственное негативное воздействие оказывается на здоровье человека ,на его рабочем месте и на окружающую природную среду. Как показывает практика по истечению, какого-то времени может наблюдаться косвенное воздействие у работников в виде профессиональных заболеваний.

Если на предприятии применяются опасные материалы, а технические средства несовершенны, то и население, проживающее в загрязненной окружающей среде, может заболеть. Промышленное предприятие с позиции экологической безопасности можно представить как три объекта с определенными уровнями: первый - низший, второй - средний, третий - высший. К первому объекту

относится непосредственно рабочее место, второй это цеха, службы и третий - все предприятие. Устранить причину опасности на рабочем месте быстрее, легче и экономичнее, чем на втором и третьем объектах. Управление экологической безопасности состоит из двух направлений: промышленная безопасность и охрана окружающей среды. Эти два направления являются объектом международной стандартизации: ИСО 14001 и OHSAS 18001.

Сущность стандарта ISO 14001 – это анализ и изменение производственных, технологических процессов с целью уменьшения воздействия на окружающую среду. Система экологического управления содержит работы по оценке имеющихся и возможных экологических рисков, уменьшению ущерба окружающей среды путем совершенствования технологий производства. Целью данных работ является предупреждение возможного ущерба, снижение выявленных рисков путем предпринятых своевременных мер. Эта система также дает возможность снижению производственных издержек за счет экономии ресурсов (электричества, сырьевых материалов и т.д.), улучшения его "экологичности", изменение системы утилизации отходов, дополнительная прибыль от продажи отработанных отходов или их вторичное использование [3].

Какие задачи решает стандарт OHSAS 18001?

OHSAS 18001 – это международный стандарт, устанавливающий требования к системам менеджмента профессионального здоровья и безопасности. Он помогает организации выявить все присущие риски, возникающие в процессе работы и чрезвычайных ситуаций, управлять ими и повышать свою результативность в этой области [4].

Структура стандартов имеет последовательность действий:

1) разработка политики организации;

2) разработка программы управления ООС и охраной труда;

3) функционирование системы управления, структуры и ответственности, обеспечение обучения, связи, подготовленность к аварийным ситуациям (несчастным случаям) и реагирование на них;

4) подготовка проверок и корректирующих действий, проведение мониторинга и измерений, устранение несоответствий, аудит системы;

5) анализ системы менеджмента со стороны руководства и постоянное ее улучшение.

Анализируя современные системы менеджмента можно сделать вывод об общности направления развития этих двух систем:

• форма развития;

• комбинация технических и организационных решений;

• выбор на эффективность работы производства;

• содействие различных компонентов в технологической цепи;

• обязательный учет направления изменения внешней среды предприятия;

Внедрение двух систем дает положительные плюсы:

Организационные:

• систематический менеджмент;

• конкретное разделение обязательств и прав между работниками;

• совместное действие процессов и функций;

• гарантирование законов;

Экономические:

• уменьшение опасных факторов и ущербов;

• инспектирование и эффективный расход ресурсов;

• увеличение мощности производства;

• уменьшение расходов на сокращение неточностей;

Престижность:

• привилегии во время тендеров, заключении договоров;

• облегченное приобретение различных соглашений и разрешений;

• повышение популярности среди потребителей, поставщиков, партнеров.

Эти системы менеджмента имеют много общего и взаимно перекликаются, поэтому лучше создавать на предприятии объединенную систему менеджмента (БСМ), состоящую из двух частей, т.е. объединенную систему управления экологической безопасностью (БСУЭб).

БСУЭб – эта система поддержки на всех стадиях переработки и получения продукции с уменьшением, а лучше вообще, без воздействия на качество окружающей среды и здоровья людей.

Основы принципов (БСУЭб):

1) системное отношение - связывает в единое целое различные стороны деятельности;

2) планомерное отношение - это подход к управлению, охватывающий различные стороны деятельности предприятия и обеспечивающий эффект сотрудничества всех компонентов;

3) процессный подход рассматривает всю деятельность организации как совокупность взаимосвязанных процессов;

4) политика согласованности означает, что система должна развиваться в определенном направлении для объединения всей системы;

5) целенаправленность – работники всех отделов сами независимо контролируют весь процесс и при необходимости вносят изменения;

6) опережающий принцип - вся работа управления должна быть направлена на предупредительные меры возможности аварийных ситуаций;

7) принцип бережливости – без потерь рационально использовать все виды ресурсов;

8) приоритетность руководителя - необходимо выбрать сильного руководителя, ответственного за объединенную систему менеджмента;

9) квалификация - необходимая подготовка работников в области экологической безопасности.

На предприятиях имеются отделы: по охране труда и окружающей среды. Для обеспечения экологической безопасности эти отделы проводят меры по снижению опасности производства. К сожалению, эти отделы решают проблемы не согласованно и соответственно не могут дать точную оценку уровню экологической безопасности.

На предприятиях эти отделы могут иметь следующие структуры, которые занимаются экологической безопасностью:

1) нет службы, которая бы занималась вопросами охраны ОС;

2) вопросами охраны окружающей среды занимаются в подразделении другого отдела предприятия;

3) охраной окружающей среды занимается самостоятельный отдел, руководство которого не имеет решающего голоса на предприятии;

4) охраной окружающей среды занимается самостоятельный отдел, руководство которого имеет решающей голос на предприятии.

Для малых предприятий, где объемы воздействия на окружающую среду минимальны, действует структура первого типа. Проблемы экологической безопасности решается в основном слабо, скорее, для отчета.

При работе подразделения второго типа за решение проблем по охране окружающей среды отвечает назначенный один или несколько сотрудников, число которых зависит от степени воздействия опасности производства. Для подобных структур характерны следующие недостатки: низкая эффективность, высокая загруженность работников.

В третьем типе отсутствуют резервы руководства, без которых сложно следить за степенью воздействия предприятия на окружающую среду. Но этот тип структуры обладает преимуществом возможности совмещать производственные и природоохранные цели и задачи.

Четвертый тип – самостоятельный отдел является наиболее эффективным для решения природоохранных задач. Увеличение затрат на содержание отдела оправдывается, так как более комплексно и полноценно осуществляется контроль за воздействием на окружающую среду.

Улучшить работу предприятий по охране качества окружающей среды можно внедрением и функционированием двух стандартов ISO 14001 и OHSAS 18001.

Для этого необходимо:

1) организация центра по обеспечению экологической безопасности;

2) подбор приемлемой формы объединения (БСУЭб) в общую систему руководства предприятием.

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Ecological Technologies – Alternative of Future

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Abstract: In the article the data, by perspective directions of "green economy" development and ecological policy of Azerbaijan Republic in energetic, realization of national strategy by use of alternative and renewable sources of energy, wind- and hydropower, geothermal energy and production of energy from biomass are presented. The experience conducting of lessons with students by use of method of brain assault, devoted to problem of ecological technologies and monitoring of creative searches by given object are considered. The recommended themes for creative endeavors are presented.

***Keywords*:** ecological policy, ecological technology, wind generators, solar energy.

На сегодняшний день есть две глобальные проблемы, которые предстоит решить человечеству в 21 веке, и обе они связаны с экологией:

- Первая проблема – это переход на новые ресурсы, от невозобновляемых к возобновляемым. Ведь полезные ископаемые заканчиваются, их добыча из нефти, которую извлекают из земли и недр всего-то полтораста лет уже не долговечный процесс. Нужны срочные источники по поиску новых энергий. И на все эти усилия по подсчётам экспертов человечеству отпущено не более 15 лет.
- Вторая не менее сложная проблема – это переработка отходов. Если к 2050-му году ситуация с отходами будет сохраняться как в нынешнем виде – на Земле наступит мусорный калапс. Однако, известно что ни один вид живых существ на Земле не может жить в среде, состоящей из собственных отходов.

Поэтому важнейшим направлением человеческой деятельности является на настоящий момент развитие экологических технологий.

В настоящий момент для того чтобы навести порядок в своем «земном хозяйстве» человечеством уже предприняты следующие шаги:

• Для снижения энергопотребления инженерами изобретена система «активный дом». Качественные теплоизоляции и передовые строительные технологии «активного дома» обеспечивают минимальное энергопотребление – в 5 раз ниже нормы.

• «Ветряки» являются одной из надежд на получение энергии из возобновляемых источников. Большое распространение получили ветряные генераторы. Но сейчас уже планируется строительство электростанций, работающих на пьезоэлектрическом эффекте.

• Солнечная энергетика также перспективное направление. Уже через 40 лет при соответствующем уровне претворения уровня технологий солнечная энергетика будет вырабатывать около 25% всего необходимого электричества и это обеспечит сокращение выбросов углекислого газа на 6 млрд. тонн ежегодно.

• Биотопливо – наш будущий бензин. Он будет изготавливаться из биологического сырья, получаемого как правило в результате переработки биологических отходов. С 1 апреля 2011 года более чем на 300 шведских заправочных станциях можно приобрести новое дизельное топливо. Швеция стала первой страной в мире, где можно заправлять машины экодизелем, сделанным на основе масла шведских сосен. 8 марта 2013 года был выполнен первый коммерческий трансатлантический авиарейс на биотопливе.

Понятно, что стремлением сохранить планету идти надо к эко-городам, к поселениям с проектированным с учетом влиянием на окружающую среду и населённым людьми, стремящимся минимизировать потребление энергии, исключить неразумное потребление тепла, загрязнение воздуха и воды.

Решение проблемы экологической безопасности страны внедрением экологических технологий стало приоритетной задачей Азербайджанской Республики. За последние годы в нашей стране многочисленные исследованиями учёных изучено состояние существующего потенциала в области развития альтернативной и возобновляемой энергии [1]. Было выявлено, что в Республике имеется большой запас ветряного, солнечного и гидроэнергетического потенциала, а также биогазовых и термальных видов энергии. При сопоставлении показателей инфраструктуры альтернативной и возобновляемой энергетики Азербайджан можно сопоставить с Данией и Германией (таблица 1).

Если в России число солнечных составляет 500-2000 часов год, то в Азербайджане - 2000-2800. Это говорит о достаточно высокой солнечной интенсивности в стране по сравнению с другими странами, что может стать фактором привлечения инвестиций с целью использования солнечной энергии. Приблизительные расчеты показывают, что объем потребления энергии в Азербайджанской Республике можно уменьшить на 20-25%.

Таблица 1

Запасы и потенциал нетрадиционных источников энергии в Азербайджанской Республике [2]

Наименование энергетических ресурсов	Количество	Реализуе-мый потециал, МВт
Ветер, млрд.кВт.ч	> 2,5 ÷ 4 в год	>800
Малые гидроэлектростанции, млрд.кВт.ч	2,5 ÷ 3 в год	>400
Солнечная энергия, т.у.т	в эквиваленте более 100 тыс. тонн нефти	>5000
Термальные воды, т.у.т	в большом количестве	>800
Биомасса, т.у.т	в большом количестве	>1500

Многие регионы Азербайджана располагают большими возможностями для применения ветровых установок. Согласно расчетам, годовой потенциал ветровой энергии страны составляет 800 мВт. Средняя скорость длительных ветров составляет более 6 м в секунду, что является располагающим фактором для использования ветряной энергии.

Гидроэнергия является основным возобновляемым источником, обеспечивающим поставки энергии в Азербайджане. В 2010 году гидроэнергия составила 18% от объема производства электроэнергии. Всего Азербайджан располагает действующими гидроэнергетическими мощностями в 1000 МВт, на стадии строительства - 62 МВт гидроэнергетических мощностей.

В стране есть следующие источники биомассы: горючие промышленные отходы; лесное хозяйство и отходы от деревообработки; сельхозпродукция и органические отходы; бытовые и коммунальные отходы, а также отходы из регионов, загрязненных нефтью и нефтепродуктами. Все эти ресурсы могут быть использованы для производства энергии.

Национальная стратегия по использованию альтернативных и возобновляемых источников энергии в Азербайджанской республике на 2012-2020 годы поставила цель: к 2020 году довести долю альтернативных и возобновляемых источников энергии в общем производстве энергии до 20 процентов. В ближайшем будущем намечено сдать в эксплуатацию солнечные электростанции в Сумгайыте, Самухе, Сангачале и Пираллахи.

Решение всех вопросов обеспечения экологически безопасной жизнедеятельности зависит от перспективных направлений развития «зеленой экономики» и экологической политики страны. Так, в Азербайджане была проведена VII Международную выставку охраны окружающей среды «Caspian Ecology 2016». Данная выставка - самое крупное мероприятие в области экологии и защиты окружающей среды, проводимое в прикаспийском и кавказском регионах с участием 62 компаний из 14 стран мира. Основным направлением ежегодного проведения подобного рода мероприятий является переход на наилучшие доступные технологии (НДТ), система внедрения которой позволит перейти к системе предотвращения негативного воздействия на окружающую среду.

Прогрессивные научные разработки, инновационные технологии, объединяющие удовольствие, качество и комфорт - это результат как научного мышления, так и результат творческих начинаний студентов при создании экологично технических инноваций.

В данной статье представлен опыт проведения занятия со студентами в Азербайджанском Государственном Университете Нефти и Промышленности, с использованием метода «мозговой шторм» по дисциплине «Общая экология». Данный метод был использован в теме «Экологические проблемы Азербайджанской республики» на групповом занятии, посвященном проблеме экологических технологий.

Было дано задание – представив себя в музее высоких технологий или в магазине электроники, наугад выбрать 20 любых объектов. Записать по своему выбору предложенные объекты, свойства или характеристики объектов в две колонки. Мысленно сочетая объекты или их свойства с обеих колонок, по методу случайных комбинаций, можно подобрать комбинацию, которая могла бы быть инновацией в этом направлении.

Ниже приведен пример с недавнего семинара. Студенты были разделены на две группы. С каждой группы к доске вышли два студента. Один записал в

колонку А первые десять объектов, которые пришли ему в голову, а другой записал десять объектов в колонку В. Каждый из студентов высказывает своё видение варианта, а затем этот вариант выносится на обсуждение аудитории. Одна идея рождает другие. Идеи одного члена группы подстегивают воображение других, что увеличивает количество возможных ассоциаций.

Интересными оказались следующие наблюдения:

- даже если на доске предложены варианты объектов, на первый взгляд нескрещиваемых или иными словами, свойства которых не пересекаются, креативность студентов образует синтез понятий, весьма достойных к рассмотрению;
- активная дискуссия вызывала интерес у всей группы студентов;
- в дискуссии активно участвовали даже те студенты, которые отстают по предмету.

Ниже для закрепления данной темы и творческих начинаний студентов приведены темы для обсуждения на практических занятиях с последующим их оформлением в виде презентаций:

- Предложите новизну, предполагающую экономии воды и электричества в квартире.
- Предложите образец самоутилизирующейся обуви. К примеру, в Великобритании придумали такой мобильный телефон, корпус которого способен разлагаться с выделением органики. Это даёт возможность, закапав непригодный к использованию телефон в почву, вырастить из него растение.
- Предложите набросок плаката, стимулирующего экономию энергии.
- Предложите задумку акции, которая вызовет интерес у населения к экологическим проблемам.
- Порекомендуйте такой товар для потребителей, который может быть изготовлен или из отходов или из возобновляемых ресурсов, а после использования самоутилизироваться, т.е. товар, который будет соответствовать экологическим требованиям.
- Задумайте такие технологии, которые можно было бы внедрить в «экологичном доме».
- Опишите производство, которое на ваш взгляд с точки зрения экологии будет считаться экологичным.

Подобного рода упражнения помогают освободить воображение для генерации оригинальных идей. Совместная работа студентов в группе способна генерировать гениальные идеи. Внедрение их в жизнь способствует созданию экологических технологий, без которых дальнейшее существование человечества невозможно.

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Perspectives of Inculcation of a New Sorbent

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Abstract: In article the methodic receive of the new compositional sorbent is given and its properties are presented. The perspective use of received sorbent for improvement of refinery technology is described.

***Keywords*:** composite sorbent, improved properties, eco-friendly technology, the flotation machine, oil and oil products.

Требования к качеству воды для потребления населения вызывает необходимость поиска экологичных технологий водоподготовки и современных методов очищения сточных вод.

Сооружения по очистки воды, используемые на нефтеперерабатывающих заводах, требуют усовершенствования, трудны при эксплуатации и производят большой выброс вредных веществ в окружающую среду. Такого рода проблемы по очистке загрязненных сточных вод предусмотрены к рассмотрению со стороны предприятий по переработки и транспортировки нефти и нефтепродуктов. Нефть и нефтепродукты являются существенными и масштабными загрязнителями окружающей среды. Нефтепродукты, попадая в водоем, создают плавающую по поверхности воды пленку, а также смесь смоляных частиц в эмульгированой и растворенной формах. Установлено, что всего одна капля нефти растекается на поверхности в пленку площадью около 25 м^2, а одна тонна нефти покрывает более 500 га поверхности водоема, что препятствует газообмену, в том числе поглощению водой кислорода [1]. Для лучшей очистки сточных вод, загрязнённых нефтепродуктами, применяются установки каскадного типа, оснащённые дорогим очистным оборудованием. Поэтому очень важно на сегодняшний день научиться очищать сточные воды не принося вред окружающей среде, а именно: до минимума уменьшить площадь, занимаемую очистными аппаратами, и соответственно, уменьшить площадь испарения, применение минеральных коагулянтов на стадии флотации, применять сорбенты, выделенные из промышленных отходов.

Основная цель работы – улучшение методов очистки сточных вод содержащих нефть и нефтепродукты с помощью недорогих и дающих хороший эффект по очистке реагентов.

Как видно из анализа литературных данных [2], основным реагентом при ликвидации нефтяных загрязнений является активированный уголь. В последнее время эффективным для ликвидации нефтяных пятен с водной поверхности считается применение синтетических сорбентов, получаемых при утилизации полимерных отходов: полиуретан в губчатом или гранулированным виде, резиновая крошка, полые полимерные микросферы, а также композиции, состоящие из нескольких сорбентов.

Инновацией в технологии глубокой очистки сточных вод является применение углерод-минеральных сорбентов, представляющих собой композиции из нескольких компонентов (например, минеральный матрицы и органического компонента, нанесенного на эту матрицу) и объединяющие в себе ряд уникальных свойств, необходимых для очистки воды. Но учитывая высокую стоимость этих сорбентов, приходится искать пути решения этой проблемы в разработке более дешёвых, доступных и результативных композициях сорбентов.

Для изучения степени очистки сточных вод готовились контрольные растворы. Образцы для испытания получали разбавляя нефтепродукт в дистиллированной воде. Для изучения были применены сточные воды с систем очистки (песколовок, нефтеловушек, сепараторов). Анализ сточных вод, проводимый в течение месяца, выявил следующие показатели: колебания концентраций нефтепродуктов – 130-650 мг/л, воды имеют нейтральную среду pH = 6,0 – 7,2), низкое содержание солей (сульфатов – менее 120 мг/л, хлоридов – 45-70 мг/л) и при эффективной очистки от загрязняющих веществ они пригодны для повторного использования.

Применяемый мономер И – 160 используется для выявления показателя pH исследуемых сточных вод. Количество вредных веществ в испытательных образцах определяли гравиметрией и спектофотометрией. Процесс изучался в лабораторных условиях с использованием установки флотации и фильтрования. Органическую часть отхода отделяли экстракционным методом. После сушки бензольного раствора получили материал, фракционный состав которого изучали просеиванием через лабораторные сита.

Органическую часть отхода переработки нефти для изучения отделяли методом экстракции бензола и дальнейшей сушки бензольного раствора. Фракционный состав этого материала исследовали просеиванием через многоступенчатые механические лабораторные сита. Нефтеемкость композиционного сорбента исследовали методом погружения сита в нефтепродукт.

Нефтяной отход был получен виде порошка темно-серого цвета. Состав минеральной части отхода нефтепереработки. В таблице 1 представлен состав минеральной части отхода нефтепереработки.

Таблица 1

Состав минеральной части отхода нефтепереработки

Массовое содержание оксидов в минеральной части отхода, %								
SiO_2	Al_2O_3	ZnO	Fe_2O_3	MgO	CaO	Na_2O	K_2O	Прочее
71,82	15,64	0,72	2,12	0,21	0,69	2,58	3,35	2,87

Как видно из таблицы 2 отход нефтепереработки очень легкий, имеет большое количество пор, не тонет в воде, а также обладает свойством поглощения нефтепродуктов.

Таблица 2

Физико-механические свойства отхода нефтепереработки до и после тепловой обработки

Наименование показателя	Отход нефтепереработки			
	(без сушки)	после сушки при 30-50 ^{0}C в течение 600 мин	после тепловой обработки при 120-150 ^{0}C в течение 160-200 мин	после тепловой обработки при 500-600 ^{0}C в течение 200 мин
Насыпная плотность, кг/м^3	430-440	410	330	80-140
Размер частиц, мм	0-0,6	0-0,6	0-0,6	0-0,6
Массовая доля влаги, %, не более	1,0	1,0	1,0	1,0
Пористость, %	40-54	52-56	54-62	88-93
Нефтеемкость, кг/кг	0,7	1,4	1,7	6,3

Согласно представленным данным при обработке отхода нефтепереработки 500-600^{0}С положительными сторонами является то, что насыпная плотность уменьшается от 440кг/м^3 до 80 кг/м^3 и повышение его нефтеемкости, а отрицательная сторона – стоимость получаемого образца повышается.

Для того чтобы улучшить сорбционные свойства и гидрофобность полученного нефтяного отхода был использован полистирол. Модификацию проводили следующим образом: при комнатной температуре и непрерывном перемешивании в течение 4-5 минут пенополистирол растворили в смеси ацетона с метилтретбутиловым эфиром. В полученный раствор добавили отход нефтепереработки (из расчёта 2 кг отхода на 1 литр раствора) и при перемешивании раствора температуру довели до 100^{0}С. При этой температуре отгоняли растворитель – ацетон, что способствовало повышению гидрофобности отхода.

В результате проведённых работ получили композиционный сорбент с улучшенными свойствами (таблица 3).

Таблица 3

Свойства композиционного сорбента

Наименование показателя	Размер частиц, мм		
	0,02-0,1	0,1-0,4	1,0-4,0
Насыпная плотность, кг/м3	230-400	410-470	490-550
Массовая доля влаги, %, не более	1,0	1,0	1,0
Пористость, %	70	68	65
Нефтеемкость, кг/кг	3,5-6,5	2,0	1,5

Были проведены испытания композиционного сорбента по определению возможности его использования на флотационной и фильтровальной установках на стандартных растворах, в качестве нефтепродуктов использовалось отработанное моторное масло. Был определен оптимальный расход композиционного сорбента во флотатор, который составил 120-160 мг/л.

Применение полученного композиционного сорбента рекомендуется для использования в напорном флотаторе с целью сбора нефтепродуктов. Это позволило бы отказаться от использования коагулянта сульфата алюминия и прудов дополнительного отстоя перед флотатором, привело бы к повышению эф-

фективности работы систем оборотного водоснабжения, снизило бы объем потребляемой свежей воды и объемы сточных вод, направляемых на биологическую очистку.

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Sorption of Heavy Metals by Multicomponent Foam Polymer Sorbents

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Abstract: Research results of the capacity of foam polymer sorbents on the basis of multicomponent polymer mixtures for heavy metals, experimental data on the establishment of the effect of the ratio of polymer components, temperature, and pH of the medium on the regularity of the change in the sorption capacity have been presented. The real possibility of the chemical modification of the foam polymer sorbents has been shown with the aim of achieving high results in increasing the sorption capacity for a number of heavy metals.

Keywords: foam polymer sorbent, bulk weight, sorption capacity, macro structure

With the development and expansion of different industries occurs constant and growing environmental pollution by hydrocarbons and heavy metals [1-3]. At the same time, not only the so p il and water bodies are polluted, but also the air environment, which, as is known, adversely affects the environment and human health. At this stage, we are going through a rather difficult period in our activity, and therefore it becomes

necessary to carry out a set of measures aimed at eliminating or neutralizing foci that are dangerous to the health of people and their descendants. At present, water quality in natural sources has deteriorated significantly. A special group presents a number of heavy metals, many of which are toxic.

A weighty argument in favor of purifying the natural water environment is the degree of influence of metals on human health. There are metals that even with a slight ingress into the human body cause irreparable harm to his health with a possible fatal outcome. At the same time, there are metals that an integral part of the body, performing a useful and necessary mission under certain micro doses to strengthen human immunity. If in the human body, the content of copper, cobalt or chromium ions does not exceed the required dose, then they can be considered as trace elements. At their considerable excess in the body, the term "heavy metals" comes into full force. Therefore, it will be possible to agree with the opinion that there are no harmful substances, but there are dangerous concentrations for human health.

In recent years, the interest of scientists in the development of sorbents for the selective sorption of those or ions of metals from the aqueous medium has significantly increased [4-6]. A relatively new sorbent for the sorption of heavy metals is the foam polymer materials. This is explained, first of all, by the relatively large sorption capacity of foam polymers for hydrocarbons and heavy metals, their buoyancy and the ability to repeatedly regenerate. Unexplored in terms of use for cleaning reservoirs from heavy metals are foam polymer sorbents, especially derived from multi-component polymer blends.

In this regard, the purpose of this paper is to conduct studies aimed at studying the sorption characteristics of multicomponent foam polymer sorbents for various types of heavy metals.

MATERIALS AND METHODS OF RESEARCH

As the object of the study has been used foam polymers, which developed and obtained by us on the basis of polymer mixtures. The initial components of the polymer mixture were polyurethane (PU), polyamide (PA) and acrylonitrile-butadiene-styrene copolymer (ABS). Foam polymer sorbents have been obtained during the mixing of polymer components in the melt regime, into composition which the dicumyl peroxide and porophore were simultaneously added. The mixing process has been carried out in the material cylinder of the extrusion machine [7].

The sorption properties of the foam polymer sorbents have been studied in aqueous solution of metal salts. By spectrophotometry method periodically have been measured the change in the concentration of heavy metals, according to which the kinetic regularities of their sorption have been determined.

Chemical modification of the foam polymer sorbents has been carried out as follows: to remove air bubbles from the sorbent cells, the crumb or granules have been pre-extruded with a glass rod. The granules were mixed with a vibro-mixer in a vessel containing sodium nitrite (at the rate of 2.4 g/l) in 30 ml of 2 M aqueous solution of hydrochloric acid.

RESULTS AND DISCUSSION

Depending on the chemical nature and the ratio of the initial components in the macromolecules of PU, PA and ABS-copolymer, the following functional groups are present: urethane, etheric -O-, ester -C(O) -O-, amide -C(O)-NH-, urea NH_2-C(O)-NH_2, and also aliphatic -CH_2- and CN-groups.

Foam polymer sorbent on the basis of PU, PA and ABS consists of pores and cells with a membrane structure, which allows using it for effective sorption of polar and nonpolar compounds. The presence of the pore system and cells allows diffusion of sorbate in its more deep-seated areas. Unlike polymer plates in our foam polymer sorbents sorption occurs throughout the volume of the sorbent. In this case, the extraction of compounds occurs not only due to adsorption (surface absorption), but also as a result of absorption (absorption by the entire volume of the polymer). Essentially, the foam polymer sorbents sorb the molecules by dissolving them on the surface of their membranes. A large variety of adsorption centers on the surface and in the volume of polymer PU (PPU) causes a whole complex of sorbent-sorbate interactions, among which Van-der-Waals, dispersion, electrostatic and hydrogen bonds are the main ones. The role of each of these types of bonds largely depends on the structure of the polymer link and the chemical nature of the molecules being sorbed.

In order to show how effective the foam polymer sorbents are for sorption of heavy metals, let us turn to the results of the study given in Table 1.

Comparative analysis of the data unequivocally proves the extent to which foam polymer sorbents have wide possibilities. Table 1 gives data on sorbates based on ions of heavy metals such as Cu^{2+}, Co^{2+} and Ni^{2+}. Analyzing the data, it can be found

that the foam polymer sorbents on the basis of PA + PU + ABS have comparatively high sorption characteristics. As can be seen from this table, the use of foam polymer sorbent modified with sodium nitrite ($NaNO_2$) contributes to a significant increase (in 2-2.5 times) in sorption capacity for heavy metals. To obtain more detailed information on the sorption capabilities of polypropylene sorbents based on multicomponent polymer mixtures, we turn to a phased analysis of the results of the study.

Table 1

Physicochemical and analytical characteristics of the foam polymerc sorbents and sorption of Cu^{2+}, Cd^{2+}, Ni^{2+} at the temperature of 298 K. The bulk weight of the sorbent is 200-300 kg/m^3. Time 20 min.

№	Sorbent composition	Sorbate, Me^{2+}	pH	Sorption capacity for Me^{2+}, mg/g
1	PA+50%PU	Cu^{2+} Cd^{2+} Ni^{2+}	3.5-4.5 4.0-4.5 4.0-5.0	4.2 4.5 4.8
2	(PA+50%PU)+10%ABC	Cu^{2+} Cd^{2+} Ni^{2+}	3.5-4.5 3.5-4.5 4.5-5.0	5.3 4.9 5.5
3	Modified (PA+50%PU)+10%ABC	Cu^{2+} Cd^{2+} Ni^{2+}	3.0-4.5 3.5-4.0 3.5-4.5	12.6 13.3 11.2

Figure 1 shows the sorption curves, carried out at different temperatures, of copper ions on polyurethane sorbents based on a mixture (PU + PA), which differ in the ratio of the components of the mixture. From a comparative analysis of the data, it can be established that the highest values of sorption of copper ions are observed in the range of the ratios PU: PA = 60:40 - 40:60. Moreover, with increase in the temperature of the aqueous medium from 298 to 318 K, the sorption capacity of the copper ion increases.

Fig. 1. Effect of PA concentration in the composition of the foam polymer sorbent on the basis of PU + PA and the temperature of the aqueous medium on the sorption capacity for Cu^{2+} ions: 1- 298K; 2- 308K; 3 318K.

Taking into account the fact that the composition of the sorbent mixture has significant effect on the sorption capacity, it seemed interesting to study the effect of the ABS-copolymer on the regularity of the change in the value of this index. Analyzing the data presented in fig. 2, one can note that with the introduction of ABS-copolymer into the PU + PA mixture, there is a general tendency towards an increase in the sorption capacity of the foam polymer sorbents obtained on their basis. At the same time, the growth of the sorption capacity for copper ions proceeds throughout the entire range of PU + PA ratios.

Fig. 2. Effect of PA concentration in the composition of the foam polymer sorbent on the basis of (PU + PA) + 10% wt. ABS and the temperature of the aqueous medium on the sorption capacity for Cu^{2+} ions: 1- 318K; 2- 308K; 3- 298K.

Figure 3 shows the kinetic regularity of sorption of copper ions for foam polymer sorbents based on individual polymers of PPU and PPA, as well as their mixtures. As can be seen from fig. 3, the sorbents based on PPA, and then polyurethane foam, possess the lowest sorption capacity. At the same time, the foam polymer sorbents based on mixture of polymers are characterized by higher values of the sorption capacity for copper ions. The obtained experimental results of the study make it possible to consider that the additional introduction of ABS copolymer in the composition of the polymer mixture PA + PU makes it possible to some extent to increase the sorption capacity. Apparently, this is due to the fact that in addition to the available active functional groups [ether -O-, ester -C(O)-O-, amide -C(O)-NH-, urea NH_2-C(O)-NH_2], CN- groups are added that can further activate all available polar groups to sorption of heavy metals.

Fig.3. Kinetic regularity of sorption of Cu^{2+} by foam polymer sorbents with bulk weight of 50-70 kg/m^3: 1-PA; 2- PU; 3- PA + 50% wt of PU; 4- (PA + 50% wt PU) + 10% wt of ABS.

The presence of end amine group in the composition of PA and PU opens up a promising possibility of modifying their molecular structure. As a result, it is possible to significantly increase the sorption capacity of the foam polymer sorbents. As a result of modification of the terminal amine groups in the composition of PPU and PPA, it is possible to obtain a polymer cation of diazonium according to the known scheme:

$$R\text{-}NH_2 \xrightarrow[2M\ HCl]{NaNO_2} R\text{-}\ N^{+}{\equiv}NCl^{-}$$

As can be seen from the presented chemical reaction, a cation of diazonium is formed in the hydrochloric acid aqueous solution of sodium nitrite, which, as is well known, is characterized by high activity with respect to heavy metal ions. Evidence of this was the results of IR spectral analysis of diazotized PPU and PPA, according to which absorption bands in the region of 2106-2110 cm^{-1} appeared on the spectra of these modified polymers. Their appearance is usually interpreted by the vibrations of the N≡N bond, which indicates the formation of the diazonium salt in the polymer phase. Simultaneously, a redistribution of the intensity in a wide band of NH_2-valent vibrations was observed in the 3260-3410 cm^{-1} region, which indicates the diazotization reaction involving NH_2 groups.

The obtained results of the study are in good agreement with the previously developed ideas on the possibility of chemical modification of the polyurethane foam. In fact, we have the opportunity to obtain new materials - chemically modified polyurethane foam. Assuming that the diazonium salts can have a sufficiently high activity with respect to the salts of heavy metals, it seemed interesting to study the sorption properties of modified polymeric foam sorbents obtained on the basis of a mixture of PA + PU + ABS. For example, copper salts in an aqueous medium with concentration of 300 mg/l in the initial mixture have been used as the sorbate. Figure 4 shows the results of a study of the effect of temperature of the aqueous medium on the sorption capacity of a chemically modified expanded polymer sorbent obtained on the basis of a mixture of PU + PA + ABS.

Fig. 4. Influence of temperature and concentration of PA in the composition of chemically modified penopolymer sorbent (PA + 50% wt of PU) + 10% wt of ABS on the sorption capacity for copper ions: 1- 298K; 2- 308K; 3 318K. The bulk weight of the sorbent is 50-70 kg/m^3

Comparing the results of the study in figs. 1 and 4, it can be established that the process of sorption of copper ions on the modified sorbent in the entire range of the PU: PA ratios proceed more efficiently. In this case, the sorption process on sorbents is most effective in the range of the ratio PU: PA = 70:30 - 40:60. With increase in the temperature of the aqueous medium from 298 to 318 K, increase in the rate of sorption and sorption capacity is observed. All these circumstances indicate that chemisorption occurs on the surface of the membranes of the foamed polymeric sorbent. Effective mixing of the sorbent in the solution allows to maintain a constant concentration of the sorbed dissolved copper ion near the sorbent-sorbate interface and thus to exclude the influence of the diffusion process from the volume of the solution to sorption.

In those cases when the foam sorbent is used as a sorbent, the important point is to study the influence of their bulk weight on sorption processes. So, for example, we used as the object of research penopolymer sorbents on the basis of a mixture of PU + PA + ABS with different bulk density and, respectively, cell diameter (fig. 5).

In this case, we used 3 types of sorbent with bulk density of 50-70, 200-300 and 500-600 kg/m^3, respectively, with cell diameter equal to 0.9-1.1, 0.1-0.2 and 0.01-0.02 mm. In addition, a modified sorbent with bulk density of 200-300 kg/m^3 has been used. Comparing the curves in this fig. 5, one can pay attention to the fact that, with other equal conditions, sorbents with bulk weight of 200-300 kg/m^3 (curve 1) possess comparatively better sorption properties. Worst sorption properties have sorbents with bulk density of 500-600 kg/m^3 (curve 3). It is possible that in this case, it would be appropriate to mention the peculiar "capillary" effect that occurs in porous or close-cell macrostructures of sorbents. According to this theory, as the diameter of the cells decreases or the foam is compacted, the size of the cells decreases to such an extent that it favors the development of a dispersion interaction between the sorbate and the functional groups of the sorbent. As a result, the sorption capacity and the degree of extraction by metal ions increase. But with the further consolidation of the foam polymer sorbent within 500-600 kg/m^3 and higher, the diameter of the cells sharply decreases to 0.01-0.02 mm, which immediately affects on the one hand, on diffusion

difficulties in the delivery of metal ions to deeper sections of the sorbent, and with Another, the difficulty of removing air from the fine-mesh structures of sorbents. As a result, the sorption of metal ions in fine-grained macrostructures with a bulk density of 500 kg/m^3 and above becomes inefficient, since it proceeds mainly on the surface areas.

As for sorbents with a bulk density of 50-70 kg/m^3, in this case, in connection with the increase in the cell volume, we are already confronted with the opposite effect: the possible weakening of the dispersion forces of interaction between sorbent functional groups and metal ions. As can be seen from fig. 5 (curve 2), this circumstance to a certain extent leads to a decrease in the degree of recovery of the sorbate.

If the sorbent is subjected to chemical modification with a bulk density of 200-300 kg/m^3, it can be seen that the sorption capacity of these samples rises sharply from 12.0 to 16.0 mg/g (fig. 5, curve 4). The obtained results of the study once again confirm the high efficiency of the diazonium salt during the sorption of copper ions.

Fig. 5. Kinetic regularities of Cu^{2+} sorption by chemically modified foam polymer sorbents on the basis of (PA + 50% wt PU) + 10% wt of ABS with different bulk weight: 1- 200-300 kg/m^3; 2- 50-70 kg/m^3; 3- 500-600 kg/m^3; 4- chemically modified sorbent with a bulk weight of 200-300 kg/m^3. The temperature of the aqueous medium is 318K.

In order to obtain a more complete picture of the processes that occur at the sorbent-sorbate interface, it seemed interesting to study the effect of pH of the medium and the bulk density of the foam polymer sorbent on the sorption efficiency. Figure 6 shows the results of a study of the degree of extraction of copper ions by multicomponent and chemically modified penopolymer sorbents on the basis of a mixture of PU + PA + ABS. From the analysis of the curves in this figure, it can be established that comparatively better sorption occurs in media where the pH of the medium has values in the range of 3-5.

Fig. 6. Influence of the pH of the medium on the degree of extraction of Cu^{2+} from the aqueous medium by the foam polymer sorbents on the basis of modified (PA + 50% wt PU) + 10% wt of ABS. The volume weight of the sorbent is 200-300 kg/m^3.

CONCLUSION

Based on the studies conducted, it can be argued that polymer blends based on PA + PU + ABS are promising polymer composites for the preparation on their basis of hydrophilic foam polymer sorbents intended for selective sorption of heavy metals from an aqueous medium. The more different types of functional groups in the composition of the foam polymer sorbent, the more active centers for the effective course of sorption of heavy metals. It becomes obvious that the use of foam polymer sorbents on the basis of individual polymers can not ensure their high sorption capacity.

Along with this, carrying out of chemical modification of foam polymer materials with sodium nitrite on the basis of terminal amine groups present in the composition of PU and PA allows to get even more active centers - diazonium cations, which results in the maximum effect on improving sorption capacity of foam polymer sorbents.

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Humanities & Social Sciences

How Teachers Perceive Their Classroom Environments and Student Goal Orientation: A Look into High School Biology Classrooms in Kenya

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ABSTRACT

Aims: To examine teachers' and observers' perceptions of classroom climate and goal orientation in high school biology classrooms in Kenya.

Study Design: A mixed design utilizing quantitative and qualitative approach.

Place and Duration of Study: A boys' and girls' boarding high schools in Kenya, observed between May and July of 2010.

Methodology: Participants included 12 biology teachers from two same sex boarding high schools (5 females, 7 males).

Results: Tests of means and t-tests showed that male teachers perceived themselves to be supportive, $t(10) = 3.76$, $p = .01$, $d = 2.201$ and innovative, $t(10) = 2.93$, $p = .05$, $d = 1.882$. Male teachers also reported greater school and classroom performance goals. Observers reported significant differences in the classroom climate and goal orientation, where they saw the girls' classrooms to be more innovative, $t(10) = 5.10$, $p = .01$, $d = 2.125$, high in order and organization, $t(10) = 3.10$, $p = .01$, $d = 2.200$ and affiliation. They also found teachers in the boys' school to be more supportive, $t(10) = 2.41$, $p = .02$, $d = 1.809$.

Conclusion: Male teachers perceive themselves to be more supportive and innovative. Observers see girls' classrooms to be more innovative and well organized.

Keywords: biology classrooms; classroom climate; goal orientation.

1. INTRODUCTION

Teachers do not choose their classrooms. However, they do have control over the kind of classroom climate they construct with their students and the kinds of instructional practices they utilize. The classroom environment shapes teachers' relationships with their students, and students' relationships with each other and with classroom concepts. Teachers often speak of a classroom's atmosphere, tone, ethos or ambience and its importance for student learning [1, 2, 3, 4]. Typically, teachers concentrate almost exclusively on the assessment of academic achievement, and devote little attention to factors which might be related to their students' patterns of adaptive learning and performance. There is research evidence indicating classroom climate to be a factor in the types of goals students establish [5, 3, 6].

1.1 Classroom Climate

Although classroom environment is a somewhat subtle concept, remarkable progress has been made over the last three decades in conceptualizing, assessing and researching it [7, 8, 9]. This research has attempted to answer many questions of interest to educators, such as does a classroom's environment affect goal orientation? Can teachers conveniently assess the climates of their own classrooms? Questions such as these represent the thrust of the work on classroom environments over the past three decades.

Teachers play a vital role in the conceptualization of the classroom climate. They create both the social and physical environments for learning. The very nature of classes, teaching, and students makes a positive classroom climate a critical ingredient of student success [10]. Teachers who are successful in establishing effective classroom climates create more time for learning, involve more students, and help students to become self-managing [11, 12]. A positive learning environment must be established and maintained throughout the year. One of the best ways teachers accomplish this goal is by having a good classroom management plan which includes ways to prevent problems from occurring, having clear rules and procedures, a physical environment that is well organized, ways in which to communicate effectively with students, and how students can interact with each other [10]. According to Doyle [10] classrooms are particular kinds of environments. They have distinctive features that influence their inhabitants no matter how the students or the desks are organized or what the teacher believes about education. Furthermore, classrooms are

multidimensional, they are crowded with people, tasks, and time pressures, have people with differing goals, preferences and abilities, inhabitants must share resources, and actions can have multiple effects and influence student participation [10].

The social and physical environment of a classroom can support or interfere with student learning and well-being. Therefore, teachers carefully plan and create appropriate and effective classroom climates. There is empirical evidence that shows teachers' perceptions of classroom climate differ based on subject matter [1,7,13]. Teachers' perceptions of science classrooms have produced mixed results in terms of classroom climate, with some studies finding teachers' perceptions of science classrooms to be high in competition and low in affiliation [14,8], whereas other studies show teachers' perceptions of science classrooms to be low in cooperation and cohesion [15,2]. However, recent research has revealed a wide variety of science classroom climates, with this diversity based on the teacher's teaching style [16, 4, 17].

1.2 Goal Orientation

Does a subject-specific climate influence the learning goals that teachers structure in their classrooms? Recent research on classroom climate has focused on the classroom instructional goals that teachers establish. Teachers' perceptions of the fit between their classroom environment and their goal orientation are important for the learning outcomes. A goal is an outcome or attainment an individual is striving to accomplish [18]. Goal orientation refers to a pattern of beliefs about goals related to achievement in school. Goal orientations include the reasons teachers pursue goals and the standards they use to evaluate progress toward those goals. There are four main goal orientations: mastery (learning), performance, work-avoidance, and social [19]. For the purposes of this research, only three goal orientations will be utilized. Mastery-approach goal orientation refers to the need to improve and focuses on learning, understanding, and developing competence in academic situations [20, 21, 22, 19]. Students with a mastery goal are concerned about the task itself instead of their self-presentation compared to others. Their evaluation for goal progress is intrapersonal in that their success is based on the improvement of competence and the mastery of the material. For these students setbacks or even failures are not threatening [22].

Performance-approach goal orientation refers to both the need for improvement and a fear of failure, and a focus on demonstrating and validating one's competence [23, 24]. Performance approach goal orientated individuals, are mainly concerned about their self-presentation compared to others. They use interpersonal standard to evaluate their performance in that their success is determined with other people as referents. Demonstrating competence, outperforming others and garnering favorable judgments are signs of success and meeting goals. For these students, their ability is constantly on the line. Setbacks and especially failures are threatening and suggest a lack of ability [25]. Performance approach goals may sound quite negative. Earlier research indicated performance goals generally were detrimental to learning, but current research suggests that a performance goal orientation may not be all negative. In fact some research indicates that both mastery and performance goals are associated with using active learning strategies and high self-efficacy [20, 26, 25]. Performance-avoidance goal orientation refers to a fear of failure and a focus on masking incompetence; in other words, performance-avoidance oriented students try to avoid being seen as incompetent [24, 27]. Students with performance avoidance goals are typically characterized as having a high fear of failure and low competence expectancies [24]. Thus, they are likely to orient themselves towards the possibility of failure and are highly sensitive to information suggesting anticipated failure [24,19].

1.3 Classroom Climate and Goal Orientation

Goal theory researchers have found a relationship between teachers' goal orientation and their classroom climate [28,29,17]. Furthermore, goal theory leads us to expect that instructional practices and the nature of educational tasks and assignments that teachers design can pull for either mastery or helpless motivational patterns that have profound influence on student achievement. In other words, the goal orientation of classrooms influences whether students will pursue learning goals (mastery orientation) or performance goals (ego orientation). Mastery goals, in the United States, are associated with achievement, better academic coping, and positive affect towards school while performance goals are associated with deterioration of performance, impaired academic coping, negative affect and disaffection from school [30, 31, 14, 5, 32, 33, 34, 35]. However, recent research indicates that performance goals may not be bad all the time. This research indicates that both performance and mastery goals are associated with high achievement and efficacy [20,25].

Dweck and Leggett [36] defined two major kinds of goal orientations: performance goals and learning goals. Individuals with a performance goal orientation seek to maximize favorable evaluations of their ability and minimize negative evaluations of ability. Questions like, “Will I look smart?” and “Can I beat others?” reflect performance goals. In contrast, with a learning goal orientation, individuals focus on mastering tasks and increasing competence at different tasks. Questions such as “How can I do this task?” and “What will I learn?” reflect learning goals. Nicholls and his colleagues [37] described two similar achievement goal orientations; they used the terms ego-involved goals and task-involved goals, e.g. [37]. Classroom environments that were high on task involvement and innovation had students with mastery goal orientations, whereas classroom environments that were high on competition had students with performance goal orientations [38]. Teachers who embrace mastery goals are more likely to maintain positive learning environments [39, 40, 17].

Researchers studying goal orientation have focused primarily on academic outcomes. Recently, however, scholars have become interested in ethno racial differences. In their study of eighth grade African American and White students, Freedman, Gutman and Midgley [41] found that African American students espoused personal mastery goals and extrinsic goals significantly more than did White students, suggesting cultural differences in student goal orientation. Similar studies have established an interaction between performance-approach goals and race in predicting the use of self-handicapping [42,43,21], and the role of academic self-efficacy in mediating the relations between performance-approach outcomes [17, 44]. These studies indicate the importance of conducting studies in other cultures before reaching concrete conclusions.

Whereas a vast research literature exists on the influence of classroom climate on goal orientation and learning outcomes, these studies have been largely conducted in the United States and Europe. Indeed few studies have investigated the nature and influence of classroom climate and goal orientation in African cultures [45,46]. Research in the United States and Europe has established that teachers’ perceptions of classroom climates and students’ patterns of adaptive learning vary between urban and rural schools [47, 48, 49, 35, 50, 51]. Gender and ethnic differences have also been established, suggesting a possibility of cultural differences in classroom environments and goal orientation [32,40]. However, these findings cannot be generalized to other cultures.

Teacher practices most likely reflect the values and beliefs of the larger culture they live in. Glover and Law [52] found a strong link between school culture, teacher practices, and the learning experiences of students. As revealed in the macrosystem, the uttermost level of Bronfenbrenner's model, society's cultural values, laws, customs and resources significantly affect the activities and interactions of its members [53]. For example, studies on child rearing practices reveal that even though authoritative child rearing has advantages across cultures, ethnic groups often have distinct child-rearing beliefs and practices. Some involve variations in warmth and making demands that are adaptive when viewed in light of cultural values and family circumstances [54]. These cultural variations remind us that just like parenting practices, teacher practices such as the conceptualization of their classroom environments and goal orientation can be fully understood only in their larger ecological context.

This study investigated teachers' and observers' perceptions of the nature of classroom climates and goal orientation in biology high school classrooms in Kenya. The following research questions were addressed: How do teachers perceive the classroom climate in their biology classes? Are there school and gender differences in the teachers' perceptions of the classroom climate and goal orientation? Do teachers and observers perceive the classroom climate and goal orientation in biology classes similarly?

2. METHODOLOGY

2.1 Participants

Participants included 12 teachers who taught tenth- and eleventh-grade biology classes of two boarding high schools in Kenya. Five of the teachers were from a boys' school (2 females and 3 males) and 7 from a girls' school (3 females and 4 males). Professional experience ranged from 2 to 12 years. Both schools are national schools, admit only high ranking students -those who score 350+ out of 500 points on the eighth grade national examination [55]. Teachers in both schools are all graduates from either one of the two main teacher-training national universities in the country. (Note: Except for few cases, majority of the high schools in Kenya that admit students who pass the eighth grade national examination are same sex boarding schools. This is typical of the Kenyan education system). The average class size for both schools was 45. The size of the schools ranged from 980 to 1,120 students. Biology was chosen for this study because it is a required course for all high school students.

2.2 Procedures

Participation in this study was voluntary; research information and purpose was sent to all biology teachers in both schools requesting their participation prior to data collection. Data was collected from multiple sources using self-report and direct observation measures during the second term (May–July) of the school year.

2.2.1 Construct validity

Prior to the visit, the Classroom Climate Questionnaire (CCQ; [9,56] and Patterns of Adaptive Learning Scales (PALS; [43,42] were sent to two volunteer teachers from each of the schools where the project was conducted. The teachers (4) were asked to examine the validity of the items by pointing out any terms that might be confusing or misunderstood. The volunteer teachers were recruited via e-mail and personal phone calls. All four teachers identified two terms that may mean something different in the Kenyan context on the PALS and gave suggestions for changes. In their view, “smart” meant dressed up, and “dumb” meant hard of hearing. Therefore, “smart” was replaced with “bright” and “dumb” was replaced with “stupid”. To control for possible bias, these four teachers did not participate in the final study.

2.3 Measures

2.3.1 Teacher surveys

All of the teachers completed the two surveys (CCQ and PALS). The surveys were administered in English. (Note: English is the main language of instruction in the Kenyan schools, starting in third grade). The teachers responded to the surveys in their free time and returned them to the researcher upon completion. It took approximately 10–15 minutes to complete each survey.

2.3.2 The classroom climate questionnaire (CCQ)

This 54-item instrument adapted from the student survey [57] was developed by Trickett and Moos [9,56] to assess three underlying sets of classroom dimensions in junior high school classrooms: Relationship, Personal Growth, and System Maintenance and Change. The Relationship dimension identifies the nature and intensity of personal relationships within the environment and assesses the extent to which teachers and students are involved in the environment and support and help each other. The Personal Growth dimension assesses basic directions along which personal growth and self-enhancement tend to occur. The System Maintenance and Change

dimension assesses the extent to which the environment is orderly, clear in expectations, maintains control, and is responsive to change.

Under these three dimensions are nine specific subscales (the original alphas from Trickett and Moos' study of [9] appear here): (a) Involvement (e.g., "Students put a lot of energy into what they do in this class", α = .60); (b) Affiliation (e.g., "Students enjoy helping each other with homework in this class", α = .59); (c) Teacher Support (e.g., "I take a personal interest in students in this class", α = .72); (d) Task Orientation (e.g., "Students sometimes spent extra time on activities in this class", α = .36); (e) Competition (e.g., "Some students try to see who can answer the questions first", α = .65); (f) Order and Organization (e.g., "Activities in this class are clearly and carefully planned", α = .54); (g) Rule Clarity (e.g., "There is a clear set of rules for students to follow", α = .49); (h) Rule Strictness (e.g., "I make it a point of sticking to the rules I make", α = .45); and (i) Innovation (e.g., "I like for students to try new projects", α = .39). All items are presented in a four-step Likert continuum (e.g., never happens to often happens), with higher scores representing the high end of the scale. This survey has been used in classroom climate studies [57,3,9,56,58] and has proven to be reli-able and valid. A test-retest reliability of individual scores on scales, when adminis-tered twice with a 6-week interval between occasions, ranged from .83 for Rule Clarity to .95 for Innovation [56].

Traditionally, this survey has been used to assess learning environments mostly in the United States. Therefore, there was a need to determine if the internal consistency reliabilities of the scales in the present study were comparable to the original survey. To this end, the Cronbach's alpha values were calculated for the nine subscales. Reliabilities are presented in Table 1. As seen in Table 1, most of the current study scales' reliabilities were comparable to the original survey. Rule Clarity, Rule Strictness, and Innovation had relatively high reliabilities compared to the original subscales. However, Competition (α =.36) and Order and Organization (α = .34) had low reliabilities. Teachers had several questions regarding these subscales that could be attributed to cultural differences. For examples, most teachers put question marks or asked the researcher to explain the meaning of the following items: (a) "A student's grade is lowered if he/she gets homework in late" (Note: Because the schools are boarding schools, homework is usually completed during class time); (b) "Students have to work hard for a good grade in this class"; (c) "I hardly ever have to tell students to get back in their seats"; and (d) "Students don't interrupt when I am talking". As several teachers commented, "Isn't that common sense…".

Table 1. Reliabilities for the original and the current study classroom climate subscales

Subscale	Original	Current
Involvement	.60	.86
Affiliation	.59	.58
Teacher support	.72	.63
Task focus	.36	.49
Competition	.65	.36
Order & organization	.54	.34
Rule clarity	.49	.79
Rule strictness	.45	.80
Innovation	.39	.60

Note. Number of items per subscale = 6

2.3.3 Patterns of adaptive learning scales (PALS)

This 22-items survey was developed and used by Midgley et al. [42,43] to assess teachers' perceptions of various constructs associated with students' goal structures. It assesses mastery and performance-approach goal structures at the school and classroom levels. The School Mastery Goals scale (seven items) assesses individual teachers' agreement that the purpose of academic work in the school is to gain mastery over content and to demonstrate student improvement (e.g., "In this school, the emphasis is on really understanding schoolwork, not just memorizing it", α = .81). Note: the attached Cronbach's alpha values are from the original scale [42]. The School Performance-Approach Goals scale (six items) assesses teachers' perception of their school's desire for students to appear able and outperform others (e.g., "In this school, students hear a lot about the importance to getting high test scores", α = .70).

The Classroom Mastery Goal scale (four items) assesses teachers' perceptions of whether the purpose and meaning of academic tasks and achievement emphasized in their classes focuses on student improvement and mastery (e.g., "In my classroom, I consider how much students have improved when I give them report card grades", α = .69). The Classroom Performance-Approach Goal scale (five items) assesses teachers' perceptions of whether their classroom academic tasks focus on competition and ability (e.g., "In my classroom, I display the work of the highest achieving students as an example", α = .69). All items are presented in a five-point Likert-type format (strongly disagree to strongly agree), with higher scores representing the high end of the scale. The scale has been used in several studies [48]; [43]; [42] which have proven its reliability and validity. Reliabilities of the subscales in the present study were reasonable (Table 2).

Table 2. Reliabilities for the original and current study patterns of adaptive learning scales

Scale	# of Items	Original	Current
Perceived School Goals:			
Mastery	7	.81	.53
Performance- Approach	6	.70	.51
Perceived Classroom Goals:			
Mastery	4	.69	.61
Performance-Approach	5	.69	.60

2.3.4 Classroom observations

Prior to data collection, a team of graduate students received a 2-day mandatory training of classroom observations. Several observations (ranging from 6–8) were made for each of the twelve teachers, with approximately six observations per teacher, spread over the second term (May–July) of the school year. At least two graduate students observed each classroom at the same time for all the observations used in this analysis. Observation time ranged from 40–80 minutes. Observers used two observation forms: the Classroom Climate Observation Form [57] and the Patterns of Adaptive Learning: Classroom Observation Form [43,42]. Both observation forms tapped into similar concepts as those of the teachers' surveys. The classroom climate form was developed by the researcher and has been used in previous research with reasonable reliability [57,3], and the patterns of adaptive learning was developed and used by Midgley et al. [42,43]. They were on a four-point Likert-type format, with space provided at the bottom for observer comments. Using Cohen's Kappa statistic, an inter-rater agreement beyond chance was established at 0.95.

3. RESULTS

3.1 Teacher Survey Data

A preliminary analysis was conducted to determine if there were differences among dependent measures by the length of teaching experience. No significant differences were found. Some of the teachers taught more than one class and grade. There were a total of twenty classes (11 from the boys' school and 9 from the girls' school). Some teachers taught both grades 10 and 11. Therefore, a second preliminary analysis was conducted on the teachers' data to determine if there were differences among the dependent variables by class and grade. No class and grade differences were evident. Consequently all the classes and the two grades were combined in subsequent analyses.

Note: Cohen's d was used to calculate effect sizes.

3.1.1 How do teachers perceive their classroom climate?

Two t-tests were conducted on the classroom climate variables to examine how teachers perceived their classrooms. The first test examined the nine classroom climate variables with school as the independent variable. No significant effects were found. The second analysis examined the classroom climate measures with gender as the independent variable. This test revealed significant effects between male and female teachers on Teacher Support, t(10) = 3.76, p = .01, d = 2.201 indicating that the male teachers perceived themselves as being more supportive of their students compared to the female teachers. In addition, male teachers saw their classrooms as being more innovative compared to female teachers, t(10) = 2. 93, p = .05, d =1.882. There was no significant interaction effect between school and gender on classroom climate variables. See Table 3 for all the means and standard deviations for the classroom climate measures.

Table 3. Overall means and standard deviations for classroom climate for male and female teachers

Subscales	Females		Males		Sig.
	Mean	SD	Mean	SD	
Involvement	3.17	.66	3.45	.52	n.s
Affiliation	3.43	.32	3.69	.35	n.s
Teacher support	3.17	.24	3.64	.20	.01
Task focus	3.57	.25	3.59	.36	n.s
Competition	3.03	.14	3.31	.42	n.s
Order & Organization	3.17	.39	3.31	.24	n.s
Rule clarity	3.30	.96	3.59	.33	n.s
Rule strictness	2.70	.83	3.29	.38	n.s
Innovation	2.60	.56	3.36	.49	.05

Note. Mean range: Low=1.0, High=4.0; Males: N= 7, Females: N=5

3.1.2 What are teachers perceptions of their school and classroom goal orientation?

Descriptive statistics were conducted to determine what types of goals teachers report on the PALS subscales. Overall, teachers reported greater school and classroom structured performance-approach goals. Tests of means revealed a significant difference between male and female teachers' perceptions of their school performance goals, t(10) =2.98, p =.05, d =1.874 and classroom performance goals, t(10) =3.12, p =.05, d = 1.964. Compared to female teachers, male teachers perceived their school to be encouraging performance approach goals. Similarly, they perceived their classrooms to be encouraging performance approach goals. See Table 4 for all means and standard deviations. Tests of means revealed no statistical difference

between the two schools. In addition, there was no significant interaction between school and gender on goal orientation.

Table 4. Overall means and standard deviations for goal orientation based on gender

Scales	Females		Males		Sig.
	Mean	SD	Mean	SD	
School Performance Approach	4.13	.36	4.82	.37	.05
School Mastery goals	4.26	.27	4.29	.61	n.s
Classroom Performance Approach	3.64	.26	4.46	.70	.05
Classroom Mastery goals	3.45	.62	3.62	.72	n.s

Note. Mean range: Low=1.0, High=5.0; Males: N= 7, Females: N=5

3.2 Classroom Observations

Only observations that were made by two observers at the same time were used for analysis. After establishing an inter-rater reliability at 0.95, only one observer's ratings for all the twelve teachers were used for analysis. Seventy-two observations were analyzed, with six observations per teacher. All observations conducted by the same observer were combined to provide multiple samples of data for each teacher which could then be averaged as a general profile of the teacher's classroom climate and goal orientation according to the subscale ratings. Descriptive statistics and independent t-tests comparing schools, gender and grades were conducted on the data.

3.2.1 What are observers' perceptions of the classroom climate in biology classes?

Preliminary analyses exploring class and grade-level differences in observers' survey reports revealed no statistically significant effects. Therefore, class and grade were not included in subsequent analyses.

From the overall descriptive statistics, observers saw classroom climates conducive to high student involvement and task focus and with highly supportive teachers. Teachers were also observed to make clear rules and to be strict in enforcing these rules. See Table 5 for all means and standard deviations.

Table 5. Overall means and standard deviations for classroom climate based on observation data

	Overall		Boys' School		Girls' School		
	Mean	SD	Mean	SD	Mean	SD	Sig.
Task Focus	3.63	.27	3.55	.27	3.70	.24	n.s
Teacher Support	3.45	.32	3.60	.31	3.30	.25	.05
Rule Strictness	2.50	.00	2.50	.00	2.50	.00	n.s

Rule Clarity	2.50	.00	2.50	.00	2.50	.00	n.s
Innovation	2.22	.52	1.83	.18	2.60	.31	.01
Student Involvement	2.01	.29	1.90	.16	2.21	.35	n.s
Affiliation	1.85	.73	1.50	.40	2.20	.82	.05
Order and Organization	1.55	.53	1.25	.42	1.85	.47	.01

Note. Mean range: Low=1.0, High=4.0; boys' school: N=5, girls' school: N=7. Values are based on 6 observations per teachers (total = 72 observations)

Tests of means were conducted to examine whether observers reported significant differences in the classroom climate between the schools and the teachers' gender. The first t-test revealed significant school differences in the classroom climate on Innovation, $t(10) = 5.10$, $p = .01$, $d = 2.125$ with the boys' school teachers' classrooms being perceived as more innovative; Order and Organization, $t(10) = 3.10$, $p = .01$, $d = 2.200$ with the girls' school teachers' classrooms being reported as more organized; Teacher Support, $t(10) = 2.32$, $p = .03$, $d = 1.988$ with the boys' school teachers being perceived by observers as more supportive of their students; Affiliation, $t(10) = 2.41$, $p = .02$, $d = 1.809$ with the girls' school classrooms being perceived as more friendly compared to the boys' school's classrooms. No significant gender differences were found.

3.2.2 What are observers' perceptions of goal orientation in biology classrooms?

Descriptive statistics conducted on the patterns of adaptive learning classroom observations showed class activities to be carefully planned. Observers noted that teachers stayed on task and covered the amount of material intended to be covered during class time, and they (teachers) also checked to see if students understood the material being covered. Rarely did observers see students being recognized for their work or emphasis being placed on trying hard and making learning fun. Observers reported few incidences where students worked in collaborative groups. All observers marked "N/O-Not Observed" against the items examining the teacher's authority. The items were (a) "The teacher is consistent in dealing with students who break rules", and (b) "The teacher explains what the rules are and enforces them if necessary". Table 6 reports all means and standard deviations.

Table 6. Overall means and standard deviations for goal orientation based on observations

Subscales	Overall		Boys' School		Girls' School		Sig.
	Mean	SD	Mean	SD	Mean	SD	
Task	3.21	.33	2.78	.35	3.60	.24	.01
Time	2.50	.14	2.50	.00	2.50	.19	n.s
Evaluation	2.16	.43	2.11	.27	2.20	.50	n.s
Social	1.71	.26	1.50	.22	1.85	.27	.05
Grouping	1.67	.23	1.00	.34	1.05	.25	n.s
Help-seeking	1.60	.56	1.61	.57	1.60	.58	n.s
Messages	1.38	.31	1.61	.22	1.65	.38	n.s
Recognition	1.25	.39	1.22	.45	1.20	.39	n.s
Authority	1.00	.00	1.00	.00	1.00	.00	n.s

Note. Mean range: Low=1.0, High=4.0; boys' school: N=5, girls' school: N=7. Values are based on 6 observations per teachers (total = 72 observations)

To examine whether the means were significantly different, tests of means were conducted with the goal orientation measures as dependent variables and school and the teacher's gender as independent variables. The first test of analysis examined the four goal orientation measures with school as the independent variable. Significant effects were found for Task Focus, $t(10) = 4.29$, $p = .01$, $d = 2.210$ with the teachers in the girls' school's classrooms being perceived by observers as more task oriented. The classrooms of the teachers in the boys' school were perceived as significantly social, $t(10) = 2.54$, $p = .02$, $d = 2.005$ compared to the girls' classrooms. The test of means by gender did not reveal any significant effects for the goal orientation as reported by observers.

4. DISCUSSION

The aim of this study was to examine teachers' perceptions of their classroom climate and goal orientation in high school biology classes. Teachers from the two schools did not differ significantly in their perception of their classroom climate. All the teachers saw their classes as being high in task focus, student involvement, affiliation, and order and organization. This perceived similarity could be due to the fact that the two schools are boarding, all the teachers are trained at either one of the two main teacher training universities, the curriculum is centralized across schools in the country, and all students wear uniforms [55]. For example, during the second term of the school year (the period of observations), all the tenth grade teachers in both schools were teaching about "pollination" and "human reproduction", while all the eleventh grade teachers were teaching about "gaseous exchange" and "immunity and the immune response in humans".

However, when the classroom climate was assessed by the teachers' gender, a significant difference emerged. The male teachers from both schools saw themselves as being more supportive of their students compared to the female teachers. This finding was surprising. Since the two schools are boarding, students are away from their parents for nine months per year and teachers act as "surrogate parents" we expected no significant difference in the teachers' perceptions of their support for their students. More research is needed to further explain and understand this finding. Male teachers also perceived their classroom climate to be high in innovation.

Results on goal orientation revealed all teachers perceive their schools' and classrooms' practices as more performance focused. However, male teachers reported significantly high school and classroom performance-focused practices. The fact that male teachers perceived their classrooms to be high in teacher support and innovation and also reported high performance-focused practices is contrary to the findings from [36] and [38] studies which found that classroom climates that were high in task involvement and innovation led only to mastery-focused practices and goals. It is likely that teachers' perceptions of environmental goal structures are partially influenced by their existing goal orientations. As Pintrich [33] study in the United States found, if teachers believe that there is an emphasis on competition and demonstrating ability, these beliefs should affect their own motivation and classroom practices.

The other possible reason for these teachers' inclination to performance-focused practices could be the nature of the education system in the country. The Kenyan education system is examination oriented. The centralized national examinations for twelfth graders are quite intense. Eleventh-grade students start preparing for the national examination in January, the beginning of the year. Eleventh-grade teachers spent a considerable amount of time reviewing past examination questions with their students. Bear in mind that all but two of the teachers participating in this study taught at least one eleventh grade class. Teachers whose students perform well are publicly recognized by the school and sometimes given awards. In addition, the government, through the Ministry of Education, publicly announces and publishes the top ten schools. Plus, this national examination is the single determinant to college or university [55]. It is therefore safe to say that the academic practices that these teachers report are emphasized within the societal context and also relate to their own perceptions of the academic goal orientation emphasized in the school context. As Ames [30] and Midgley et al. [29] reported, practices such as public honor rolls or special

privileges based upon academic standing send important messages to teachers and students regarding what constitutes success in a given school. Likewise, the results from this study support classroom climates being a reflection of cultural contexts.

In the past, research has found that those in positions of power, in this case teachers, perceive environments they are in more positively than those not in positions of power [56,57,3]. Contrary to these findings, teachers and observers in the present study viewed the classroom climate similarly. Like the teachers, observers reported more student involvement, high teacher support, positive student-student interactions, clear classroom rules, and hardly any disruptive incidences. The observed classroom environment enabled teachers more time to devote to student learning. However, when the two schools were compared statistically on classroom climate, significant differences emerged on innovation, order and organization, teacher support, and affiliation. Observers noted that in the girls' school, the teachers were more innovative and organized, and students were friendly towards each other. On the other hand, teachers in the boys' school were observed to be more supportive of their students. This finding was quite unexpected. Further research investigating teachers' perceptions of their support for their students in same-sex schools is warranted. In addition, future research conducted with students and teachers to assess their perception of classroom climate would be helpful.

On the patterns of adaptive learning, observers just like the teachers, reported high task focus; teachers stayed on task and made sure that the amount of material to be covered was covered during the allotted class time. Teachers consistently checked to make sure their students understood the material being completed. However, significant differences regarding task focus were found between the two schools. In the girls' school, observers reported significantly more task focus in the classrooms compared to the boys' classrooms. In addition, observers noted high positive student-student interactions in the girls' school. It appears that students engage in more positive interactions in the girls' classrooms.

In both schools, observers noted that teachers rarely recognized students for their work or class participation. In the same vein, hardly any emphasis was placed on making learning fun. The only work displayed in the classrooms were science related posters, a class time table, and a schedule of after-class activities. In addition, there were few incidences of collaborative group work during class. This is interesting since science classrooms in the US and Europe have been shown to regularly have

small group-based experiments [1, 8]. It appears as though the teachers in this study emphasize mastery of content more than critical thinking skills and inquiry learning that is usually embedded in active student-student interactions or small groups' activities.

The teacher's authority was apparent. Students sat in rows facing the teacher, did not get out of their seats nor talk without the teacher's permission. All classrooms appeared to be well-managed with clear rules and the greatest emphasis placed on covering the material intended to be covered during class time. The overriding element was task focus regardless of the grade, gender, class, or school. It was no wonder that observers consistently checked "N/O-Not Observed" on items inquiring about the teacher's authority.

This study had some limitations. The sample of teachers included in this study was limited to 12 teachers and thus restricted higher level statistical analyses. This calls for caution in interpreting the findings. In addition, these teachers were in same-sex boarding schools, therefore, the results may not generalize to all high school biology teachers. Furthermore, this study did not collect data on the students in these teachers' classrooms to examine their perceptions of classroom climate and goal orientation. In addition, the reliabilities, particularly those of the classroom climate scale, were generally low. This could be attributed to the cultural differences where some of the items might have been interpreted differently.

5. CONCLUSION

In conclusion, the study findings from teachers and observers reveal positive classroom environments that are high on task focus and high performance-focused practices at both the classroom and school level. Previous research in the United States examining classroom climates and goal orientations has reported a positive correlation between positive classroom climates and mastery goals [30,31,38,17]. Kaplan and Maehr [32] for example, found mastery-focused practices to be associated with positive outcomes, whereas performance-focused practices were associated with negative outcomes. Importantly, these studies do not explicitly include aspects of culture or perhaps the interpretation of goal orientations by different cultures. Given that the definition of a mastery goal centers on learning, understanding, and improvement, it is likely that culturally valued activities that reflect this goal are necessary, if not sufficient, for the creation of a meaningful goal orientation. The two schools in the present study are among the top national schools in the country

[55]. If the primary objective of students, teachers, and administrators is to perform better on the national examination, it is unlikely that they would focus on activities that do not meet this end. In this study, performance-approach goals could be defined as "learning" due to the nature of Kenya's national testing protocol. This finding supports current research in goal orientation that indicates performance goals to be associated with high achievement and self-efficacy [20, 26, 25].

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COMPETING INTERESTS

We, the authors have no competing interests that could potentially bias our work.

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Education for All in Low-Income Countries: A Crucial Role for Cognitive Scientists

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Abstract: Donor funding has helped enroll in school most children of low-income coun-tries. However, students get little schooling and few opportunities to encode and con-solidate information. Many fail to learn and automatize the small units needed for more complex skills, such as reading. As a result, many children remain illiterate and drop out in the early primary grades. However, donors and governments often focus on the socioeconomic difficulties of the very poor and have limited insights on how to teach students who get no academic preparation before grade 1. Furthermore, staff experi-ences with middle class schools may promote complex instructional methods and raise unrealistic expectations regarding the performance of the very poor. In principle cognitive scientists could provide technical assistance and conduct research on is-sues relevant to learning for the very poor. In practice, however, essential memory functions needed to explicate the knowledge gaps have little value added in high income countries and receive less attention in academia. Few cognitive scientists are sufficiently exposed to them, while education faculties similarly do not teach them. The question arises how to engage cognitive scientists in international development. There is a need for intellectual leadership in this field. New avenues of collaboration are needed between those who research learning and those who plan the education of the very poor.

Keywords: education for all; low-income countries; cognitive science; neuro-science; reading; working memory; observational learning; elaboration; encoding specificity; automaticity; chunking; international education; perceptual learning; policy advice; teacher training.

ACRONYMS

DFID - Department for International Development; FTI - Education for All Fast Track Initiative Secretariat; GPE - Global Partnership for Education; RTI - Research

Triangle Institute; UNESCO - United Nations Educational, Cultural, and Scientific Organization; UNICEF - United Nations International Children's Education Fund; USAID - United States Agency for International Development.

1. TRIUMPHS AND TRIBULATIONS OF EDUCATION IN LOW-INCOME COUNTRIES

About 60-72 million children are of school worldwide. Ensuring their education, particularly in low-income countries[1], is an important goal of the international donor community. The United Nations agencies and affiliated organizations have devoted much thinking and resources in the last 20 years to improve access to good-quality education for low-income populations.

In 1990, a worldwide initiative was instituted to ensure that by 2015 all children in the world should complete primary school. The Education for All initiative [1,2] has become a high-profile operation aimed at raising the funds needed to close the gap between national budgets and the investments needed for universal primary enrollment. The funds pay for budget items such as school construction, curriculum development, textbook production, teacher training and hiring, management information systems, student assessment, and evaluation capacity development. Efforts have borne fruit. Some of the poorest countries, such as Niger, Burkina Faso, Ethiopia, or Cambodia increased enrollments by multiples between 2000 and 2010 (See statistics at www.globalpartnership.org; Education for All Fast Track Initiative, 2010).

Annually about US$13.5 billion are needed to educate the children of low-income countries [3,4]. This herculean task is being financed by scores of donor agencies and partners. There are United Nations organizations, such as UNESCO and UNICEF; multilateral institutions such as the World Bank, African Development Bank, the Organization of American States, and others; bilateral donor agencies, such as United States Agency for International Development (USAID); many national and international non-governmental organizations, such as Save the Children, Oxfam, or Actionaid; civil society groups that advocate for education. Many consulting companies are also involved that vie for contracts to implement various initiatives. Partners

[1] *The World Bank defines country groups in terms of per capita gross national income, using the Atlas method. In 2011, thresholds were: low income, $1,025 or less; lower middle income, $1,026 - $4,035; upper middle income, $4,036 - $12,475; and high income, $12,476 or more (retrieved from www.worldbank.org).*

have worked hard to harmonize their procurement and accounting rules to ease the reporting burdens of low-income countries. Thousands of very dedicated staff work in these agencies, managing the bureaucracy and providing advice to governments and donors.

So, do schools in low-income countries teach students the needed basic skills that will help them rise out of poverty? Unfortunately not. Many of the enrolled students learn very little and fail to reach even minimal competencies [5,6]. Early-grade reading fluency tests in the primary grades show that in some countries 90% of the second or third graders fail to read even a single word, and many do not even know individual letters [7,8]. As a result, students abandon school early and remain illiterate; in sub-Saharan Africa, only about 67% of the beginning cohort graduate from primary school, and many of the graduates are functionally illiterate [9]. The Africa Learning Barometer (supported by the Brookings Institution) reported that overall 53% of poor children and specifically 43% of children from rural areas fail to learn basic literacy and numeracy skills [10]. Similar data are reported from other low-income countries, such as Yemen, Papua New Guinea and East Timor.

Failures are not just limited to basic reading or the poorest countries of Suhsaharan Africa; they extend to higher grades of lower-income countries. International comparison tests such as TIMSS and PIRLS[2] show large performance differences among the 49-63 countries thatparticipate. (Most low-income countries do not participate.) For example in grade 4, the 2011 PIRLS score for Hong Kong was 571 compared to 310 for Morocco and a scaled score of about 330 for Botswana and South Africa [11, p. 45]. Similarly in the 2011 TIMMS, the 4th grade average score for Singapore was 606 compared to 238 for Yemen.

TIMMS and PIRLS socioeconomic data have showed large score differences by parental levels of income and education. For example overall students of many resources scored in TIMMS an average of 535, and those of few resources scored 415 [12, p. 13]. The students who could do early numeracy tasks very well when they began primary school scored 524 compared to a score of 451 for those who could not do them well. On the basis of these and other data, it was found [13] that children in low-income countries are able to answer correctly only about 30 percent as many questions as children in upper-income countries. It has been estimated [6,11,13] that the learning of the average child assessed in low-income countries is at about the 5th percentile of children in upper-income countries.

[2] *Trends in Mathematics and Science Study, Progress in International Reading Literacy Study (TIMSS).*

It appears, therefore, that many lower-income countries are raising a generation of nominally schooled but illiterate students. Organizations such as UNESCO have raised alarms (e.g., [14]). Some publications and blog articles describe the situation as a “learning crisis” [15].

In some respects, the learning crisis should not come as a surprise. Many students lack the skills necessary for performance. They often go to school without preschool experience or home preparation for academic tasks. They may have limited vocabulary even in their own languages; they may have developmental delays and poor executive control. Many suffer from malnutrition and diseases that are known to compromise skills acquisition [16,17]. These students can certainly learn, but they need specific inputs and extra teaching time to master preliminary tasks. In high-income countries, such students would get individualized attention by well-educated teachers, a surfeit of materials, and follow up at home. In many low-income countries, the only available option would be private tuition [18].

Another important reason for failure is limited instruction and little or no feedback. To implement Education for All, public schools of countries such as Malawi or Congo Democratic Republic must admit massive numbers of children with very limited class space or staff. In cities like Lilongwe, classes may have over 100 students in the early grades [19]. The teachers may have the equivalent of 4th grade education, may not know how to teach, and may be absent on average 20% of the time. Schools often start late in the school year and end early [20]. Countries that lack sufficient buildings and teachers may reduce class hours to fit all students in multiple shifts. As a result of all these constraints, the students may only get 39% or less of the instructional time given to first graders in higher-income countries [21]. And when teachers teach, they may interact with the few who can do the work and ignore the rest [22,23]. Nonperformers may attend sparsely until they drop out.

Multilingualism further complicates the picture. In many low-income countries citizens speak numerous languages; so many governments have adopted English, French, Portuguese or Arabic as their language of instruction. Nearly all countries of Sub-saharan Africa and the South Pacific face this complexity. Students must learn the official languages during class at the same time as reading. The above languages happen to have complex spelling systems, which may take two or

three years to master. In addition, textbooks are usually imported, expensive, scarce, or inappro-priate for the students' knowledge level. Without them, class time is largely spent copying incomprehensible texts from the blackboard. Scant instruction suffices only for those few who are inordinately intelligent or the better off who get help at home. Thus, Education for *All* becomes in fact education for the gifted.

Clearly the above circumstances reduce the opportunities to obtain new information, elaborate it, practice basic tasks to the point of effortless execution, get feedback. Despite systemic limitations, certain classroom activities could be modified to increase precision, timing, or frequency of some inputs. However, classroom issues receive limited attention. Instead, sociocultural factors are emphasized such as child marriage, child labor, or the effects of income inequalities, emotional and physical well-being in schools, safety issues in conflict-affected countries, or gender (e.g., [24, 25, 26, 27]). Attention to sociocultural complexity may detract attention from instructional variables[3], or result in conflicting advice about educational quality and use of funds.

These exigencies are directed at government and donor staff who are burdened with the complex financial and logistical problems involved in expanding their school systems. Procurement events, disbursement schedules, budget meetings, contracts have clear deadlines and take up much of officials' time. Multiple and complex demands for accountability may push learning issues low on the agenda.

Given the exigencies of political economy and the extreme limitations of low-resource schools, how can students learn more and perform better? Whose advice to governments and donors is most likely to achieve results? The article presents some aspects of this very complex topic and suggests how research on memory and cognition can be used to improve learning outcomes for the poor.

One note is important on documentation. Many cited reports by donor agencies and consultants are work documents that may not necessarily meet rigorous academic standards. Also, certain topics that are well-known in international development have

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[3] *For example one draft consultant report about Ethiopia stated in 2013: "Learning outcomes depend on a variety of factors, both on the side of educational provision, and with regard to sociocultural, environmental, and individual factors. Any assessment of the impact of higher teaching quality on learning outcomes must take account of this complexity".*

not necessarily been documented, such as the academic background of staff. However, the issues are critical and merit publication.

To illustrate the knowledge needed, some real-world questions are presented below.

2. THE LEARNING CRISIS AND POLICY ADVICE DILEMMAS

A foreign service officer from a European country manages the bilateral aid program of her country in certain African countries. Citizens in these countries speak 15-37 languages, so instruction takes place in English, French, or Portuguese. Textbooks are scarce, so most classroom time is spent on transcription; and about 85% of students remain illiterate. In the course of a week, the following topics require input. What policy advice could be offered and on what basis?

- Many donors advocate that children should learn in a language they know best, so one government developed a policy of teaching children in local languages for the first three years. One colleague wonders why it is necessary to delay English-medium instruction. His children went into French immersion class and did very well. Which research studies can be used to facilitate decisions?

- A team of economists spent about a million dollars for a randomized experiment that tested whether better school management improves learning outcomes. The answer was negative. (See for example [28]). The economists searched for answers, but they did not think of examining the grade 1 reading book used in that country. The book started with entire sentences in English and no obvious attempt to teach letter sounds. How important was the textbook vis-a-vis school management?

- The primary education director in the Ministry of Education is preparing new books for grade 1 reading but gets contradictory advice. Some specialists believe in phonics and others in the whole word approach. Some suggest that instruction should start with entire sentences, then words, then letters, and others believe in the opposite order. Which research could be used to predict likely outcomes of each viewpoint?

- Many students completing primary school can barely decode, so the government was advised to start youth centers that would teach “flexible” 21st century skills. A consultant will develop competency-based curricula that will minimize teaching of facts and focus instead on critical thinking and catalytic communicative skills. Does existing research suggest that this will work?

- To develop creativity among students, one government plans to buy one million inexpensive laptops. Most students are illiterate, and the computers do not include software for teaching basic skills. (See for example [29]). Proponents say that computers will improve 'lateral thinking'. Should this low-income government spend scarce revenues to buy laptops for all children?

The above questions are hard to answer and are rarely encountered in higher income countries. Governments and donors must decide on certain solutions that are reasonably effective and politically acceptable, and then dedicate taxpayers' money to them. Many decisions have far-reaching consequences for citizens and typically involve millions of dollars. They must often be made in a matter of days or weeks, so research studies are out of the question. It is important therefore to follow the most reasonable advice available at a given moment.

Which body of knowledge can effectively advise governments and donors on how to improve learning in low-income classrooms? No clear contender exists. Staff who work in international development typically have advanced degrees in a wide variety of fields, which typically offer no learning-related coursework: Economics, finance, statistics, political science, international relations, comparative education, education policy, sociology, political science, or literature. Not surprisingly, donor agencies tend to recommend policies that reflect the academic preparation of employees. Few documents offer actionable instructional advice (e.g., [30,31]). Instead, agencies produce countless documents attributing learning problems to low incomes, gender biases, psychosocial development, community conflicts, social theory, or malnutrition [32,33].

Economic and management advice may also detract attention away from classroom learning. Certain economists consider the classroom a "black box" and they posit that if teachers are made accountable, they will somehow find means to make more students learn. To improve quality, governments are urged to invest in school-based management and give grants to schools under the supervision of citizen committees [34]. Countries are also advised to invest in merit pay and training, in hopes that incentives will increase attendance and teaching quality. To assess and evaluate the results of various interventions, the donors have heavily invested in statistical data collection and international comparative tests [35].

Added to the varied academic backgrounds of donor agency staff is the human tendency to interpret unfamiliar situations through easily available memories (e.g.,

availability bias [36, pp. 65, 129-136]. Few studies have explored the educational beliefs of staff (e.g., [37, p. 71; 38]). But whenever instructional advice is given, it seems to reflect a middle-class perspective of well-trained children who have been learning academic content since birth. As shown above there are large test score differences across socioeconomic strata; the better-off students may be better prepared to study more complex topics, and they are more likely to have better educated teachers. These may be reasons why education advisors often condemn memorization and recommend "modern" discovery methods over "traditional" routines. They may recommend a child-friendly classroom climate, "active learning", child-centered learning, constructivism, transformative education, teaching that is individualized and relevant to children's lives (e.g., [39,40]). They may expect teachers who are barely literate to carry out reflective practices and complex classroom activities [41], [24, pp. 54, 110]. Some expect all teachers to use computer technology, discounting the training and procurement problems likely with large-scale applications.

Since there is no clear corpus of research that guide on difficult issues, large-scale consultations are sometimes held to arrive at "best practices". Certain organizations may invite hundreds of staffroom international agencies and organizations involved in education and ask them to comment on various questions until a consensus emerges. For example, the Interagency Network for Education in Emergencies (INEE) has conducted hundreds of workshops seeking advice from persons involved in education on how to teach conflict-affected children. The consensus resulted in about 70 variables to be used as Minimum Standards for education in emergencies (www.ineesites.org). The theoretical framework created by these standards emphasizes community involvement, security, human rights, emotional healing, and teaching according to cultural context. The Brookings Institution also led a large consultation in 2012-13 to determine what the students of the world should know and how to measure their achievement [42]. In the first two phases of the study, nearly 1,000 people in 84 countries informed task force recommendations. However, few of the participants had experience in teaching school or studying memory research. The document with the initial findings uses in 101 pages the words 'learn' or 'learning' about 209 times and 'teach', 'teaching', or 'teacher' about 26 times. However learning research is rarely cited in conjunction with these[4].

[4] *Another document on the education of marginalized children uses the word "learn" or "learning" 153 times in 35 text pages. It also uses "teach" and "teaching" 18 times, but it does not refer to any research or propose means for students to learn better [27].*

Overall, the chorus of advocates about the education of the poor rarely includes people with expertise on how people learn. Few if any staff working in international development have studied cognitive psychology, cognitive neuroscience or related disciplines. If expertise in learning were more widely available, information processing principles could be used to advise governments. An international strategy to make learning more efficient could focus on the information processing commonalities of humans rather than cultural and individual differences: encoding, consolidation, retrieval, forgetting [43]. The environment certainly modifies some aspects of learning and cognition [44]. However, similarities of cognitive development across cultures at about the same age suggest applicability of basic information processing functions to children [45]. It could be possible to optimize classroom activities of low-income countries and increase efficiency in encoding, consolidating, and retrieval of needed information.

Research suggests that people must first learn to execute essential skills fast and automatically, so that they can devote their working memory to more challenging and complex cognitive tasks. Fluent performance in various skills results from practicing and automatizing progressively larger chunks of information [46,47,48,49]. Students must also acquire networks of well-connected knowledge that will effortlessly arrive in working memory to help reach conclusions and make decisions [50]. As mentioned earlier, many students in low-income countries fail to master fundamental skills, and subsequently perform poorly in the more advanced skills. This pattern suggests failures to learn what might be called for a lack of a better collective term, “simpler” cognition:[5] perceptual learning, chunking, mapping letters to sounds, reading and math automaticity, executive control. To put it simply, it is difficult for students to analyze the meaning of text when they can hardly lift it “off the page”. It is hard to engage in critical thinking and transformative learning when students must consciously search their memory for essential information items. Survivors able to tackle more complex concepts do so years later than students of the same grades in better off countries.

[5] *“Lower-level” processes are not simple, but the term ‘simpler’ cognition is used as a placeholder, given the frequent use of the term “complex cognition”.*

Government and donor staff have not sufficiently focused on these prerequisite skills. The “simpler” cognitive functions are largely unconscious, so people have limited insights about them [51, p. 47]. Also middle-class children, with whom donor staff are familiar, learn them quickly. This may be one reason why documents often lament the lack of basic skills but rarely drill down into the specific variables that must be reinforced.

These variables could come sharply into focus if an information processing framework guided educational decisions. It would emphasize in all cultures the acquisition of speed and automaticity in basic skills, such as reading, writing, or math [52]. Without this focus, advice to low-income countries can be misleading. The following section offers some examples.

2.1 Reading Instruction for the Very Poor

Reading is the skill that falters most often in low-income countries. Early action is crucial because often students drop out in grades 1 and 2. Fluency acquisition by the end of grade 2 at the latest may help them stay in school; and if life circumstances force dropout, fluent readers may continue to decode environmental print and thus retain the skill [53]. To teach such high-risk populations governments should aim for efficiency. Teaching methods should target the weaker students and aim to teach nearly everyone to read.

Reading neuroscience helps point to the important variables and activities that may speed up automaticity. Visual perception research suggests that simpler visual patterns are faster to automatize and critical spacing affects reading speed [54]. Practice with corrective feedback reduces reaction time and links letters into increasingly larger chunks [55]. Eventually, the visual word form area is activated, enables recognition of entire words [56], and makes it possible to process multiple letters in parallel. Many psychological and educational studies suggest that teaching individual letters matched with sounds may efficiently automatize reading (e.g., [57, 58]). In consistently spelled languages, which constitute the vast majority of the world’s languages, funda-mental instruction requires only about 100 days in most scripts [59]. By contrast, literacy instruction in the complex orthographies of English or French takes about three years and requires some learning of whole words [58]. Word shapes constitute more complex patterns that take longer to automatize.

Unfortunately low-income countries often get garbled advice. Reading specialists tend to come from high-income Anglophone countries and may have ambivalent

feelings about phonics, given that instruction in English cannot completely rely on them. And since middle-class children progress quickly, curricula are often designed to focus on textual meaning rather than teach the script [60, pp. 2, 116].

However, to understand, students must read fast enough to input sufficient text into working memory and retain it long enough to make sense out of it. If they know the words, they may understand their literal meaning [59]. The relationship between speed and comprehension has been documented repeatedly in education [61,62,63], but without understanding working memory functions, the relationship makes no sense to some education advisors. Some argue that speed should be discouraged because children may just “bark at print” [64]. Several others state that if students do not understand what they read, they are not really reading; they are merely decoding. But with limited practice, it may take years to acquire fluency. And those who manage after years of schooling may read too slowly to make sense of texts or learn much information from them [7].

Teacher training transmits these ambiguities about reading. For example, Kenyan teachers are rarely taught how to teach reading and may even use whole word techniques for consistently spelled languages like Swahili; they are sometimes advised to focus on language development, picture recognition, inferences, and prediction [65]. Another result of ambivalence with respect to speed and practice is the design of grade 1 reading textbooks. They typically have big pictures, few pages, and small amounts of text, so children who parents cannot afford books cannot get more practice [66].

The outcome of confused beliefs about reading acquisition is evident in the textbooks of many low-income countries (e.g., [67]). Students receive whole-word instruction without textbooks in an unknown language that has a complex orthography. It seems a bizarre way to teach reading, but all over Africa it happens every day.

With political will, this fundamental cause of the learning crisis can be mitigated in about two years. Given the time limitations of low-income students and schools, curricula might prioritize fluency. To help nearly all students attain automaticity, governments are advised to adopt synthetic phonics and teach reading in local languages whenever possible, since the latter are consistently spelled. Letters are to be taught one by one, with pattern analogies, plenty of practice opportunities, phonological awareness, and writing. Grade 1 textbooks should have well-spaced letters, should maximize text than pictures, and contain substantial amounts of text since no other reading materials exist to help achieve automaticity [66]. Reading in official languages

such as English or French might best be deferred until students have acquired automaticity in the same script. During the months that students are engaged in this process, the official language could be taught orally.

Some governments agreed to implement this advice, and school-level pilots showed greatly improved student performance compared to control schools: In Cambodia, performance improved from one year to the next in all measures. For example, letters by minute rose by over 100% (from 30 to 63 letters), words per minute by 63% (from 23 to 35 words), and comprehension by 70% (from 48% to 68% answers correct; [68]). In the Gambia, only 50% of the lessons were taught on average. Still, the percentage of first graders knowing at least 80% of the letters was 69% in the Pulaar language and 57% in Wolof (target was 85% of children [69]). Following six months of application in grade 2 in Egypt, word and text reading fluency rates doubled in comparison to rates obtained two years earlier (from 7 to 15 and from 11 to 21 words per minute respectively; syllable reading tripled from 10 to 28 syllables per minute). By contrast, the same measures in control schools improved only by about 27%. The percentage of students reading 0 correct words was cut by half in project schools (from 44% to 21%) while in control schools it improved only by 10% [70]. The Cambodian and Egyptian programs have been scaled up nationwide by the third year of implementation.

Learning research also helps predict and improve outcomes of teacher training. Poorly educated teachers have been hard to train, and methods imported from middle-income countries have given limited results [71]. Knowledge gaps may impede the retention of unfamiliar pieces of information, and efforts to bring consciously much material in mind may result in cognitive overload [72,73]. In addition, inservice training often is offered through intense brief courses given at training centers. Under such circumstances state-dependent learning and spaced learning research would predict limited recall for long-term use [74,75]. Thus when teachers return to their classrooms, the content may become a vague memory and without reviews, it may fade as work urgencies take over. However, observational learning research findings suggest that teachers may remember better to carry out activities they watched, particularly if they also visualized themselves executing them in class [76,77,78]. Thus, videoclips of the desired behaviors may effectively help train teachers of limited education. These and other learning concepts can help use donor funds more effectively when teachers are trained.

The need to execute effortlessly the building-block skills before engaging in more complex problems seems applicable at all educational levels. Methods that skip preliminary steps or assume that students will learn them rapidly on their own may succeed in teaching mainly those who are better off. Also methods that require little-educated teachers to make multiple rapid decisions and keep track of many items simultaneously may be abandoned. For governments this implies revision of curricula to ensure fluency in component skills, affordable textbooks for all students to facilitate formation of cognitive networks, use of classroom time for practice and elaboration of knowledge, training of teachers to engage students in relevant tasks, and remediation at public expense to those lagging behind.

To disseminate and apply these concepts on a large scale in lower-income countries, experts are needed who understand these principles in detail and can clearly enunciate them. But very few exist. The following section discusses the reasons and proposes some solutions.

2.2 Attracting Cognitive Scientists to International Development

Most studies exploring chunking, automaticity, working memory capacity, or conditions that optimize retention are old. Hundreds of publications from the 1940s to the 1990s explored elementary memory operations. (See for example [79]). The findings have been taught in cognitive psychology courses for decades. Over time, research has specified variables better and measured them more exactly, while neuroimaging has succeeded in linking some cognitive functions to brain functions. Overall, the information processing framework remains valid.

This older body of research has considerable utility for low-income schools. Often nonsense words were used in order to limit knowledge about a subject, and in some ways the paradigms resemble the poor students' limited knowledge. For example, the relationship between instructional time and practice can be clarified by using the cognitive psychology experiments of that period (see for example [80]).

For the education of high-income countries, however, elementary memory operations offer little added value. Students enter grade 1 with much academic knowledge and move quickly beyond basic skills towards issues of greater cognitive complexity [81]. With parents attentive to children's learning at home, the relationship between classroom time and outcomes becomes muddled. Thus fundamental topics such as chunking have become less interesting, and they get less space in cognitive science syllabi. And as complexity increases, the earlier paradigms may appear

simplistic. For example, Daniel Reisberg's 2001 edition of undergraduate cognitive science had informative illustrations of nodes and links of cognitive networks, but by the 2009 edition, they had been omitted [50,82]. Lack of opportunities in explaining and applying these concepts may make it hard for cognitive scientists to identify potential applications and advise low-income countries.

Psychologists may be leaving these concepts behind, but colleges of education have rarely taught them. Traditionally, educators and psychologists have rarely collaborated [83,84,85,86]. Faculties of education have constructed theoretical frameworks on the basis of practices and philosophies of educators such as John Dewey, Lev Vygotsky, Maria Montessori, or Paulo Freire. These luminaries exerted their influence before most cognitive research was carried out. Some contemporary educators discuss learning in terms of ultimate results, as in transformative learning [87, p. 3-4]. Specific or intermediate memory processes seemed to have been locked in a black box. Few know where to find the key, and there is limited interest in looking for it.

Moreover certain education professors express caution against cognitive science or neuroscience. Some believe that information processing is a reductionist framework that leads to narrow and mechanistic prescriptions [88,89,90,91]. Similarly certain textbooks that teach reading to university students caution against using cognitive science [92]. Such beliefs are inevitably transmitted to students who are the next generation of workers in international development. It is difficult to base justifications on concepts that specialists have learned to ignore.

To mitigate the learning crisis in low-income countries therefore, the challenge is considerable. The existence of building-block cognitive concepts must be demonstrated, often to skeptical audiences. The concepts must become attractive to teach in seminars or training events aimed at government or donor decisionmakers. Potential middle-class biases must be discussed diplomatically, and somehow decisionmakers must be trusted to remember and use explanations that run counter to their beliefs.

Thus solutions with a high payoff for the poor may be mired in perennial philosophical disputes among academics and lie unused. Arguably, the standards of higher-income countries create obstacles for the education of the marginalized.

Can cognitive scientists fill the needed role of learning specialists in international development? Graduates are relatively few and are usually absorbed in the job markets of higher-income countries. When they conduct research, it is funded by institutions as the National Science Foundation that are interested in topics pertinent to

high-income countries. So cognitive scientists are unfamiliar with donor agencies, and the latter are similarly unfamiliar with what cognitive scientists can do.

And the cognitive scientists who are interested in international development need preparation. They must become familiar with the learning needs of very constrained environments. It is hard for inexperienced people to conceive of students dropping out in grades 1-3 or of the need to make children literate by the middle of grade 1. There is a need to understand international development issues and the functions of various donor agencies. There would also be a need to function in foreign languages such as French, Portuguese, or Arabic. Coursework and internships in bilateral or multilateral organizations would fulfill these needs. Thus, interested professionals would become able to function as consultants or full-time staff of donor agencies or contractors.

Some cognitive scientists might collaborate productively with departments of comparative and international education. These departments focus mainly on sociocultural and economic issues of education across countries and offer no courses in learning. However, the faculty and students often conduct field research in low-income areas, sometimes observing classes for months in rural Subsaharan Africa. Joint research might be most useful in addressing priority topics on improving learning efficiency for the poor. And it may encourage international education departments to introduce coursework on learning.

3. PRIORITY LEARNING RESEARCH FOR LOW-INCOME COUNTRIES

The research on the building blocks of learning is broadly applicable to all humans, but the studies were mainly conducted with college students in the U.S. Findings are being used translationally to formulate hypotheses. However, new rigorous research is needed to unravel the learning issues that hold the very poor back at all stages of education.

Of primary importance are topics pertaining to the acquisition of automatized perceptual and performance skills by children and adults. Crucial are visual pattern recognition features that can help speed up literacy acquisition in children and unschooled illiterate adults [93,94]. To help determine the easiest methods to teach basic reading to nearly all students, parameters for chunking might also be developed, picking up where older research left off (e.g., [95]).

For fluent and effortless performance in basic math, there is a need to understand better how to develop the number sense and the Weber fraction of poor students, particularly given the limited instructional means of poorly resourced schools [96].

One risk of dropout in the early grades could be referred to as *literacy attrition*. If a student drops out soon after acquiring reading automaticity, is that lost? Research suggests that 6 year olds forget more information than 9 year olds [97]. But is automaticity as forgettable as episodic information? A 1986 study [53] found that Egyptians who dropped out fluent readers in grade 4 maintained and improved their skills, while those who could not read well forgot what they knew. As with language attrition, children may forget how to read, but the parameters are not known. Variables influencing the permanence of automaticity could be aggregate hours of practice, maximum reading speed attained, practice intervals, age at abandonment, or something else.

Countries with large numbers of languages are often advised to offer reading in a subset of languages that are used for regional communication. Residents often learn them from casual interactions, such as commercial transactions. Community learning is certainly important [98]. However, the parameters of learning languages from the environment are unknown. On average how much do students learn across time? How do~~es~~ language knowledge limitations affect their reading automaticity?

Some people ask why it is worth using a regional lingua franca rather than use English from the beginning. The consistent spelling seems to confer an advantage over English and French, so one small study showed benefits [99]. But how big are they and what are the costs? Languages are learned through interaction, so children cannot learn a language merely by watching TV [100, pp. 133–144]. However, does a broadcasting teacher in a class constitute an intermediate situation? These issues must be explored.

Students' knowledge is limited by teachers' information processing capacity. To succeed in training teachers who have limited education, many questions ought to be answered. For example, what are the most effective ways to improve teachers' automaticity in basic math calculations so that they can check students' work instantly and effortlessly? Insights are also needed on how many and how complex tasks these teachers can comfortably carry out and how to estimate these empirically. To use

observational learning protocols in teacher training, information is needed on the optimal "dosage" that would maximize the probability of executing in class the behaviors presented through videos.

Some officials expect that marginalized students will somehow learn acceptable skills despite scant instruction. To provide some realism, older studies of learning rates could be repeated with low-income populations. For example, what would be the lowest amount of time spent engaging in a task, and what would be the optimal distribution of practice sessions that would enable 85% of learners to attain reading rates of 60 words per minute in two school years? Similarly, what would be the minimum amount of time and optimal distribution that would enable 85% of the students to carry out correct arithmetic operations on 10 or more digits per minute in grades 1-3? [59]. The questions are not limited to primary education. For secondary or higher education students who have spent their school lives without textbooks (as in Mozambique), there is a need to research how to optimize the remaining time and teach efficiently the basic concepts they have missed. The contribution of technology must be studied from this perspective, though large-scale remediation programs have been limited.

An important advantage of engaging cognitive (neuro) scientists in this research is training in neuroimaging and instruments such as event-related potentials. To optimize instruction in difficult circumstances, it is insufficient to collect mere paper and pencil data. There is a need for eye trackers, experience sensing devices, or psychophysics displays. fMRI[6] can be realistically used mainly in countries such as South Africa or India, but eye tracking and event-related potentials equipment have become portable. These would provide valuable insights in the workings of children who read and count under circumstances that have probably never been researched.

One difficulty with the needed research is that such studies have limited relevance to higher-income countries; therefore funding has been nearly impossible to get. However, donor agencies are becoming more interested in financing learning research. A partnership led by the World Bank has been developing parameters for various topics. It is hoped that suitable amounts of funding can become available. Research targeted on learning basics is urgently needed if the Education for All initiative is to succeed.

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[6] *Functional magnetic resonance imaging (fMRI).*

4. FUTURE PROSPECTS IN THE EDUCATION OF THE VERY POOR

The learning outcomes of the very poor clearly demonstrate why it is important for the donor community to understand better the principles of learning. Certainly, economic and other socioeconomic factors must be mitigated so that children can enroll, attend, and stay in school. But when children come to class, they must process information according to certain biologically determined requirements. One of them is a need to learn the fundamental components first and perform them with sufficient speed to undertake sequences of operations within the capacity limits of working memory.

In high-income countries, students usually get plenty of elaboration and practice opportunities, so they become adept at basic kills and can quickly progress to more complex tasks. Tackling more complex concepts may help students become more efficient learners, so the amount of information that higher-income students can abstract, organize, and retain increases exponentially [101]. But in low-income countries, the limited prior knowledge and instruction make it hard for learning rate to take off. Delays in acquiring the basics delay the acquisition of complex information. Limited practice with reading, writing, and math may make work slow and tedious and limit what children can achieve. Each operation may require extra milliseconds, and these add up. But operations must nevertheless be conducted inside a working memory window that has limited capacity. Thus, processing speed can affect whether a test item can be answered correctly, incorrectly, or just abandoned. Small but systematic differences in basic skills performance may add up over the grades and result in large performance differences between the higher and lower-income countries in international comparisons.

Differences in learning rate may explain to some extent the findings that the average child of lower-income countries performs at the 5th percentile of wealthier countries [13]. The score difference in PIRLS between Hong Kong and Morocco suggests that very roughly fourth graders in Hong Kong may get 150% more information than Moroccans, given an equivalent text and same timeframe. Fourth graders in Singapore may do roughly three times more arithmetic operations than fourth graders of Yemen.

Scores of tests like TIMSS are analyzed through sophisticated procedures and extensively discussed in various countries and the donor community. Much is made of the differences in international comparison tests, but insights about their evolution are

rather limited. Certainly home background is important, but in some respects it is distracting. Educational systems cannot educate homes; they must concentrate on what can be done in class.

The author has found a few cross-cultural studies on reaction-time [102]; but no studies have been found that tracked performance on variables leading to those test scores, such as response time to simpler and more complex tasks and amount of information retained over weeks or months of school. Possibly response times to simple reading passages and math operations could follow a logistic S curve, with low-income countries at the bottom. But without a good handle on information processing variables, government and donor decisionmakers find it hard to focus on the critical variables to improve during school. And without a valid causal chain, it is not easy to remedy deficits.

Intellectual leadership is therefore needed to explain issues convincingly and open new areas for research. Such leadership might best be provided by scientists who understand the how memory works. If governments focus curricula on the automaticity of small information chunks, the performance gap between the poorer and richer countries may be reduced. Without expertise on information processing, such an outcome is unlikely. Colleges of education produce legions of PhDs every year who lack the training to deal with information processing. And there is no evidence of imminent change in this respect.

Due to a lack of expertise, the education of the children who live on a dollar pay day may be compromised by the very people who aim to help them. Education specialists in low-income countries routinely design curricula that seem aimed at average rather than lower scores of international tests. The curricula cover large amounts of material, expect students to read several pages on their own per day, develop reading textbooks on the basis of whole-language methods, assume that students somehow have learned thousands of English and French words by grade 4, and leave much to the discretion of poorly educated teachers [103]. Therefore students get little if any exposure to the preliminary knowledge needed for learning the more complex materials. This is how middle-class standards may rob the poor of the scant learning opportunities that international donors put at their disposal with so much effort.

As things stand in 2013, the academic community that once generated the basic memory principles has moved on. But the mission to educate the millions of students who live on a dollar per day is barely underway. To serve them, we must

reintroduce the 20th century research pertinent to simpler cognition. Teaching and researching essential memory principles might produce better informed policies and learning outcomes. Without them, pouring billions of dollars into the budgets of low-income countries is tantamount to dropping food packages on isolated villages and hoping that some will fall into cooking pots. Disappointment may reduce donor investments or divert them from education to other sectors (See for example [104]).

The challenges to disseminate and apply these concepts are significant but if suitably prepared cognitive scientists become engaged, there is hope. To teach the poor efficiently and fulfill children's UN right to education, human cognitive commonalities offer unique opportunities. In all countries, governments must offer students dense and well-connected networks of knowledge, with automatized basic skills. Thus human capital can be optimized worldwide. And some currently obscure psychological research can be shown to have worldwide implications.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Web-Based Homework Assignments for Introductory Physics Courses

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Abstract: In this work, we investigated the use of online homework in teaching introductory physics courses at United Arab Emirates University. The online homework assignments were conducted by "mastering physics course managing system. Students had unlimited time for each question within the due date. They also received hints and feedback to correct their answers. The average grade for all homework s for each student has been calculated and classified according to the time spent in solving the homework. The time spent spans over an interval of time 0-800 minutes, and a Gaussian distribution for the time interval was observed with a peak at 300-400 minutes. It showed that students spent short time got a homework grade below 60% of the total grade; on the other hand students spent longer time achieved grades above 60%. The results were found to be correlated with students scores achieved in traditional written tests.

Keywords: online tests; e-learning; blackboard manager; web-based courses; mastering physics; general courses.

1. INTRODUCTION

Students poor performance in introductory physics courses is known to be a global issue [1]. Many physics educators contributed towards resolving this observation by using new different teaching methods [2-4]. The use of new technologies has received the attention of educators to improve students performance [5]. Advances in computer technology are transforming the methods of instruction to a web-based one [6]. Their effectiveness for the learners provides a new paradigm of research [7]. They are widely used in higher education in delivering the material and assessing students learning. In United Arab Emirates University (UAEU), the new technologies such as laptop projects, blackboard course management, e-learning and many others involving various hardware and software products are in use [8]. It has been proven that combining lecturing with other teaching

methods and technology helps students retain their interest and attention, which stimulate students for more participation, and emphasizes different learning styles [9,10]. Mastering physics is an emerging such medium which has been proven to facilitate problem-solving transfer through tutorial problems [11], which contains help in the form of requestable hints, descriptive text, and feedback. It tutors students individually while providing instructors with rich teaching diagnostics. Twice as many students were able to complete problems correctly in real-time compared to those problems that did not provide any help [12]. The students homework performance using a web-based testing system and paper-based in introductory physics courses have been assessed and compared. The result showed that students perceptions about the web-based homework system were positive, and it suggests that students were motivated to complete more homework using the web-based method [13,14]. The effect of web-based assessment on student achievement was conducted in conceptual tests, exams, and homework assignments [15]. It is found that the web-based homework scores were higher than that of the paper homework.

In this work, mastering physics homework managing system is used for online assignments of introductory physics courses at UAEU. We have investigated the impact of the time allowed for students to complete an online homework on their average score, and its correlation with students performance in traditional written examinations.

2. THE STUDY

The data in this study involves 30 students taking the first introductory physics course (electricity and magnetisms) at UAEU. Each student has to open an account on a web- based tutorial homework system called mastering physics by using a pass code provided by Pearson publisher. Students were asked to work out an online homework assignment at the end of each chapter which allows students to practice solving problems on the basic physics concepts covered during the lectures. The homework includes multiple choice, fill in numbers, and essay questions.

When a student login to the assignment site, he/she will find several questions that were carefully selected by the course instructor from the site accompanies the textbook “University Physics by Young and Freedman [16]. Questions were selected from the end of each chapter, test bank, and tutorial problems and questions. An example of the online homework is shown in the appendix at the end of this manuscript, and contains 4 problems to assess students understanding in calculating

the magnetic force on a moving charge in a magnetic field, and the force on a wire-carrying current in a magnetic field. Here, students are asked to complete the homework assignments outside the classroom and they can use the textbook or any other reference, since this activity is assessment for learning which based on thinking rather than memorizing. They might interact with each other; therefore, the learning process of individual student is affected. It is reported that plagiarisms is a very serious problem and it is the form of academic dishonesty that has significantly increased in the last 40 years [17]. Therefore, homework options and features in mastering physics allow restrictions in order to minimize students plagiarism. In this work several restrictions were implemented:

a) Limit the due date for submitting their assignments; about a week time was given for students to complete an online homework.
b) Questions appear for students one at a time.
c) The variables of a question were randomized.

After submitting the answers, students received feedback to correct their answers. The feedback includes hints on solving a problem correctly by breaking down the problem into steps. When students were satisfied and felt that they understood their mistakes and learnt how to answer the question or solve the problem correctly, they normally stopped receiving hints. Demanding more hints may affect the total score of the student. Since students understanding is the center of the learning process, in this pilot trial of using mastering physics students were allowed to receive as many hints as they want without any reduction in their score. Moreover, the time for each homework assignment was left open in order to encourage students using the online homework which makes them feel more relax in doing their homework assignments.

To measure the effectiveness of online homework on students learning, the scores were correlated with students performance in traditional tests. Herein, three written tests were scheduled during the semester, and each test covers the material of three chapters in the textbook. The tests were graded uniformly by teaching assistants in the department according to model solutions, and the scores were recorded. On the other hand online homework were automatically graded and recorded by mastering physics homework system.

3. RESULTS AND DISCUSSION

The homework was completed by 30 students distributed over two sections. Each student submitted eight online assignments through mastering physics homework managing system. The total time spent by a student in completing the eight

assignments was calculated. The total times for students are distributed in the range from 71 to 723 minutes. The time scale is divided into eight groups, each of one hundred minutes. The number of students out of the sample in each group is plotted in Fig. 1.

The figure shows a normal Gaussian distribution of the time spent by students with a maximum number of students at 300-400 minutes group, where 37% of the students are belonging to this group. The number of students is decreasing at the sides of the maxima, where a very small number of students spent short-times (0-100 minutes) and long-times (700-800 minutes). Mastering physics course manager classifies the problems according to the progress of students who did these questions all around the globe, in terms of time and difficulty. It is interesting to note that the time of 300 minutes is the total average time spent by students all around the world who did the selected problems, and it agrees with our observation in Fig. 1 that the majority of students in this study spent about this time.

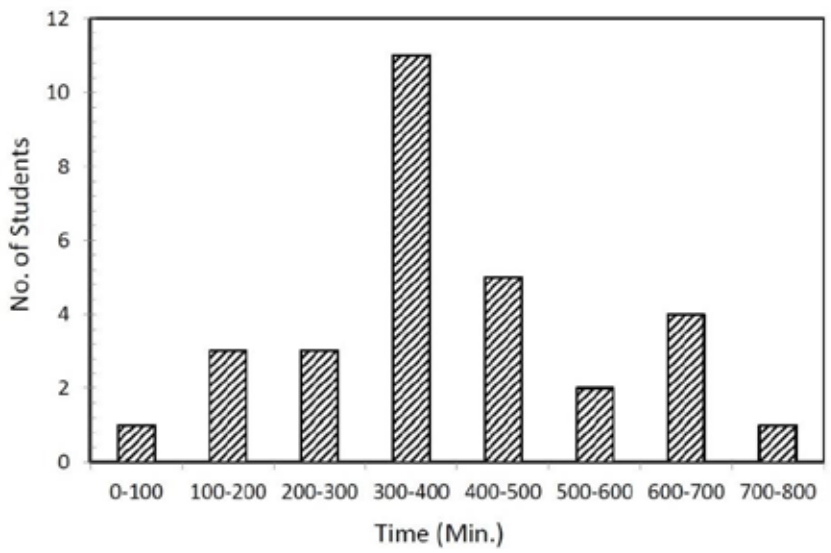

Fig. 1. The number of students distributed over the eight time groups they spent in doing their homework

Students learning through assignments and tests are reflected by students scores. The average score of the eight homework assignments were calculated and categorized according to the grading scheme shown in Table 1. Students in each time group were distributed over the grade categories according to their average homework score. Fig. 2 shows students distribution over the time groups, and the figure displays that students performance in the time groups 0-100 and 100-200 is very low where no students scored more than 60% of the total score. In this group, students did not spend enough time on doing their homework and did not show interest in completing it

successfully. On the other hand, all students who spent longer time between 600-700 minutes showed better performance, where none of them scored less than 60% of the total homework score. Those students are distributed over the grade categories: one student scored between 60-69, one student between 70-79, and two students in the category 90-100.

Table 1. Online homework grading scheme and the number of students in each category

Grades Category	Number of students in each group							
	0-100 min	100-200 min	200-300 min	300-400 min	400-500 min	500-600 min	600-700 min	700-800 min
90 – 100	0	0	2	6	2	0	2	0
80 – 89	0	0	1	1	1	1	0	1
70 – 79	0	0	0	2	2	1	1	0
60 – 69	0	0	0	1	0	0	1	0
50 – 59	0	1	0	1	0	0	0	0
40 – 49	0	0	0	0	0	0	0	0
30 – 39	0	1	0	0	0	0	0	0
20 – 29	0	0	0	0	0	0	0	0
10 – 19	1	1	0	0	0	0	0	0

Between these two extremes there are three students spent time between 200 to 300 minutes, where their performance is remarkable and their scores are between 80-100. The other interesting group is 300-400 which consists of about 38% of the sample (11 students).

55% of the students in this category (6 students) scored more than 90, and other students are distributed over grades from 50 to 89. The time scale between 300-400 minutes could be considered as a standard time for the sincere and serious students for completing successfully the given eight online assignments.

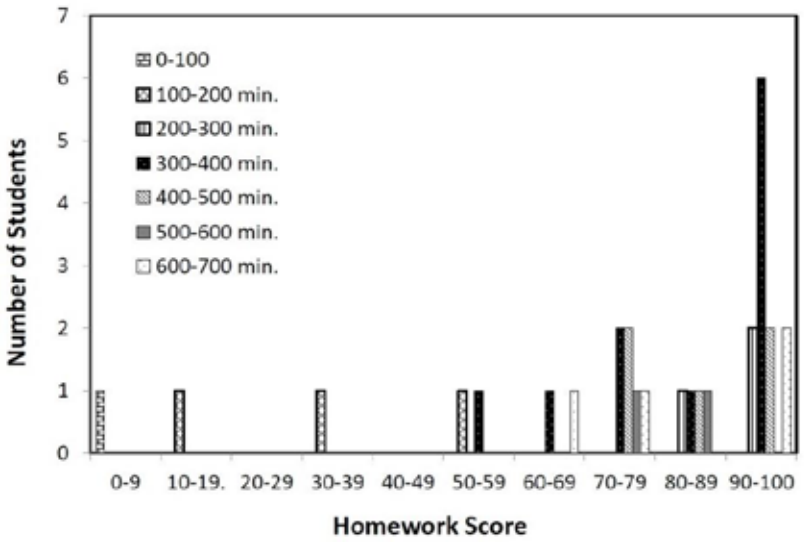

Fig. 2. The distribution of students over grade categories for each time group

The performance of students in the homework as observed in Fig. 2 is not absolute, because students may receive some external help; many students were motivated by a desire to pass the course and/or obtain a degree rather than to learn. The written tests in solving analytical problems can be considered a good measure for students understanding, since students made and complete the tests in the class under the instructor invigilation. Therefore, the average scores of students in online homework were correlated with students average grades in three written tests that cover the same homework material, as shown in Fig. 3. Each point in the figure represents the average score of one student. The score is calculated out of one hundred. The dashed line in the figure is the best straight line fit for the data with a slope equal to 0.75. A more realistic relationship between the online homework and average score of the tests can be found by calculating the correlation coefficient *r* using [18]:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \frac{\left(\sum X\right)^2}{N}\right)\left(\sum Y^2 - \frac{\left(\sum Y\right)^2}{N}\right)}},$$

where X and Y are the correlated variables for homework and tests average scores, respectively. The correlation coefficient of student s performance in Fig. 3 was found to be $r = 0.54$, which indicates that the performance in online homework somehow reflects the actual academic level of students, as measured by the written-test scores. The data points in Fig. 3 are accumulated around the least square fit straight line, nevertheless there are poin scattered away on both sides towards either high or low homework performance. Students with low performance spent short period of time between 100-200 minutes in solving the problems. They are considered to be inactive during the semester, because they showed less interest and missed the opportunity to improve their skills through the online homework assignments and other activities. On the other hand, the offline high homework performance was achieved by students who might seek others help or spent longer time to solve the homework problems.

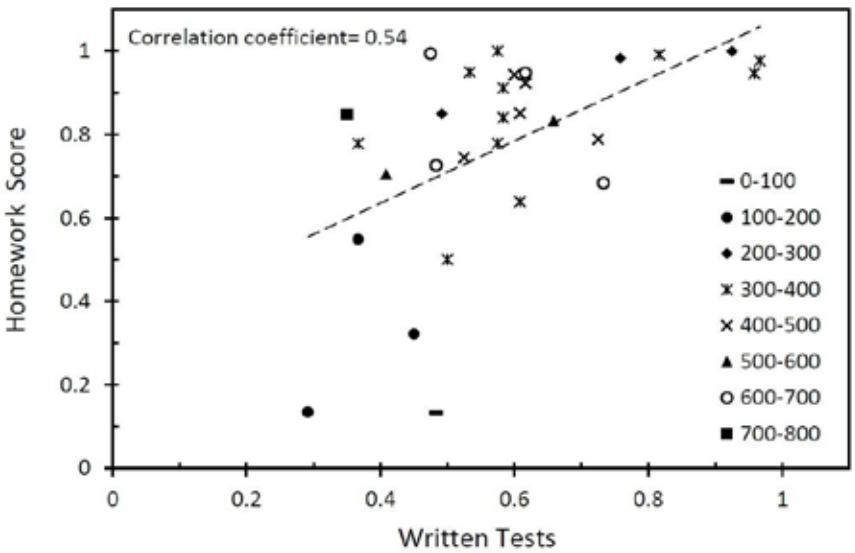

Fig. 3. The average scores for students in online homework assignments versus written tests for all time groups in minutes. The data is normalized to the highest possible score. The dashed line is the least square fit for the data of all time groups

Receiving external help (plagiarism) is a worldwide problem and its popularity among students deserves more consideration. Normally, students who spent a short period of time and they got a higher score in the homework than in the exams were most probably received an external help. Hence the percentage of students in each time group who gained higher average score in the homework than the trend line (straight line fit) of the data in Fig. 3 was calculated, and the percentage in each time group is plotted in Fig. 4. The figure shows that 25% of the students who spent short time (100-200 min.) in solving their homework most probably did not ask for an external help, due to their low scores. It seems that those students have minimal motivation to improve their learning. The percentage of students who achieved better performance in the homework increased with time; and it reaches 80% for students who spent 600-700 minutes in solving their homework. Those students either have received an external help or they had sufficient time to do their assignment correctly. In the group 300-400, there are 11 students, 6 of them (55%) achieved high homework score. Among the 11 students there are 3 students (27%) scored above 80 in the tests. It is remarkable that 200-300 minutes was sufficient to complete the online homework successfully, and 2/3 of the students in that group achieved above 80 in the written tests. This may conclude that the time 300-400 minutes is more than enough to complete the online assignments, and about 50% of the students in the time group 300-400 are most likely received an external help in

doing their homework. Note that adding the number of students that might have received external help in doing their homework for all time groups and divided by the total number of students in the sample, it gives about 50%. It is remarkable that this value is in good agreement with the percentage of students normally passed the final exams in general physics courses at UAEU. This is not characterizing UAEU students only, but also students in other places [19]. The absence of external help factor in the written tests suggests that students who did not practice solving homework problems were not be able to manage the time of the written tests. Consequently, the overall fraction of students passed the written tests is similar to that of the online homework assignments.

Moreover, it is a general habit of students to start working on their homework just prior to the due time. Therefore, they feel under pressure and have to complete and submit their homework. Thus, they exert much less effort and did not learn the analytical skills in solving the problems which were targeted by the homework [10]. Consequently, students performance in the exams is strongly correlated with their seriousness in doing their homework.

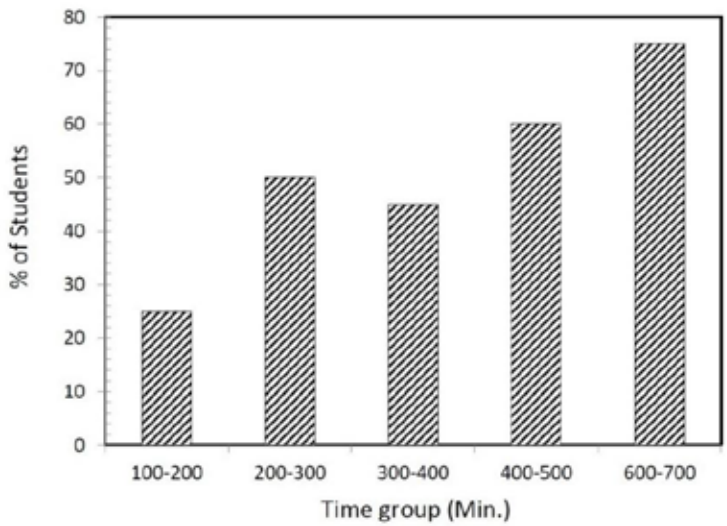

Fig. 4. The percentage of students in each time group who achieved better performance in the homework than the exams

Nevertheless, it is notable that using online homework increases the interaction of honest students during the semester; we noticed that the online tests had a considerable effect on students learning and achievements. Students felt that they can manage their scores and they were given the opportunity to enhance self-learning through hints on demand. Knowing that they can improve their scores, students

became more responsible and displayed a very positive interaction among students and with their instructor.

4. CONCLUSION

The effect of time spent in solving online homework problems on the students performance has been investigated. The total time spent by a student in completing 8 homework assignments was calculated. The data for all students is found to be distributed between 71 to 723 minutes. The analysis showed that:

- The majority of students spent 200-400 minutes, and the time found to be sufficient to complete the homework assignments.
- The fraction of students in each time group with higher homework score than tests is increasing with increasing the time duration.
- About 50% of the students in the sample might either had received an external help to do the online homework or they managed to do it during a longer period of time.
- The results display a reasonable connection between the students performance in solving the homework and the written tests with a correlation coefficient of r 0.54 It is recommended to consider more time restrictions for the online homework duration and due date to allow students practice on managing the time of the tests.

ACKNOWLEDGEMENT

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Exercise 27.1

A particle with a charge of $\Delta 1.4 O 10^{\Delta 8}\ C$ is moving with instantaneous velocity $\vec{v} = (4.80\text{m/s})\,\hat{i} + (-3.20\text{m/s})\,\hat{j}$.

Part A

What is the force exerted on this particle by a magnetic field $B\ \Delta\,(1.60T\,)i^0$? Find the x-component.

$F_x =$ N

Submit My Answers Give Up

Part B

Find the y-component.

$F_y =$ N

Submit My Answers Give Up

$F_z =$ N

Submit My Answers Give Up

Part D

What is the force exerted on this particle by a magnetic field $\overset{\mathrm{D}}{B}\ \Delta\,(1.60T)k^0$? Find the x-component.

$F_x =$ N

Submit My Answers Give Up

Part E
Find the y-component.

$F_y =$ N

Submit My Answers Give Up

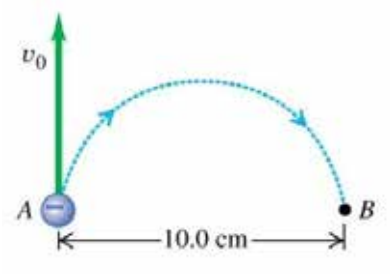
Part F
Find the z-component.

$F_z =$ N

Submit My Answers Give Up

Exercise 27.15

An electron at point A in the figure (Fig. 1) has a speed of $1.2\,0\,10^6\ m/s$.



Part A
Find the magnitude of the magnetic field that will cause the electron to follow the semicircular path from A to B.

$B =$ T

Submit My Answers Give Up

Part B
Find the direction of the magnetic field that will cause the electron to follow the semicircular path from A to B.

- out of the page
- into the page

Submit My Answers Give Up

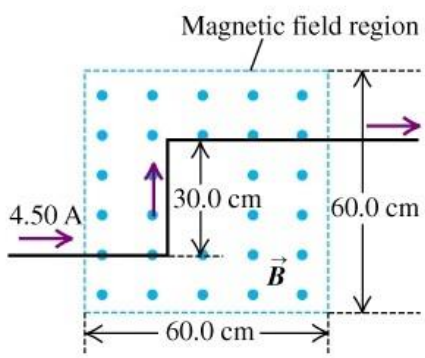
Part C
Find the time required for the electron to move from A to B.

$t =$ s

Submit My Answers Give Up

Exercise 27.35

A long wire carrying 4.50 A of current makes two 90° bends, as shown in the figure. The bent part of the wire passes through a uniform 0.240 T magnetic field directed as shown in the figure and confined to a limited region of space.



Part A
Find the magnitude of the force that the magnetic field exerts on the wire.

$F =$ N

Submit My Answers Give Up

Part B

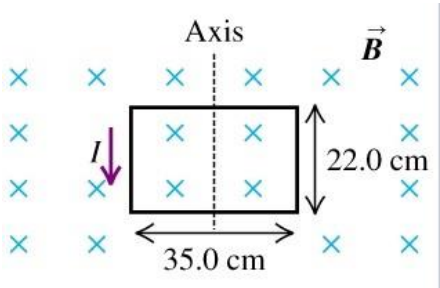
Find the direction of the force that the magnetic field exerts on the wire.

ϕ = ° clockwise from right direction

Submit My Answers Give Up

Exercise 27.44

A rectangular coil of wire, 22.0 cm by 35.0 cm and carrying a current of 1.40 A , is oriented with the plane of its loop perpendicular to a uniform 1.50 T magnetic field, as shown in the figure.



Part A

Calculate the net force which the magnetic field exerts on the coil.

F = N

Submit My Answers Give Up

Part B

Calculate the torque which the magnetic field exerts on the coil.

τ = N · m

Submit My Answers Give Up

Part C

The coil is rotated through a 30.0 angle about the axis shown, the left side coming out of the plane of the figure and the right side going into the plane. Calculate the net force which the magnetic field now exerts on the coil. (Hint: In order to help visualize this 3-dimensional problem, make a careful drawing of the coil when viewed along the rotation axis.)

F = N

Submit My Answers Give Up

Mathematical Model of the Amount of Information in the Human Memory for Short Time Discrete Trainings

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Abstract: A mathematical model of the change in the amount of information in the memory of an abstract individual is presented in the presence of time-sensitive "short-time discrete" trainings (information filling). In the created model, the amount of information is a solution of impulsive differential equation with fixed moments of impulsive effects. Several easily verifiable limitations related to the model parameters are proposed, where the amount of information depends continuously on the quantities of multiple replenishments.

Keywords: information, impulsive differential equation, continuous dependence.

INTRODUCTION

This work is a continuation of the research conducted in [3], where the primary dynamic concept of the amount of information $I = I(t)$ is introduced. Here and further we denote time by t. More specifically, $I(t)$ is a measure of a set of knowledge in the memory of generalized abstract person associated with a fixed part of the human knowledge which is measured at the moment t. In the above-mentioned work, the following hypotheses are used:

First hypothesis: Information has a quantitative value $I = I(t)$ for $t \geq 0$;

Second hypothesis: The amount of information $I(t)$ (in the absence of short-time discrete trainings) is a continuous positive function, defined for any moment $t \geq t_0$;

Third hypothesis: The change in the amount of information (in the absence of short-time discrete fillings) at any moment t is proportional to the amount of information at that moment;

Fourth hypothesis: The output data and the results derived are averaged, i.e. they refer to a "typical aggregate representative" chosen by a group of learners placed under the same external conditions.

Under the above assumptions (in the case of absence of short-time discrete fillings of information) in [3] were found common, easily verifiable conditions in which it is claimed that the amount of information:

- Is changing asymptotically weakly;
- Is uniformly Lipschitz stable;
- Is uniformly stable.

Here (in contrast to the work cited), we will assume that with the passage of time, there are short discrete trainings (filling information in memory) of an abstract aggregate individual. We will also assume that the length of these trainings is negligible compared to the total period of study of the dynamics of the amount of information. For this reason, we will consider that:

Fifth hypothesis: Each training takes place instantly, i.e. the change of information takes place jump-like at the predefined moments $t_1, t_2, \ldots,\ t_0 < t_1 < t_2 < \ldots$. At these moments, the discrete fillings of information take place.

We reformulate the second and third hypotheses as follows:

Sixth hypothesis: In the case of short-time discrete trainings, the amount of information is a piecewise continuous positive function which is defined at every moment t, located after the initial moment t_0. The moments (points) of discontinuity $t_1, t_2, \ldots$ of the function $I(t)$ coincide with the moments of short-time trainings;

Seventh hypothesis: Changing the amount of information at any moment $t,\ t \neq t_i,\ i = 1, 2, \ldots$ is proportional to the amount of information at this moment.

Finally, we will require:

Eighth hypothesis: After each training, the increasing in the amount of information

$$\Delta I(t_i) = I(t_i + 0) - I(t_i), \quad i = 1, 2, ...,$$

to be proportional to the amount of information calculated just before the relevant jump-like filling, i.e.

$$\Delta I(t_i) = \beta . I(t_i - 0) = \beta . I(t_i).$$

The coefficient β depends on both the time and the amount of information and that time, i.e. $\beta = \beta(t, I(t)), \quad t \geq 0$.

Further on in the paper, we require hypotheses with numbers 1, 4, 5-8.

PRELIMINARY NOTES

We use the following notations:

- t_0 - the initial moment (point) of studying the dynamics of the amount of information. For convenience we consider that $t_0 \geq 0$;

- I_0 - the amount of information in memory at the initial moment t_0, i.e. $I_0 = I(t_0)$;

- $\alpha'(t), \quad \alpha'(t) \geq 0$ - coefficient of proportional loss of information in memory for $t \geq 0, \ t \neq t_i, \ i = 1, 2, ...$;

- $\alpha''(t), \quad \alpha''(t) \geq 0$ - coefficient of proportional recovery (recovery rate) of information in memory for $t \geq 0, \ t \neq t_i, \ i = 1, 2, ...$;

- $\alpha(t) = \alpha''(t) - \alpha'(t)$ - storage ratio of information;

- $\beta = \beta(t, I(t)) > 0, \quad t \geq 0$ - proportional filling rate for each training;

- $I(t; t_0, t_1, t_2, ..., I_0, \alpha, \beta)$ - the amount of information in memory at the moment $t \geq t_0$ under the condition that:

- at the initial moment t_0, the amount of information is I_0;

- the filling of information take place at the moments $t_1, t_2, ...$.

The inequality $I(t; t_0, t_1, t_2, ..., I_0, \alpha, \beta) \geq 0$ is valid for $t \geq t_0$. It is also clear that $I_0 = I(t_0; t_0, t_1, t_2, ..., I_0, \alpha, \beta)$.

Remark 1. (Deduction of the initial problem modeling the change in the amount of the information in memory). We will consider several cases, depending on the current moment t.

Case 1. First, we consider an arbitrary moment t, satisfying the inequalities $t_0 \le t < t_1$. It is natural to assume that:

- The amount of information at the selected moment t depends only on the initial moment t_0, the initial amount of information I_0, and the coefficient storing information α, i.e. the function $I = I(t;t_0,I_0,\alpha)$;

- The coefficient storing information a at the moment t depends on the length of interval $[t_0,t]$. Therefore, at this moment, the value of this coefficient is equal to $\alpha(t-t_0)$.

Let Δt be a "sufficiently small" positive increment of time. For example, it is mandatory

$$t+\Delta t < t_1 \Leftrightarrow \Delta t < t_1 - t .$$

We will calculate (approximately) the amount of information at the moment $t+\Delta t$. For this purpose, we use the amount of information at the moment t and the coefficient storing information (calculated for $t-t_0$). Taking into account the sixth and seventh hypotheses, we get the approximate equality

$$I(t+\Delta t;t_0,I_0,\alpha) - I(t;t_0,I_0,\alpha) \approx \alpha(t-t_0) I(t;t_0,I_0,\alpha)\Delta t .$$

The approximation error $o(\Delta t)$ in the above equality is higher order with respect to Δt, i.e. it is fulfilled $\lim\limits_{\Delta t\to 0}\dfrac{o(\Delta t)}{\Delta t} = 0$. In other words, we have

$$I(t+\Delta t;t_0,I_0,\alpha) = I(t;t_0,I_0,\alpha) + \alpha(t-t_0) I(t;t_0,I_0,\alpha)\Delta t + o(\Delta t), \tag{1}$$

from where, we find

$$\lim_{\Delta t\to 0}\frac{I(t+\Delta t;t_0,I_0,\alpha) - I(t;t_0,I_0,\alpha)}{\Delta t} = \lim_{\Delta t\to 0}\alpha(t-t_0) I(t;t_0,I_0,\alpha) + \lim_{\Delta t\to 0}\frac{o(\Delta t)}{\Delta t}$$

$$\Rightarrow \frac{dI(t;t_0,I_0,\alpha)}{dt} = \alpha(t-t_0) I(t;t_0,I_0,\alpha),\ t_0 \le t < t_1 . \tag{2}$$

The above equation will be called model equation of the dynamics of the amount of information in the interval $t_0 \le t < t_1$.

For convenience, we will assume that for $t = t_1$, it is fulfilled

$$I(t_1;t_0,I_0,\alpha) = \lim_{t\to t_1,\, t<t_1} I(t;t_0,I_0,\alpha) = I(t_1-0;t_0,I_0,\alpha),$$

i.e. the function I is continuous on the left hand side at this point. The corresponding initial value problem has the form

$$\frac{dI}{dt} = \alpha(t-t_0)I, \quad I(t_0) = I_0, \quad t_0 \le t \le t_1. \tag{3}$$

Case 2. Let t be an arbitrary moment satisfying the constraints $t_1 < t < t_2$. According to the fifth and eighth hypotheses, right after the moment t_1, the amount of information is filled immediately, i.e. the function I changes jump-like. We have

$$\begin{aligned} I(t_1+0;t_0,t_1,I_0,\alpha,\beta) &= I(t_1;t_0,I_0,\alpha) + \Delta I(t_1;t_0,I_0,\alpha) \\ &= I(t_1;t_0,I_0,\alpha) + \beta(t_1, I(t_1;t_0,I_0,\alpha)).I(t_1;t_0,I_0,\alpha). \end{aligned}$$

It is clear that:

- The amount of information in memory at the moment t, $t_1 < t < t_2$, depends on the initial moment t_0, the moment of filling the information t_1, the initial amount of information I_0, coefficient storing information α and a coefficient of proportional filling in training β, i.e. $I = I(t;t_0,t_1,I_0,\alpha,\beta)$;
- the coefficient storing information at the selected moment t depends on the length of the interval $[t_1,t)$, i.e. $\alpha = \alpha(t-t_1)$.

Similarly to (1), we reach the equality

$$\begin{aligned} &I(t+\Delta t;t_0,t_1,I_0,\alpha,\beta) \\ &\quad = I(t;t_0,t_1,I_0,\alpha,\beta) + \alpha(t-t_1)I(t;t_0,t_1,I_0,\alpha,\beta)\Delta t + o(\Delta t). \end{aligned}$$

Here, we will require the inequality $\Delta t < t_2 - t$. From the above equality (as in the case (2)), we find

$$\frac{dI(t;t_0,t_1,I_0,\alpha,\beta)}{dt} = \alpha(t-t_1)I(t;t_0,t_1,I_0,\alpha,\beta), \; t_1 < t < t_2.$$

We assume again that for $t = t_2$, the function I is continuous on the left hand side. We have

$$I(t_2;t_0,t_1,I_0,\alpha,\beta) = \lim_{t\to t_2,\, t<t_2} I(t;t_0,t_1,I_0,\alpha,\beta) = I(t_2-0;t_0,t_1,I_0,\alpha,\beta).$$

In this interval, the corresponding initial problem has the form

$$\frac{dI}{dt}=\alpha\left(t-t_1\right)I;$$
$$I\left(t_1+0\right)=I_1=\left(1+\beta\left(t_1,I\left(t_1;t_0,I_0,\alpha\right)\right)\right).I\left(t_1;t_0,I_0,\alpha\right),\quad t_1<t\le t_2. \tag{4}$$

Case (i+1). Let $t_i<t<t_{i+1},\ i=2,3,\ldots$. We consecutively obtain the equalities:

$$I\left(t_i+0;t_0,t_1,\ldots t_{i-1},t_i,I_0,\alpha,\beta\right)$$
$$=I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right)+\Delta I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right)$$
$$=I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right)$$
$$+\beta\left(t_i,I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right)\right).I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right);$$
$$I\left(t+\Delta t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right)$$
$$=I\left(t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right)+\alpha\left(t-t_i\right).I\left(t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right).\Delta t+o\left(\Delta t\right),$$
$$\Delta t<t_{i+1}-t;$$
$$\frac{dI\left(t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right)}{dt}=\alpha\left(t-t_i\right)I\left(t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right),\ t_i<t<t_{i+1};$$
$$I\left(t_{i+1};t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right)$$
$$=\lim_{t\to t_{i+1},\ t<t_{i+1}}I\left(t;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right)=I\left(t_{i+1}-0;t_0,t_1,\ldots,t_i,I_0,\alpha,\beta\right).$$

In this case, the initial value problem has the form

$$\frac{dI}{dt}=\alpha\left(t-t_i\right)I;$$
$$I\left(t_i+0\right)=I_i=\left(1+\beta\left(t_i,I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right)\right)\right).I\left(t_i;t_0,t_1,\ldots,t_{i-1},I_0,\alpha,\beta\right); \tag{5}$$
$$t_i<t\le t_{i+1},\ i=2,3,\ldots .$$

Taking into account the problems (3), (4), (5), the general problem modeling the dynamics of the amount of information in memory for each $t\ge t_0,$ has the form

$$\frac{dI}{dt}=\alpha\left(t-t_i\right)I,\quad t_i<t\le t_{i+1}; \tag{6}$$

$$I\left(t_i+0\right)=\left(1+\beta\left(t_i,I\left(t_i\right)\right)\right).I\left(t_i\right),\ i=1,2,\ldots; \tag{7}$$

$$I\left(t_0\right)=I_0. \tag{8}$$

Remark 2 (Form of the solution of the modeling initial problem) Taking into considerations the above cases, the general solution of the above initial problem can be presented in the form

$$I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right)=\begin{cases} I\left(t;t_0,I_0,\alpha\right),\ \ t_0\le t\le t_1; \\ I\left(t;t_0,t_1,I_0,\alpha,\beta\right),\ \ t_1<t\le t_2; \\ ..... \\ I\left(t;t_0,t_1,...,t_i,I_0,\alpha,\beta\right),\ \ t_i<t\le t_{i+1},\ i=2,3,...; \\ ..... \end{cases} \tag{9}$$

If the function α is continuous for $t\ge 0$, then the solutions of the initial problems (3), (4) and (5) are respectively the functions:

$$I\left(t;t_0,I_0,\alpha\right)=I_0\exp\left(\int_{t_0}^{t}\alpha\left(\tau-t_0\right)d\tau\right),\quad t_0\le t\le t_1;$$

$$I\left(t;t_0,t_1,I_0,\alpha,\beta\right)=I_1\exp\left(\int_{t_1}^{t}\alpha\left(\tau-t_1\right)d\tau\right),\quad t_1<t\le t_2;$$

$$I\left(t;t_0,t_1,...,t_i,I_0,\alpha,\beta\right)=I_i\exp\left(\int_{t_i}^{t}\alpha\left(\tau-t_i\right)d\tau\right),\ t_i<t\le t_{i+1},\ i=2,3,....$$

Using (9) and taking into account the above formulas for the solution of problem (6), (7), (8), we obtain

$$I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right)=\begin{cases} I_0\exp\left(\int_{t_0}^{t}\alpha\left(\tau-t_0\right)d\tau\right),\ \ t_0\le t\le t_1; \\ I_1\exp\left(\int_{t_1}^{t}\alpha\left(\tau-t_1\right)d\tau\right),\ \ t_1<t\le t_2; \\ ..... \\ I_i\exp\left(\int_{t_i}^{t}\alpha\left(\tau-t_i\right)d\tau\right),\ \ t_i<t\le t_{i+1},\ i=2,3,...; \\ .....,\end{cases}$$

where the constants $I_1,I_2,...$ satisfy the equalities:

$$I_1=\left(1+\beta\left(t_1,I\left(t_1;t_0,I_0,\alpha\right)\right)\right).I\left(t_1;t_0,I_0,\alpha\right);$$

$$I_i=\left(1+\beta\left(t_i,I\left(t_i;t_0,t_1,...,t_{i-1},I_0,\alpha,\beta\right)\right)\right).I\left(t_i;t_0,t_1,...,t_{i-1},I_0,\alpha,\beta\right),\ i=2,3,...$$

.

The problem (6), (7), (8), which is the main object of the present paper, is a typical initial value problem for differential equations with impulsive effects at the

impulsive moments $t_1, t_2, \ldots$, fixed in advance. This class of equations is a convenient mathematical apparatus for modeling processes that during their development are subjected by short-time external effects. It is supposed that the duration of these effects is negligible compared to the total duration of the processes. Therefore, it can be assumed that the effects are “instantaneous” and take place in the form of impulses. The solutions of the corresponding initial value problems are piecewise continuous functions with first type points of discontinuity and at which the solutions are continuous on the left hand side. In the introduction of monograph [8], it is said that: „The necessity to study impulsive differential equations is due to the fact that these equations are useful mathematical machinery in modelling many real processes and phenomena studied in the optimal control, biology, mechanics, medicine, bio-technologies, electronics, economics, etc.” Some specific applications of these equations are

- Population dynamics: [5], [6];
- Generalized mathematical model of the evolution dynamics of a prey-predator type co association, which is subjected to the short term external influences: [4];
- Optimization problems for impulsive Lotka-Volterra model: [1];
- "Shocking" price changes in the closed markets: [7];
- Change of the valve shutter speed in its transition from open to closed state: [2];
- Perturbations in cellular neural networks: [9], etc.

We will use the following parameters for the system (6), (7), (8):

H1. The function $\alpha \in C\left[R^+, R^-\right]$.

H2. The function β is:

- positive in its domain, i.e. $\beta : R^+ \times R^+ \to R^+$;
- Lipschitz function to its second argument with constant $L_\beta > 0$, i.e.

$$\left(\forall (t, I'), (t, I'') \in R^+ \times R^+\right) \Rightarrow \left|\beta(t, I') - \beta(t, I'')\right| \le L_\beta \left|I' - I''\right|;$$

- bounded with constant $\beta_{\max} > 0$, i.e.

$$\left(\forall (t, I) \in R^+ \times R^+\right) \Rightarrow \beta(t, I) \le \beta_{\max}.$$

H3. The impulsive moments (moments of discrete obtaining the information) $t_1, t_2, \ldots$ do not have a condensation point, i.e. $\lim_{i\to\infty} t_i = \infty$.

Remark 3 (Estimates for variables $I_1, I_2, \ldots$) The following upper estimates for the initial values $I(t_1+0)$, $I(t_2+0), \ldots$ of the amount of information in each one of the intervals of continuity $(t_1, t_2]$, $(t_2, t_3], \ldots$, are important in obtaining the main results in the paper. We will obtain the estimates by the conditions H1 and H2. We have

$$\begin{aligned} I_1 &= \left(1+\beta\left(t_1, I\left(t_1; t_0, I_0, \alpha\right)\right)\right).I\left(t_1; t_0, I_0, \alpha\right) \\ &\le \left(1+\beta_{\max}\right) I_0 \exp\left(\int_{t_0}^{t_1} \alpha\left(\tau - t_0\right) d\tau\right) \\ &\le \left(1+\beta_{\max}\right) I_0 . \end{aligned}$$

Let us assume that the following estimate is valid

$$I_{i-1} \le \left(1+\beta_{\max}\right)^{i-1} I_0$$

for some $i = 3, 4, \ldots$. Then

$$\begin{aligned} I_i &= \left(1+\beta\left(t_i, I\left(t_i; t_0, t_1, \ldots, t_{i-1}, I_0, \alpha, \beta\right)\right)\right).I\left(t_i; t_0, t_1, \ldots, t_{i-1}, I_0, \alpha, \beta\right) \\ &\le \left(1+\beta_{\max}\right) I_{i-1} \exp\left(\int_{t_i-1}^{t_i} \alpha\left(\tau - t_i\right) d\tau\right) \le \left(1+\beta_{\max}\right) I_{i-1} \\ &\le \left(1+\beta_{\max}\right)^i I_0 . \end{aligned} \tag{10}$$

By induction we find that the estimate (10) is valid for $i = 1, 2, \ldots$.

MAIN RESULTS

Definition 1. We say that the amount of information in memory depends continuously on the short-time discrete fill-in of information, if

$$\left(\forall \varepsilon > 0\right)\left(\forall T > 0\right)$$

$$\left(\forall t_0 > 0\right)\left(\forall t_1, t_2, \ldots;\ t_0 < t_1 < t_2 < \ldots\right)\left(\forall I_0 > 0\right)\left(\forall \alpha \in C\left[R^+, R^-\right]\right)$$

$$\left(\exists \delta = \delta\left(\varepsilon, T, t_0, t_1, \ldots, I_0, \alpha\right) > 0\right):$$

$$\left(\forall \beta^* \in C\left[R^+ \times R^+, R^+\right];\ \left|\beta^*\left(t, I\right) - \beta\left(t, I\right)\right| < \delta \ for\ \left(t, I\right) \in R^+ \times R^+\right)$$

$$\Rightarrow \left| I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right) \right| < \varepsilon, \quad t_0 \le t \le t_0 + T .$$

In other words, for each positive constant ε and for each time interval $t_0 \le t \le t_0 + T$ with length $T > 0$ there exists a corresponding positive constant δ depending on ε, on the length of the time interval T and on the parameters of the system, such that if two proportional filling rates in training differ slightly (more precisely, the module of their difference is less than the constant δ in the whole domain $R^+ \times R^+$), then the respective amounts of information differ insignificantly for each t, $t_0 \le t \le t_0 + T$ (the module of the difference of their amounts is less than the previously chosen constant ε).

Theorem 1. Let the conditions H1 – H3 be valid.

Then the amount of information depends continuously on the short-time discrete fillings of information.

Proof. Let:

- ε and T be arbitrary positive constants;
- $t_0, t_1, t_2 ..., I_0$ be fixed constants and $0 < t_0 < t_1 < t_2 < ...$;
- $I_0 = const > 0$;
- the functions a and β satisfy the conditions H1 and H2, respectively;
- $\beta^* \in C\left[R^+ \times R^+, R^+\right]$ and $\left|\beta^*(t,I) - \beta(t,I)\right| < \delta, \ (t,I) \in \left[t_0, t_0 + T\right] \times R^+$,

where the constant δ we will specify later.

From condition H3 we conclude that there exists a number k, such that $t_k \le t_0 + T < t_{k+1}$. We will consider successively the time intervals $\left[t_0, t_1\right]$, $\left(t_1, t_2\right]$, ..., $\left(t_{k-1}, t_k\right]$.

Case1. $t_0 \le t \le t_1$. In this case, we have

$$\left| I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right) \right| = \left| I\left(t;t_0,I_0,\alpha\right) - I\left(t;t_0,I_0,\alpha\right) \right| = 0$$

.

We reach the equality

$$I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) = I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right), \ t_0 \le t \le t_1, \tag{11}$$

from where, we find

$$\left|I_1^* - I_1\right| = \left|I\left(t_1+0;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t_1+0;t_0,t_1,...,I_0,\alpha,\beta\right)\right| \tag{12}$$

$$= \left|\left(1+\beta^*\left(t_1, I\left(t_1;t_0,I_0,\alpha\right)\right)\right) I\left(t_1;t_0,I_0,\alpha\right)\right.$$

$$\left. -\left(1+\beta\left(t_1, I\left(t_1;t_0,I_0,\alpha\right)\right)\right) I\left(t_1;t_0,I_0,\alpha\right)\right|$$

$$= \left|\beta^*\left(t_1, I\left(t_1;t_0,t_1,I_0,\alpha,\beta^*\right)\right) - \beta\left(t_1, I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)\right)\right| I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)$$

$$< \delta I_0 \exp\left(\int_{t_0}^{t_1} \alpha\left(\tau - t_0\right) d\tau\right) < I_0 \delta .$$

Case 2. $t_1 < t \le t_2$. In this case, using (12), we get

$$\left|I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right)\right| \tag{13}$$

$$= \left|I\left(t;t_0,t_1,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,I_0,\alpha,\beta\right)\right|$$

$$= \left|I_1^* \exp\left(\int_{t_1}^{t} \alpha\left(\tau - t_1\right) d\tau\right) - I_1 \exp\left(\int_{t_1}^{t} \alpha\left(\tau - t_1\right) d\tau\right)\right|$$

$$= \left|I_1^* - I_1\right| \exp\left(\int_{t_1}^{t} \alpha\left(\tau - t_1\right) d\tau\right)$$

$$< \left|I_1^* - I_1\right|, \ t_1 < t \le t_2 .$$

Moreover,

$$\left|I_2^* - I_2\right|$$

$$= \left|I\left(t_2+0;t_0,t_1,I_0,\alpha,\beta^*\right) - I\left(t_2+0;t_0,t_1,I_0,\alpha,\beta\right)\right|$$

$$= \left|\left(1+\beta^*\left(t_2, I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)\right)\right) I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)\right.$$

$$-\left(1+\beta\left(t_2, I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)\right)\right) I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta\left(t_2, I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)\right)\right) I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)$$

$$\left. -\left(1+\beta\left(t_2, I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)\right)\right) I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right|$$

$$< \left|\beta^*\left(t_2, I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)\right) - \beta\left(t_2, I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right)\right| I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta\left(t_2,I\left(t_1;t_0,t_1,I_0,\alpha,\beta\right)\right)\right)\left|I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)-I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right|$$

$$<L_\beta\left|I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)-I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right|I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta_{\max}\right)\left|I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)-I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right|$$

$$<\left(L_\beta I_1\exp\left(\int_{t_1}^{t_2}\alpha\left(\tau-t_1\right)d\tau\right)+1+\beta_{\max}\right)\times$$

$$\times\left|I\left(t_2;t_0,t_1,I_0,\alpha,\beta^*\right)-I\left(t_2;t_0,t_1,I_0,\alpha,\beta\right)\right|,$$

from where, using the condition H1 (i.e., that the function α is negative) and the inequality (13) for $t=t_2$, we obtain the estimate

$$\left|I_2^*-I_2\right|<\left(L_\beta I_1+1+\beta_{\max}\right)I_0\delta.$$

Assume (for some $i=2,3,\ldots$) the validity of estimates:

$$\left|I\left(t;t_0,t_1,\ldots,I_0,\alpha,\beta^*\right)-I\left(t;t_0,t_1,\ldots,I_0,\alpha,\beta\right)\right|<\left|I_{i-1}^*-I_{i-1}\right|,\quad t_{i-1}<t\le t_i;$$

$$\left|I_i^*-I_i\right|<\left(L_\beta I_1+1+\beta_{\max}\right)\left(L_\beta I_2+1+\beta_{\max}\right)\ldots\left(L_\beta I_{i-1}+1+\beta_{\max}\right)I_0\delta.$$

Case i+1. $t_i<t\le t_{i+1}$. We have

$$\left|I\left(t;t_0,t_1,\ldots,I_0,\alpha,\beta^*\right)-I\left(t;t_0,t_1,\ldots,I_0,\alpha,\beta\right)\right|$$

$$=\left|I\left(t;t_0,\ldots,t_i,I_0,\alpha,\beta^*\right)-I\left(t;t_0,\ldots,t_i,I_0,\alpha,\beta\right)\right|$$

$$=\left|I_i^*\exp\left(\int_{t_i}^{t}\alpha\left(\tau-t_1\right)d\tau\right)-I_i\exp\left(\int_{t_i}^{t}\alpha\left(\tau-t_1\right)d\tau\right)\right|$$

$$=\left|I_i^*-I_i\right|\exp\left(\int_{t_i}^{t}\alpha\left(\tau-t_1\right)d\tau\right)$$

$$<\left|I_i^*-I_i\right|,\ t_i<t\le t_{i+1}.$$

As in the previous case

$$\left|I_{i+1}^*-I_{i+1}\right|$$

$$=\left|I\left(t_{i+1}+0;t_0,\ldots,t_i,I_0,\alpha,\beta^*\right)-I\left(t_{i+1}+0;t_0,\ldots,t_i,I_0,\alpha,\beta\right)\right|$$

$$=\left|\left(1+\beta^*\left(t_{i+1},I\left(t_{i+1};t_0,\ldots,t_i,I_0,\alpha,\beta^*\right)\right)\right)I\left(t_{i+1};t_0,\ldots,t_i,I_0,\alpha,\beta^*\right)\right.$$

$$-\left(1+\beta\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right)\right)I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right)\right)I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)$$

$$-\left(1+\beta\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right)\right)I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\Big|$$

$$<\left|\beta^*\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)\right)-\beta\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right)\right|\times$$

$$\times I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta\left(t_{i+1},I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right)\right)\times$$

$$\times\left|I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)-I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right|$$

$$<L_\beta\left|I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)-I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right|I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)$$

$$+\left(1+\beta_{\max}\right)\left|I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)-I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta\right)\right|$$

$$<\left(L_\beta I_i\exp\left(\int_{t_i}^{t_{i+1}}\alpha\left(\tau-t_1\right)d\tau\right)+1+\beta_{\max}\right)\times$$

$$\times\left|I\left(t_{i+1};t_0,...,t_i,I_0,\alpha,\beta^*\right)-I\left(t_{i+1};t_0,...,t_iI_0,\alpha,\beta\right)\right|,$$

From where, using the above assumption, we get the estimate

$$\left|I_{i+1}^*-I_{i+1}\right|<\left(L_\beta I_1+1+\beta_{\max}\right)\left(L_\beta I_2+1+\beta_{\max}\right)...\left(L_\beta I_i+1+\beta_{\max}\right)I_0\delta.$$

By induction, we showed the following inequalities:

$$\left|I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right)-I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right)\right|=0,\quad t_0\le t\le t_1;$$

$$\left|I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right)-I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right)\right|$$

$$<\left|I_i^*-I_i\right|,\quad t_i<t\le t_{i+1},\ i=1,2,...,k;$$

$$\left|I_1^*-I_1\right|<I_0\delta;$$

$$\left|I_i^*-I_i\right|$$

$$<\left(L_\beta I_1+1+\beta_{\max}\right)\left(L_\beta I_2+1+\beta_{\max}\right)...\left(L_\beta I_{i-1}+1+\beta_{\max}\right)I_0\delta,\ i=2,3,...,k.$$

Using the first two inequalities, we conclude that for

$$\left(t\in\left[t_0,t_0+T\right]\subset\left[t_0,t_1\right]\cup\left(t_1,t_2\right]\cup....\cup\left(t_k,t_{k+1}\right]\right)$$

$$\Rightarrow \left| I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right) \right| < \max\left\{ \left| I_i^* - I_i \right|,\ i=1,2,...,k \right\}$$

$$< \left(L_\beta I_1 + 1 + \beta_{\max}\right)\left(L_\beta I_2 + 1 + \beta_{\max}\right)...\left(L_\beta I_{k-1} + 1 + \beta_{\max}\right) I_0 \delta .$$

From the last inequality and from the estimates (10), finally we obtain

$$\left| I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right) \right|$$

$$< \left(L_\beta I_0 + 1\right)\left(L_\beta\left(1+\beta_{\max}\right)I_0 + 1\right)...\left(L_\beta\left(1+\beta_{\max}\right)^{k-2} I_0 + 1\right)\left(1+\beta_{\max}\right)^{k-1} I_0 \delta,$$

$$t_0 \le t \le t_0 + T.$$

From the last inequality, it is clear that the constant δ can be chosen so that the following inequality is valid

$$\left| I\left(t;t_0,t_1,...,I_0,\alpha,\beta^*\right) - I\left(t;t_0,t_1,...,I_0,\alpha,\beta\right) \right| < \varepsilon,\ \ t_0 \le t \le t_0 + T .$$

For this purpose, it is enough to be valid the following inequality

$$0 < \delta < \frac{\varepsilon}{\left(L_\beta I_0 + 1\right)\left(L_\beta\left(1+\beta_{\max}\right)I_0 + 1\right)...\left(L_\beta\left(1+\beta_{\max}\right)^{k-2} I_0 + 1\right)\left(1+\beta_{\max}\right)^{k-1} I_0}$$

.

The theorem is proved.

CONCLUSIONS

In conclusion, we will formulate some of the results obtained in terms of the dynamics of the amount of information in the memory in case of short-time discrete fillings of the information. In formulating the following conclusions, we assume that the hypotheses given at the beginning of the paper are valid. These hypotheses will be called basic. Mathematically, the hypotheses are expressed by H1-H3 conditions.

Conclusion 1. When the basic hypotheses are present, the amount of information is a piecewise continuous function over time. The points of discontinuity coincide with the moments of reception of information. In continuous parts the amount of information decreases monotonically, provided that the rate of loss of information is greater than the recovery rate. In these hypotheses, the increase in the amount of information is due to the short-time discrete training.

Conclusion 2. Conditions H1 - H3 are completely natural. For example, Condition H1 means that the storage rate of information is negative, i.e. in time

(without external interferences) the information is constantly lost and the losses are carried out “continuously” over the time. Condition H2 means that immediately after training, the information increases impulsively. Jump-like increase is bounded above (this is again set in condition H2). The latter condition H3 shows that short-time discrete trainings are „diluted” over time, i.e. their realizations do not condense to a certain fixed moment.

Conclusion 3. The estimates (10) in Remark 3 show that the amount of information is bounded above. Indeed, having in mind Condition H2, we conclude that information decreases in each interval of continuity. Therefore, its greatest value is in one of the starting moments of the intervals of continuity. In other words, we have $I(t) \le \max\{I_0, I_1, ...\}$. Finally, since discrete trainings for a limited time interval are finite in number, then $\max\{I_0, I_1, ...\} = \max\{I_0, I_1, ..., I_k\} = const.$

Conclusion 4. Through the model created in this work, in a further study, the following interesting question can be answered: is there a total monotony of the amount of information in memory? As we said above, the amount of information decreases in each smooth evolutionary part and after each short-time discrete training increases (jump-like) immediately. The interaction between these two trends gives an answer to the question. Generally speaking, the monotony of the amount of information is determined by the domination of impulsive flows of information in trainings and the evolutionary losses of information between these trainings.

Conclusion 5. Using the basic hypotheses, it is shown that the amount of information in memory is **continuously dependent** on the amount of information acquired in the process of short-time discrete trainings. In other words, let us look at two processes of changing the amount of information that are placed under the same conditions. Let these processes differ slightly only in the amounts of information that are acquired during short-time discrete trainings. Then, if the differences in impulsively received amounts of information are “relatively small”, then the amounts of information in both processes, measured at the same time after the start, differ slightly (see Theorem 1).

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Language Planning Ideologies: Influential Family Language Policy Factors

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Abstract: The focus of this sociolinguistic inquiry are parents' and future parents' (N=3512) ideologies with regard to the most influential factors fostering the (overt/covert) family language policy. The research was carried out in the Istria County, the western-most Croatian county where the Croatian-Italian bilingualism is institutionally recognized and realized *de facto*. The results confirm that, from the sample's point of view, many benefits arise from the possibility of living in a bilingual/multilingual environment and simultaneously acquiring the languages of the social environment, as the majority of the sample thinks that earlier the bilingual/multilingual acquisition starts, better will be the outcome. According to the participants, the children's bilingual/multilingual development and maintenance are strongly influenced by the parents' language practice example and the need and possibility of the active use of the language(s) in the social environment. The research suggests that certain parents'/future parents' sociodemographic and sociolinguistic background factors influence their language planning ideologies.

Keywords: language planning, language policy, language ideology, bilingualism, multilingualism, Istria.

Ideologije o jezičnome planiranju: utjecajni čimbenici obiteljske jezične politike

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Sažetak

Fokus ovoga sociolingvističkoga istraživanja je ideologija roditelja i budućih roditelja (ukupno 3512 ispitanika) o najutjecajnijim čimbenicima koji određuju obiteljsko jezično planiranje i (implicitnu/eksplicitnu) obiteljsku jezičnu politiku. Istraživanje je provedeno u Istarskoj županiji, najzapadnijoj hrvatskoj županiji u kojoj je hrvatsko-talijanska dvojezičnost institucionalno priznata i ostvarena *de facto*. Istraživanjem se potvrđuje ideologija o postojanju prednosti koje proizlaze iz znanja dvaju ili više jezika i življenja u dvojezičnoj/višejezičnoj sredini u kojoj je moguće istovremeno jezično usvajanje obaju jezika, budući da većina sudionika u istraživanju smatra da je omogućeno kvalitetnije usvajanje dvaju jezika što je ranije istovremeno dijete njima izloženo. Za razvoj i održavanje dvojezičnosti u okviru jezičnoga odgoja veoma je zastupljeno mišljenje o najvećoj važnosti primjera jezične uporabe roditelja i stvarna potreba i mogućnost korištenja jezika u društvenoj sredini. Iz obrade rezultata zaključujemo da određeni čimbenici sociodemografske i sociolingvističke naravi utječu na subjektivno poimanje utjecajnih čimbenika obiteljskoga jezičnog planiranja.

Ključne riječi: jezično planiranje, jezična politika, jezična ideologija, dvojezičnost, višejezičnost, Istra.

Uvod

Stavovi roditelja/staratelja, kao određujući čimbenici njihove ideologije o obiteljskome jezičnom planiranju (Caldas 2012; King i Mackey 2007; King i Fogle 2006a, 2006b, 2013; King, Fogle i Logan-Terry 2008; Schwartz 2010; Schwartz i Moin 2012; Shohamy 2006; Valdman 1990; Wei 2012; Yamamoto 1995) u okviru obiteljskog jezičnog planiranja i jezične politike, sastoje se od kognitivnih, afektivnih i konativnih komponenta te impliciraju postojanje vjerovanja/uvjerenja te emotivnih evaluacija koje posjeduju konativnu funkciju i mogu se pretvoriti u sklonost prema ponašajnom djelovanju (Baker 1992; Curdt-Christiansen 2009; De Houwer 2007; Garcia 1985; King 2000; King i Logan-Terry 2008). U tome pogledu, osobito je značajno istraživanje pretpostavki i stavova roditelja i budućih roditelja o pojavi dvojezičnosti/višejezičnosti kada je u pitanju obiteljsko jezično planiranje (i ono koje se odnosi na neposrednu okolinu), odnosno donošenje odluka o uspostavi dvojezičnosti/višejezičnosti prije negoli se ona manifestira, uz ocjenu uspostavljene dvojezičnosti iz sociolingvističke perspektive, što se odražava na podržavanje odluka

o javnoj valjanosti dvojezičnosti u Istri i položaju talijanskoga jezika kao jezika društvene sredine. Naime, u Istarskoj županiji je na institucionalnoj i društvenoj razini ostvarena hrvatsko-talijanska dvojezičnost, odnosno složen oblik sistemskih/funkcionalnih višejezičnih dinamika (diglosijskih/nesavršeno poliglosijskih odnosa), osobito u okviru prisutnih kroatofonih i italofonih jezičnih varijeteta te drugih idioma (Blagoni 2007; Filipi 1989; Milani Kruljac 1990).

Metodologija istraživanja

Cilj istraživanja bio je ustanoviti postojeću recepciju utjecajnih čimbenika dvojezičnoga/višejezičnoga odgoja djece uz sagledavanje sociokulturalne i interakcijske značajnosti istarske dvojezičnosti te je značajno istraživanje prijema, pretpostavki i ideoloških stavova roditelja i budućih roditelja *in primis* o navedenome fenomenu, kao što je već rečeno, prije negoli se on manifestira. Od posebnog zanimanja je trenutak kad se donosi odluka o uspostavi dvojezičnosti i/ili višejezičnosti u obitelji, kako bi se utvrdili stavovi, motivacija za njihov nastanak i način na koji utječu na konotaciju same pojave.

Istraživanje je provedeno anketnim obrascem u najvećim gradovima Istarske županije u kojima postoji institucionalizirana hrvatsko-talijanska dvojezičnost: Pula-Pola, Rovinj-Rovigno, Poreč-Parenzo, Buje-Buie, Labin i njihove okolice. Radi usporednih ciljeva uključeni su i Pazin i Buzet i njihove okolice, odnosno sredine u kojima dvojezičnost postoji, ali nije institucionalizirana. Dvije temeljne kategorije istarskih žitelja koje su obuhvaćene istraživanjem jesu roditelji i budući roditelji. Radi se o roditeljima (ukupno 1178 ispitanika) čije dijete pohađa hrvatski ili talijanski vrtić u jednom od istarskih lokaliteta Istarske županije te o budućim roditeljima (ukupno 2334 ispitanika: 1584 srednjoškolaca koji pohađaju srednje škole s hrvatskim i talijanskim nastavnim jezikom te 667 studenata Sveučilišta Jurja Dobrile u Puli), za koje se smatra da će vjerojatno postati roditeljima u budućnosti. Ukupno 66% uzorka ima od 13 do 25 godina (budući roditelji), a 34% njih od 26 do 65 godina (roditelji). Prema stručnoj spremi 1584 ispitanika) je završilo osnovnu školu, a studenti su završili srednju školu (ukupno 667 ispitanika i 83 roditelja koji su ujedno i studenti). Stručna sprema riditelja dijeli se na više razrede osnovne škole (5,2% uzorka), srednju školu (47,8% uzorka), višu školu (11,4% uzorka), sveučilišnu diplomsku razinu (31,8% uzorka) i poslijediplomsku razinu (3,8% uzorka).

Istraživanjem se željelo utvrditi u kojoj mjeri dob, spol, mjesto rođenja (u Istri kao dvojezičnoj sredini ili izvan Istre), mjesto boravka, stručna sprema, te materinski jezik ispitanika utječu na iskazane stavove o obiteljskome jezičnom planiranju kada je u pitanju dvojezični/višejezični odgoj. Ispitanici su iskazali mišljenje o najpogodnijem redoslijedu jezičnoga ovladavanja: a) najbolje je da dijete dobro nauči svoj materinski jezik prije ovladavanja drugoga jezika ili b) što je ranije dijete izloženo jednom i drugom jeziku istovremeno, bolje će ih usvojiti. Ispitanicima je dana i mogućnost dopisivanja slobodnog odgovora. Nadalje, utvrđuje se mišljenje ciljne skupine o razdoblju kada je važno odlučiti kojim će se jezikom služiti roditelj u odgoju djeteta: a) prije djetetova rođenja, b) u prvim godinama života, c) nije bitno jer odabir dođe spontano ili d) mogućnost dopisivanja slobodnog odgovora. Kako bi bila omogućena stratifikacija na dvije temeljne podskupine uzorka, utvrđuje se ima li ispitanik djece i jesu li ona jednojezična ili dvojezična te bi li ispitanik želio da njegovo dijete bude dvojezično (pitanje koje služi kao kontrolno pitanje za testiranje koherentnosti odgovora). Kako bi se istražio prijem utjecajnih čimbenika za razvoj i održavanje dvojezičnosti kod djeteta, navode se sljedeće tvrdnje (ukupno 10 tvrdnji) i mogućnost dopisivanja slobodnoga odgovora - *Što utječe na razvoj i održavanje dvojezičnosti kod djeteta?: primjer uporabe jezika roditelja; mogućnost korištenja jezika s drugim govornicima; potreba za uporabom jezika u društvenoj sredini; stav roditelja prema jezicima i njihovim govornicima; stav šire obitelji i prijatelja; stav društva; škola i nastavnici/profesori; TV i ostali mediji; knjige*).

Rezultati

Uspoređujući odgovor na pitanje o želji ispitanika da im djeca budu dvojezična i tipologiju njihove jezičnosti (jednojezični ili dvojezični ispitanici), na razini cijeloga uzorka budućih roditelja iskazuje se pozitivan stav prema namjeri da djeca ispitanika budu dvojezični govornici (91,4% uzorka). Pokazuje se statistički značajna razlika između jednojezičnih i dvojezičnih ispitanika ($\chi 2=18,625$; $df=2$; $p<0,01$). U uzorku jednojezičnih ispitanika prosječno 90,5% ispitanika želi da im djeca budu dvojezična, dok u uzorku dvojezičnih ispitanika gotovo svi iskazuju tu želju (98,8%). Ova statistički značajna razlika treba se interpretirati s oprezom zbog toga što je mogla nastati uslijed velikoga broja ispitanika, kada se povećava mogućnost proglašavanja razlika statistički značajnima. U obzir svakako treba uzeti sadržajni aspekt razlike (98,8% prema 90,5% ispitanika koji iskazuju pozitivan stav).

Od ukupnih 8,3% ispitanika koji ne žele da im djeca budu dvojezična 9,1% su jednojezični, a 1,3% dvojezični govornici. Neodlučno je 0,4% jednojezičnih ispitanika.

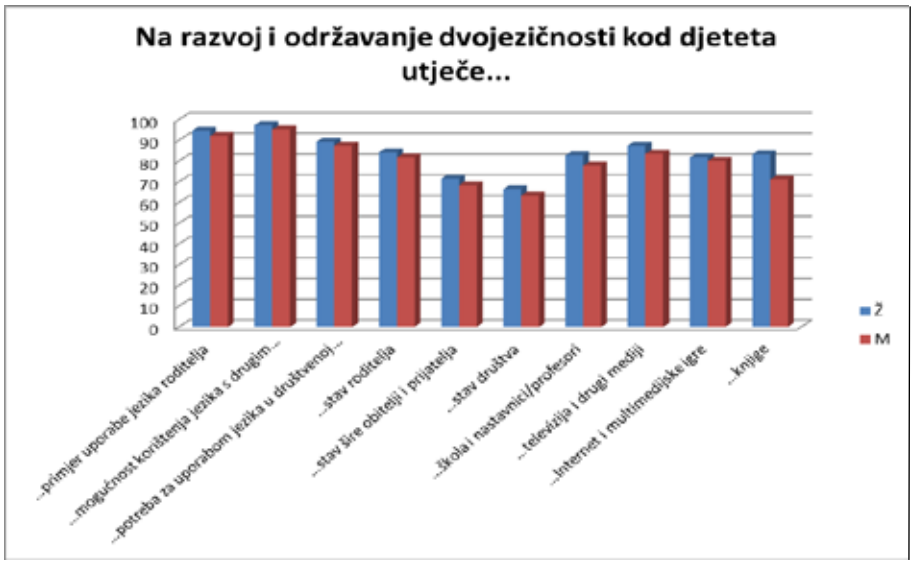
Pitanjem o utjecajnim čimbenicima za razvoj i održavanje dvojezičnosti/višejezičnosti kod djeteta sadržano je deset prethodno navedenih tvrdnji o mogućim čimbenicima koji utječu na razvoj i održavanje dvojezičnosti/ višejezičnosti. Na razini cijeloga uzorka (vidi sliku 1) najutjecajnijima se smatraju sljedeći čimbenici: korištenja jezika s drugim govornicima (kod 96,6% ispitanika), primjer uporabe jezika roditelja (kod 93,7% ispitanika) i potreba za uporabom jezika u društvenoj sredini (kod 89% ispitanika). Slijedi značajnost televizije i drugih medija (86,3%), stava roditelja (83,1%), interneta i multimedijskih igara (81,1%), škole i nastavnika/profesora (81%) te knjiga (79,1%). Iako nadilaze natpolovični dio uzorka, najniže ocjene dobili su stav šire obitelji i prijatelja (70,2% ispitanika) i stav društva (65,4%).

Slika 1: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti

Vodimo li računa o dodatnoj stratifikaciji uzorka prema spolu, nailazimo na vrlo slične rezultate u odgovorima ženskih i muških ispitanika (vidi sliku 2) te primjećujemo konstantnu zastupljenost malo nižeg potvrdnog postotka u odgovorima muških ispitanika u odnosu na ženske. Mogućnost uporabe jezika s drugim govornicima (97,3% ženskih i 95,2% muških ispitanika) i primjer uporabe jezika roditelja (94,7% i 92,1%) ocijenjeni su kao najutjecajniji faktori za jezično

održavanje i razvoj. Potreba za uporabom jezika u društvenoj sredini (89,4% i 87,5%), televizija i ostali mediji (87,5% i 83,5%) se ujedno smatraju značajnim čimbenicima kod ispitanika obaju spolova. Slijede stav roditelja (84,2% i 81,6%), internet i druge multimedijske igre (81,7% i 80%), škola i nastavnici (82,8% 77,8%) te naposljetku stav šire obitelji i prijatelja (71,5% i 68,3%) te stav društva (66,5% i 63,4%). Najveća razlika u odgovorima bilježi se kod evaluacije utjecajnosti knjiga, koju zagovara 83,2% ženskih i 71% muških ispitanika.

Slika 2: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema muškim i ženskim ispitanicima



Ukupno 96,8% ispitanika koji su rođeni u Istri dodjeljuje najznačajniju ulogu mogućnosti uporabe jezika s drugim govornicima u razvoju i održavanju dvojezičnosti/višejezičnosti kod djeteta. Slaže se 95,7% ispitanika koji su rođeni izvan Istre. Primjer uporabe jezika roditelja ocijenjen je kao drugi najutjecajniji čimbenik kod 94,2% dijela uzorka čije je mjesto rođenja unutar Istre i kod 91,7% dijela čije je mjesto rođenja izvan Istre. Prema kriteriju značajnosti slijedi potreba za uporabom jezika u društvenoj sredini (potvrđuje je 89,4% ispitanika koji su rođeni u Istri i 87,4% ispitanika rođenih izvan Istre), televizija i ostali mediji (86,8% i 84%), stav roditelja (84% i 79%), internet i druge multimedijske igre (81,3% i 80,1%), škola i nastavnici (81,1% 80,3%), knjige (78,7% i 80,9%), stav šire obitelji i prijatelja (70,1% i 70,2%) i stav društva (64,7% i 68,7%) (vidi sliku 3).

Slika 3: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su rođeni u Istri i onima koji su rođeni izvan Istre

Ukoliko uzorak stratificiramo prema varijabli materinskoga jezika i usporedimo odgovore pojedinih tipologija ispitanika (tablica 1 i slika 4), primjećujemo da odgovori slijede konstantno kretanje kod svih pet tipologija u odgovorima na prva dva pitanja. Ispitanici stavljaju na prva dva mjesta mogućnost uporabe jezika s drugim ispitanicima (postotci se kreću od 94% do 98,5%) i primjer korištenja jezika roditelja (od 92,6% do 98,2%). U oba se slučaja najviše vrijednosti ističu kod hrvatsko-talijanskih dvojezičnih ispitanika. Nešto manja značajnost dodijeljena je stavu roditelja (od 82,4% do 88%) te internetu i multimedijskim igrama (od 77,3% do 89,6%). Najviše ocjene ističu se kod dvojezičnih govornika čiji su materinski jezici hrvatski i strani jezik. Pogledom na grafički prikaz (slika 4) moguće je ustanoviti postojanje minimalnih odmaka u postotcima odgovora kada je riječ o: primjeru uporabe jezika roditelja, mogućnosti korištenja jezika s drugim govornicima, potrebi za uporabom jezika u društvenoj sredini (s izuzetkom dvojezičnih govornika hrvatskoga i stranoga jezika), stavu roditelja, televiziji i drugim medijima (s izuzetkom hrvatsko-talijanskih dvojezičnih ispitanika i italofonih ispitanika) te internetu i multimedijskim igrama (s izuzetkom dvojezičnih govornika hrvatskoga i stranoga jezika). Kod potvrda preostalih tvrdnji nailazimo na veće razmjere. Nekonstantna kretanja u odgovorima sa značajnim kvantitativnim razlikama uočavaju se u

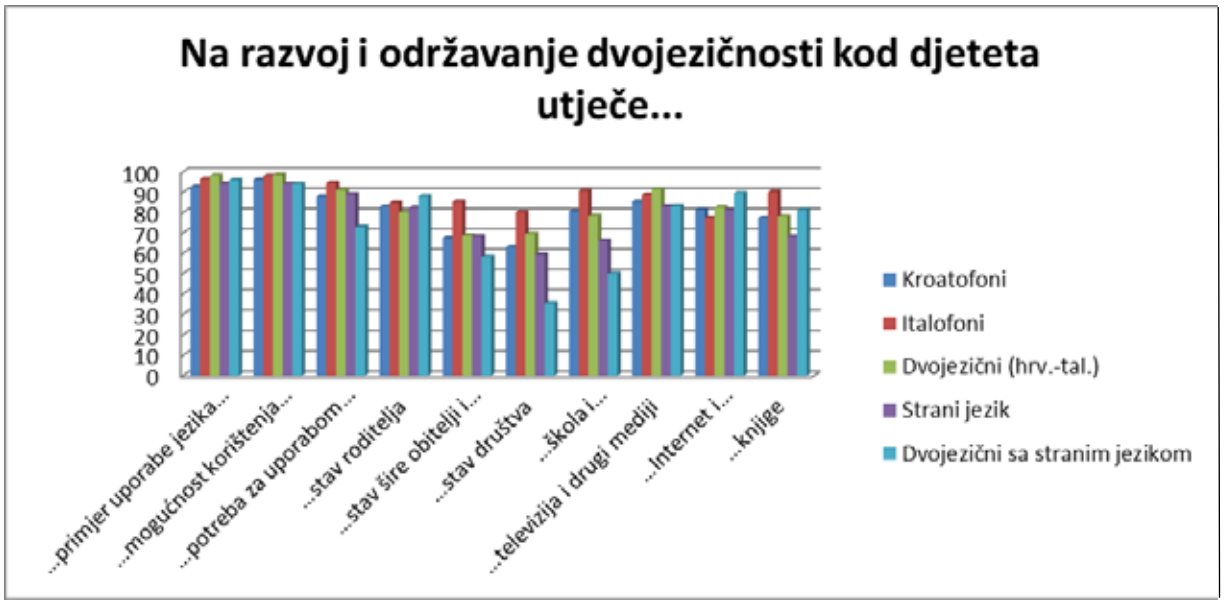
odgovorima kada su u pitanju potreba za uporabom jezika u društvenoj sredini (najmanje dvojezičnih govornika čiji su materinski jezici hrvatski i strani jezik - 72,9%, 87,9% kroatofona, 89,1% monolingvala čiji je materinski jezik strani jezik, 91% hrvatsko-talijanskih bilingvala i najviše italofona - 94,7%), knjige (najmanje jednojezičnih govornika čiji je materinski jezik strani jezik - 68,2%, 77,3% kroatofona, 78,1% dvojezičnih govornika hrvatskoga i talijanskoga jezika, 81,3% dvojezičnih govornika čiji su materinski jezici hrvatski i strani jezik, i najviše italofona - 90,2%), stav šire obitelji i društva (samo 58,3% dvojezičnih govornika hrvatskoga i stranoga jezika i najviše italofona – 85,3%; ostali odgovori su konstantni i lociraju se između 67,5% i 68,7% ispitanika preostalih tipologija), televizija i drugi mediji (od 83,1% do 91,4%), škola i nastavnici (90,7% italofonih ispitanika, 80,6% kroatofona, 78,4% hrvatsko-talijanskih billingvala, 66,2% monolingvala čiji su materinski jezici hrvatski i strani jezik i 50% dvojezičnih govornika hrvatskoga i stranoga jezika). Slična dinamika primjećuje se i kada se spominje stav društva (povoljno mišljenje ima 80,2% italofona, a najmanji postotak bilježi se kod 35,4% dvojezičnih govornika čiji su materinski jezici hrvatski i strani jezik). Moguće je zaključiti da se kod dvojezičnih ispitanika hrvatskoga i stranoga jezika ističu najniži postotci u odnosu na ostale tipologije u odgovorima na polovičan dio postavljenih pitanja.

Tablica 1: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su stratificirani u odnosu na materinski jezik

	Kroatofoni	Italofoni	Dvojezični (hrv.-tal.)	Strani jezik	Dvojezični sa stranim jezikom
…primjer uporabe jezika roditelja	92,6	96,5	98,2	94,2	96
…mogućnost korištenja jezika s drugim govornicima	96,2	98	98,5	94,1	94
…potreba za uporabom jezika u društvenoj sredini	87,9	94,7	91	89,1	72,9
…stav roditelja	82,9	84,8	80,2	82,4	88

…stav šire obitelji i prijatelja	67,5	85,3	68,7	68,3	58,3
…stav društva	63	80,2	69,5	59,4	35,4
…škola i nastavnici/profesori	80,6	90,7	78,4	66,2	50
…televizija i drugi mediji	85,3	88,8	91,4	83,1	83,3
…internet i multimedijske igre	81,4	77,3	82,6	81,3	89,6
…knjige	77,3	90,2	78,1	68,2	81,3

Slika 4: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su stratificirani u odnosu na materinski jezik



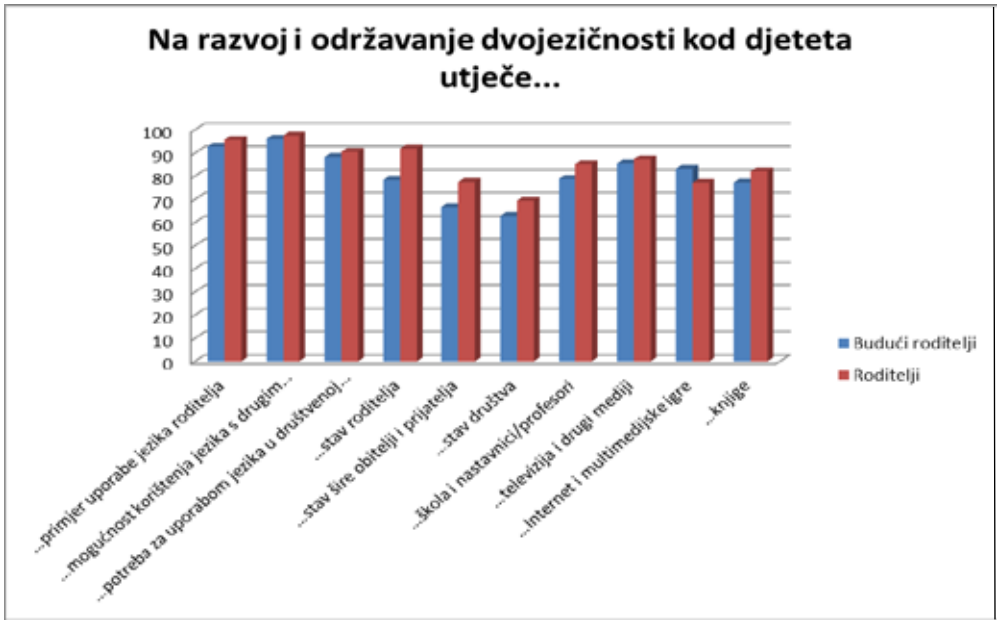
Uzmemo li u obzir odgovore budućih roditelja, odnosno srednjoškolaca i studenata (vidi sliku 5), nailazimo na vrlo slične vrijednosti u odgovorima. Najveći postotci bilježe se u potvrdi utjecajnosti uloge mogućnosti uporabe jezika s drugim govornicima (96,1% srednjoškolaca i 96,4% studenata) i primjera uporabe jezika roditelja (92,4% i 94,9%). Ukupno 88% učenika i 90,2% studenata procjenjuje važnost potrebe za uporabom jezika u društvenoj sredini te 85,8% prvih i 83,6% drugih smatra utjecajnima televiziju i druge medije. Slijedi prepoznavanje značajnosti interneta i multimedijskih igara (82,7% i 86%), školske ustanove i nastavnih djelatnika (78,1% i 82,8%), stava roditelja (78,3% i 79%), knjiga (76,8% i

79,9%) te se najniži postotak ističe kod stava šire obitelji i prijatelja (66,7% i 66,3%) te stava društva (64,1% i 55,8%). Općenito nailazimo na gotovo podjednake, odnosno nešto više postotke u potvrdama tvrdnji kod studenata, s nekoliko izuzetaka (kada je u pitanju televizija i ostali mediji te stav društva).

Slika 5: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema srednjoškolcima i studentima

U razlikovanju odgovora budućih roditelja i roditelja (vidi sliku 6) ne nailazimo na velike razlike i ponavlja se slijed pridavanja najvećih i najmanjih vrijednosti kao i kod dvaju podskupina budućih roditelja. Naime, po redoslijedu najveće pridodane utjecajnosti navode se: primjer uporabe jezika roditelja (92,8% budućih roditelja i 95,7% roditelja), mogućnost korištenja jezika s drugim govornicima (96,1% i 97,5%), potreba za uporabom jezika u društvenoj sredini (88,3% i 90,5%) te uloga televizije i drugih medija (85,5% i 87,3%). Slijedi navod utjecaja knjiga (77,3% i 82,1%) i stava društva, koji se nalazi na posljednjem mjestu (62,8% i 69,4%). Nailazimo, dakle, na prilično konstantne vrijednosti kod jedne i druge skupine s nešto višim postotcima kod roditelja. Najveći odmaci ističu se kod ocjenjivanja relevantnosti stava roditelja za koji 78,4% budućih roditelja smatra da je utjecajan i 91,9% roditelja, stava šire obitelji i prijatelja (66,6% budućih roditelja i 77,5% roditelja), utjecaja interneta i multimedijskih igara (83,2% i 77,2%) te škole i profesora (78,8% i 85,2%). Roditelji dakle u prilično većem postotku potvrđuju utjecajnost navedenih čimbenika.

Slika 6: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema budućim roditeljima i roditeljima



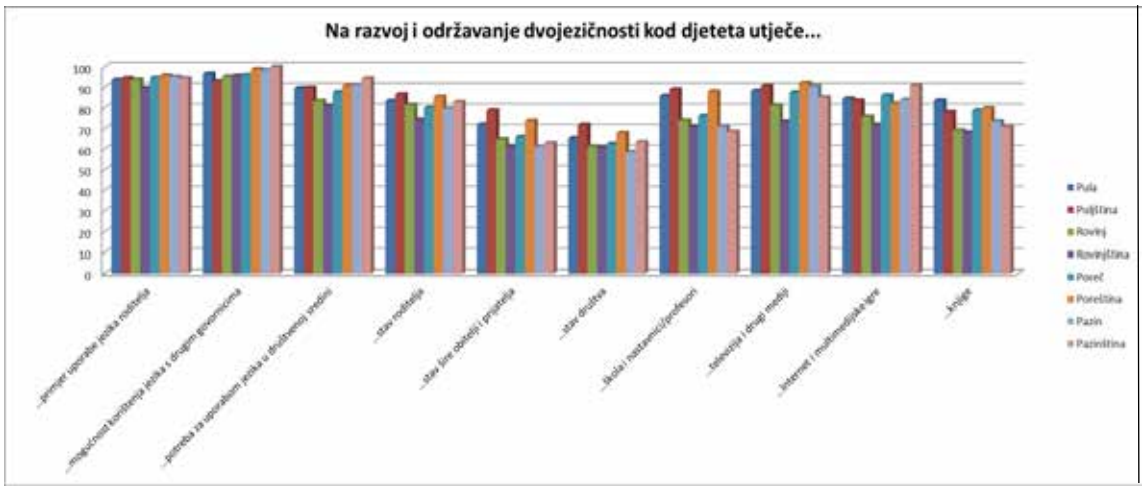
Prema varijabli mjesta boravka (za detaljan prikaz vidi tablicu 2 te slike 7 i 8) razlikujemo ispitanike koje borave u jednom od sedam gradova u kojima je provedeno istraživanje (Pula – u tablici je navedena kratica Pu., Rovinj – Rv., Poreč – Po., Pazin – Pa., Labin – La., Buzet – Buz., Buje – Buj.), odnosno u jednoj od okolica (kratica *ok.* se u tablici odnosi na okolicu svakoga grada) koje okružuju te gradove (puljština, rovinjština, poreština, pazinština, labinština, buzeština, bujština). Posljednja kategorija (označena kraticom *tr. bor.* u tablici) odnosi se na ispitanike koji trenutno borave u Istri, a prebivalište im je pretežito na području Hrvatske, izvan Istre. Njihova skupina u cijelosti (100%) smatra da su najznačajniji čimbenici primjer uporabe jezika roditelja, mogućnost korištenja jezika i stav šire obitelji. Ostali su faktori ocijenjeni prema kriteriju utjecajnosti u sljedećem redoslijedu: stav roditelja, knjige, televizija i drugi mediji, potreba za uporabom jezika, stav društva te naposljetku škola i nastavnici. Razlike u odgovorima ispitanika koji borave u gradu, odnosno u neposrednoj okolici ne razlikuju se značajno. Nailazimo na potpunu potvrdu utjecajnosti (100% ispitanika) kod ispitanika okolice Buzeta kada je u pitanju primjer uporabe jezika kod roditelja, potreba za uporabom jezika i mogućnost korištenja jezika. S posljednjom tvrdnjom slaže se i 100% ispitanika iz okolice Pazina. Na razini cijeloga uzorka prema mjestu boravka primjećujemo da se

najveća utjecajnost raspoznaje u mogućnosti uporabe jezika s drugim sugovornicima (najviša vrijednost koja obuhvaća cjelovitost uzorka bilježi se kod žitelja pazinštine i buzeštine te kod ispitanika koji trenutno borave u Istri, slijedi 99,1% ispitanika okolice Buzeta, dok se najniža vrijednost bilježi u okolici Pule – 93%) i u primjeru uporabe jezika kod roditelja (u svim gradovima i okolicama nadilazi se postotak od 89,7% ukupnog uzorka, koji se ističe u okolici Rovinja, i ne prelazi 95,8%, najvišu vrijednost zabilježenu u okolici Poreča, izuzmemo li potvrdu kod 100% ispitanika buzeštine i ispitanika koji trenutno borave u Istri). Treće mjesto po kriteriju utjecajnosti dodijeljeno je potrebi za korištenjem jezika, što potvrđuje 100% žitelja buzeštine, 95,1% stanovnika Buja a najniži postotak bilježi se u okolici Rovinja (81,2%). Moguće je primijetiti da se žitelji buzeštine ističu po najvišim postotcima potvrdnih stavova u okviru utjecajnosti šest navedenih čimbenika. Prema kriteriju utjecajnosti za jezično održavanje i razvoj ostalih čimbenika na temelju odgovora ispitanika redoslijed je sljedeći: stav roditelja, televizija i drugi mediji, internet i multimedijske igre te su na posljednjem mjestu knjige. Ocjena utjecajnosti stava roditelja konstantna je u gotovo svim gradovima i okolicama i potvrđena je od strane okvirno 80% ukupnoga stanovništva, s najvišom vrijednosti u okolici Buzeta (93,8%) i najnižom u okolici Rovinja (74,4%). Gotovo jednaka situacija bilježi se i za evaluaciju utjecajnosti televizije i drugih medija (najniža vrjednost se bilježi na rovinjštini – 73,5%, a najviša na buzeštini – 93,8%). Internet i multimedijske igre se smatraju utjecajnima u najnižem postotku ispitanika koji se bilježi u Bujama (70,2%) i najvišem postotku koji se bilježi u okolici Pazina (90,9%). Slijede knjige (od 68,1% ispitanika okolice Rovinja do 93,8% žitelja buzeštine) te škola i nastavnici (od 68,5% na pazinštini i 89% u okolici Pule). Velike razlike u evaluaciji utjecajnih čimbenika uočavaju se kada je u pitanju stav šire obitelji i prijatelja te stav društva. Dok većinom oko 60-70% ispitanika na razini uzorka potvrđuje značajnost stava šire obitelji i prijatelja, najniža potvrda ističe se kod 50% ispitanika iz okolice Buzeta, a najviše vrijednosti bilježe se u Bujama (79,1%), odnosno kod 100% ispitanika koji trenutno borave u Istri. Manje značajna je razlika u okviru ocjene stava društva, čiju utjecajnost potvrđuje većinom oko 60% ispitanika na razini uzorka; na najnižu točku (57,5%) nailazimo u Labinu i na najvišu (81,6%) kod ispitanika koji trenutno borave u Istri, odnosno na buzeštini (81,3%).

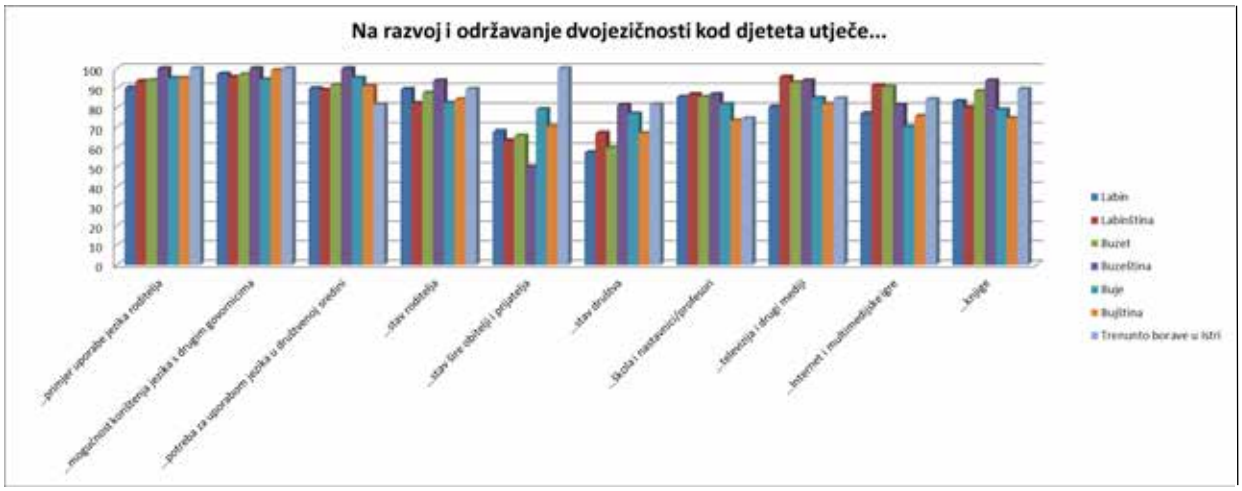
Tablica 2: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su stratificirani u odnosu na mjesto boravka

%	Pu	Ok	Rv	Ok	Po	Ok	Pa	Ok	La	Ok	Buz	Ok	Buo	Ok	Tr. bor
…primjer uporabe jezika roditelja	94	94	94	90	95	96	95	94	90	93	94	100	95	95	100
…mogućnost korištenja jezika	97	93	95	96	96	99	98	100	97	96	97	100	94	99	100
…potreba za uporabom jezika	90	90	83	81	88	91	91	94	90	89	92	100	95	91	82
…stav roditelja	83	87	82	74	80	85	80	83	89	82	87	94	82	84	89
…stav šire obitelji i prijatelja	72	79	65	61	66	74	61	63	68	64	66	50	79	70	100
…stav društva	65	72	61	61	63	68	59	63	57	67	60	81	77	67	82
…škola i nastavnici/ profesori	86	89	74	71	76	88	71	68	85	87	85	87	82	73	74
…televizija i drugi mediji	88	91	81	73	88	92	91	85	80	96	93	94	85	81	85
…Internet i multimedij-ske igre	85	84	76	72	86	82o	84	91	77	91o	91	81	70	76	84
…knjige	84o	78o	69	68	79	80	74	71	83	80	88	94	79	74	89

Slika 7: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su stratificirani u odnosu na mjesto boravka (Pula i okolica, Rovinj i okolica, Poreč i okolica, Pazin i okolica)

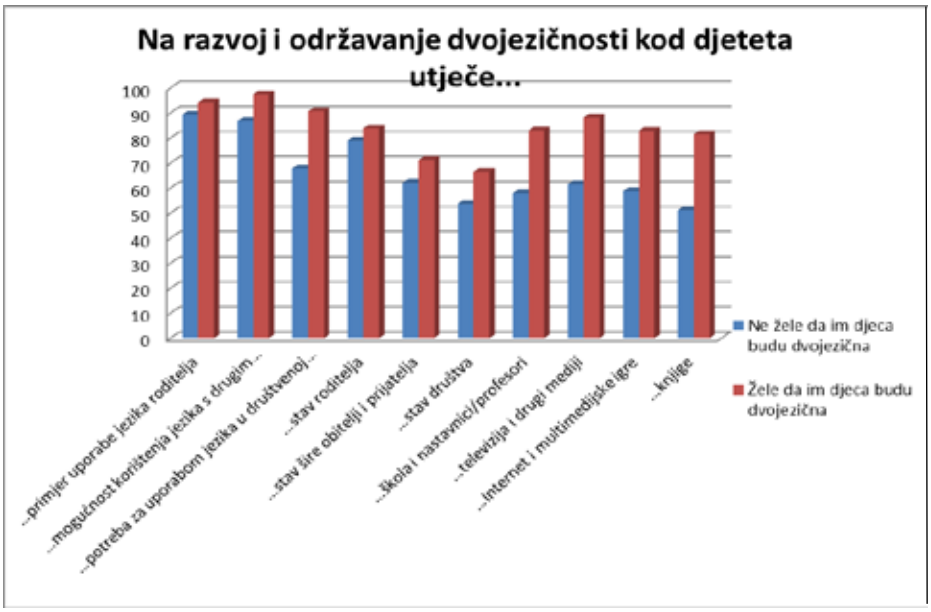


Slika 8: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji su stratificirani u odnosu na mjesto boravka (Labin i okolica, Buzet i okolica, Buje i okolica, ispitanici koji trenutno borave u Istri)



Ispitanici koji iskazuju želju da im djeca budu dvojezična stavljaju na prvo mjesto prema faktoru utjecajnosti mogućnost korištenja jezika s drugim govornicima (97,4%) i primjer uporabe jezika roditelja (94,2%). Iako u manjem postotku, slažu se i ispitanici koji ne žele da im djeca budu dvojezična (86,8% i 89,3%). Između dviju podskupina prvi put u tijeku deskriptivne usporedne analize nailazimo na značajne razlike u odgovorima (vidi sliku 9). Dok 90,7% onih koji priželjkuju dvojezičnost kod djece smatra da je značajna potreba za uporabom jezika u društvenoj sredine za jezično održavanje i razvoj, slaže se samo 67,8% ispitanika koji pripadaju drugoj podskupini. Nije značajno različita evaluacija utjecaja stava roditelja, što potvrđuje 83,8% ispitanika koji žele da im djeca budu dvojezična i 79% onih koji to ne žele, te je nešto značajnija razlika kada je u pitanju stav šire obitelji (71,2% naspram 62,1%) i stav društva (66,5% naspram 53,7%). Najveći kvantitativni odmak bilježi se kod ocjenjivanja utjecaja televizije i drugih medija (s čime se slaže 88,2% ispitanika koji žele da im djeca budu dvojezična i 61,5% ispitanika koji to ne žele), škole i nastavnika (83% naspram 58%), interneta i multimedijskih igara (82,8% naspram 58,8%) te knjiga (81,5% naspram 51,2%).

Slika 9: Čimbenici koji utječu na razvoj i održavanje dvojezičnosti/višejezičnosti prema ispitanicima koji žele da im djeca budu dvojezična i onima koji to ne žele



Usporedimo li odgovore na pitanje o utjecajnim čimbenicima za jezično održavanje i razvoj ispitanika koji smatraju da će dijete bolje usvojiti jezike što je ranije izloženo jednom i drugom jeziku istovremeno od ispitanika koji tvrde da dijete treba usvojiti materinski jezik prije nego što počne ovladavati inim jezikom (slika 10), nailazimo na vrlo male razlike kada je u pitanju utjecaj škole i nastavnika (81,2% naspram 80,4%), stava šire obitelji i prijatelja (70,8% naspram 67,9%) i stava društva (65,4% naspram 64,8%). Posljednja dva čimbenika ocijenjena su na razini dviju podskupina kao najmanje utjecajni u odnosu na ostale čimbenike. Nešto veći odmaci primjećuju se kod ocjenjivanja utjecajnosti mogućnosti korištenja jezika s drugim govornicima (97,7% naspram 93,4%), potrebe za uporabom jezika u društvenoj sredini (90,6% naspram 84,4%), primjera uporabe jezika roditelja (95,2% naspram 89,3%), stava roditelja (84,9% naspram 78,1%). Potvrda posljednja tri čimbenika prema kriteriju utjecajnosti nadilaze razliku od 7% unutar postotka ispitanika koji su istaknuli sljedeće faktore kao utjecajne: televizija i drugi mediji (88,2% naspram 80,6%), internet i multimedijske igre (82,4% naspram 76,6%) te knjige (81,2% naspram 73,3%). Nailazimo, dakle, na veće postotke kod ispitanika čije je mišljenje da će ishodi jezičnoga usvajanja biti bolji kod djece koja su što je ranije moguće istovremeno izložena obama jezicima.

Slika 10: Utjecajni čimbenici za održavanje i razvoj dvojezičnosti/višejezičnosti prema ispitanicima koji smatraju da će dijete bolje usvojiti jezike što je ranije izloženo jednom i drugom jeziku istovremeno i prema ispitanicima koji tvrde da dijete treba usvojiti materinski jezik prije nego što počne usvajati/učiti ini jezik

Zaključak

Istraživanjem se potvrđuje postojanje prednosti koje proizlaze iz znanja dvaju jezika i življenja u dvojezičnoj sredini u kojoj ih je moguće usvojiti istovremeno, budući da većina sudionika u istraživanju smatra da je omogućeno kvalitetnije usvajanje dvaju jezika što je ranije istovremeno dijete njima izloženo (Baker 2007; Bialystok 1997, 2001; Genesee i Nicoladis 2006; Harding i Riley 1986; Lanza 2001; Meisel 2001; Saunders 1988; Zentella 1997). Za razvoj i održavanje dvojezičnosti/višejezičnosti u okviru obiteljskoga jezičnog planiranja veoma je zastupljeno mišljenje o važnosti određenih najutjecajnijih čimbenika, kao što su stvarna mogućnost da se jezik koristiti u komunikaciji s drugim govornicima, primjer uporabe jezika roditelja, odnosno potreba za uporabom jezika u društvenoj sredini. Pogodna je činjenica što su roditelji i budući roditelji svjesni svoje utjecajne uloge i moći prenašanja vlastitih stavova te je kod velike većine sudionika iskazana želja da im djeca budu dvojezična/višejezična zbog percipirane korisnosti učenja talijanskoga jezika kao jezika društvene sredine te ovladavanja inim jezicima kada su u pitanju posredničke jezične funkcije.

Iz statističke obrade rezultata zaključujemo da određeni čimbenici socio-demografske i sociolingvističke naravi utječu na subjektivno poimanje fenomena dvojezičnosti odnosno dvojezičnoga/višejezičnoga odgoja. U tom pogledu ističemo da dvojezični govornik ili pojedinac koji od samoga djetinjstva živi i raste u okruženju gdje je prisutna dvojezičnost/višejezičnost razvija određen afektivan odnos prema prisutnim jezicima u društvenoj sredini, dvojezičnosti kao individualnome i društvenome fenomenu, dvojezičnome odgoju te razvija stavove sukladno vlastitome iskustvu ili posredovanome iskustvu pripadnika okoline.

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Internationalization of Latin American Firms in Europe

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Abstract: Latin American firms have started an accelerated process of internationalization in order to go global and in this scenario we can see how Europe has become one of the preferred and priority destinations for those Latin American firms. The entry strategy of Latin American firms into European market will be affected by several different key factors (business, social, macroeconomics, culture, etc.) which will explain the business decisions to select final destination in Europe for these business projects and understand the new role played by Spain as a potential gateway to large European market.

Keywords: Latin American, firms, internationalization, Europe, factors, Spain.

Abstract: Las empresas latinoamericanas han iniciado un acelerado proceso de internacionalización y salida hacia el exterior y dentro de este escenario de globalización empresarial vemos que Europa se situa como uno de los nuevos destinos emergentes prioritarios para las empresas latinoamericanas. La estrategia de entrada de las empresas latinoamericanas en Europa se basa en una serie de diversos factores (empresariales, sociales, macroeconómicos, culturales, etc.) que pueden explicar el proceso de selección del destino final dentro de Europa de estas inversiones y comprender el nuevo papel desempeñado por España como potencial puente de entrada hacia el gran mercado europeo.

Keywords: America Latina, empresas, internacionalización, Europa, factores, España.

La internacionalización de las empresas latinoamericanas y su proceso de llegada a Europa

Introducción

La aparición de una economía globalizada a principios del siglo XXI ha obligado a las empresas de todos los países a expandir sus actividades más allá de las reducidas fronteras de sus mercados nacionales, el proceso de internacionalización de las empresas ha pasado de ser una opción empresarial a un movimiento imprescindible y forzoso para toda empresa que pretenda sobrevivir en su segmento de negocio en este entorno económico mundial.

Los países latinoamericanos se habían venido caracterizando tradicionalmente por ser receptores netos de inversiones extranjeras (finales del siglo XX primer lustro del presente siglo XXI), debido a las grandes oportunidades de negocio existentes en unos países latinoamericanos de considerable dimensión, grandes cantidades de recursos naturales y un enorme potencial de crecimiento económico.

Se puede afirmar que hasta fechas muy recientes América Latina actuaba como "sujeto pasivo" en la corriente de globalización económica internacional, siendo destino prioritario de las grandes multinacionales extranjeras; al mismo tiempo ciertos problemas endémicos de las economías latinoamericanas (deuda externa, subdesarrollo social, mercados financieros internacionales, etc.) impedía una proyección exterior real de las empresas latinoamericanas.

El crecimiento y estabilidad económica generalizado que se ha desarrollado en gran parte de los países latinoamericanos en los últimos años ha permitido no solo la atracción de un gran flujo de inversión extranjera y la mejora de los resultados financieros de los grupos empresariales extranjeros sino que al mismo tiempo, de forma paralela, se produce la consolidación y crecimiento sostenido de las empresas nacionales latinoamericanas que se han venido beneficiando de un entorno empresarial muy positivo para su modelo de negocio, destacando el aumento de las clases medias en estos países lo que ha permitido una creciente demanda interior, por otra parte las exportaciones de los productos latinoamericanos de materias primas ha progresado de forma exponencial debido a la aparición de nuevos socios comerciales internacionales ávidos por comprar la producción latinoamericana (Asia), todo ello unido a la reducción de la deuda exterior y la mejora del sector financiero que ha posibilitado el acceso al crédito internacional y desarrollo de los planes de negocio de los grupos empresariales latinoamericanos.

El proceso de internacionalización de las empresas latinoamericanas se ha iniciado debido a la confluencia de una serie de factores internos-externos que han

motivado la salida al exterior de los grupos empresariales latinoamericanos: En el ámbito interno la consolidación y cierta saturación de los mercados internos latinoamericanos fuerza a las empresas locales, tal como ocurre en otros países más avanzados, a buscar nuevos mercados alternativos fuera de sus fronteras; en el entorno internacional los grandes acuerdos comerciales y la senda de elevado crecimiento económico en otros países presenta una nueva oportunidad de negocio para los empresarios latinoamericanos. Sin lugar a dudas se puede afirmar que las empresas provenientes de América Latina están protagonizando la tercera gran oleada de internacionalización empresarial en la economía global del siglo XXI, después de los dos primeros movimientos de internacionalización protagonizados por Estados Unidos y Europa y en un segundo momento por las empresas japonesas. (Fleury et al., 2009).

La inserción de las empresas latinas en el mercado mundial sigue una secuencia temporal y espacial que se puede resumir de la siguiente forma; en un primer momento las empresas latinoamericanas comienzan a expandirse hacia Estados Unidos, país que se caracteriza por un alto nivel de importaciones y que por su proximidad geográfica y relaciones comerciales tradicionales se convierte en el mercado natural de los productos ofrecidos por las empresas de sus vecinos del sur, a esto se une toda una serie de acuerdos comerciales que han tratado de fomentar las relaciones comerciales entre América del Norte y Sur.

En una fase posterior las empresas latinoamericanas comienzan una clara expansión hacia la cuenca del Pacífico, lo cual coincide con la estrategia seguida por empresas de otros muchos lugares del mundo (Estados Unidos/Europa), ello se debe por un lado a las altas tasas de desarrollo económico de algunos países asiáticos de esta zona (China, India, Vietnam, Tailandia, etc.) lo que supone un polo de atracción empresarial para las empresas extranjeras de todo tipo; por otra parte las relaciones comerciales con esos países se ven favorecidas por toda una serie de acuerdos comerciales entre los países ribereños del Pacífico que convierte a esta zona del planeta en uno de los nuevos ejes de la economía mundial.

El posicionamiento de las empresas latinoamericanas en el nuevo contexto de una economía globalizada se destaca por el retraso de las empresas latinoamericanas frente a las pertenecientes a los países asiáticos emergentes en su salida al exterior, si bien se puede señalar cierta ventaja competitiva de las empresas multilatinas en su estrategia de internacionalización debido a su habilidad

para hacer frente escenarios empresariales difíciles y diferenciados (Cuervo-Cazurra, 2010).

A pesar de que existen empresas latinoamericanas con presencia global con un origen diverso lo cierto es que se puede destacar la importancia desempeñada por ciertos países latinoamericanos en la emisión de empresas con un claro perfil global (México, Perú, Chile, Brasil y Colombia), si bien hay que mostrar la incapacidad para definir un único modelo de internacionalización de la empresa latinoamericana, a pesar de que en muchos casos el mercado de origen tenga unas circunstancias bastantes similares, esto es importante ya que evita un cierto riesgo de generalización en las conclusiones sobre este proceso (Rivera y Soto, 2010).

1. Europa: Nuevo destino de las empresas latinoamericanas

Durante el transcurso de estas dos primeras etapas de internacionalización se puede afirmar sin lugar a dudas que Europa ha ocupado una posición marginal como destino final de las inversiones latinoamericanas con respecto al resto de socios externos de América Latina (Estados Unidos/Asia) y ello se ha debido a una serie de hechos característicos de la economía Europea durante los últimos lustros; por una parte el mercado europeo está mucho más orientado a la exportación que el estadounidense, siendo menos relevante la parte dedicada a la importación/ consumo, al mismo tiempo la economía europea ha mostrado en los último cuarenta años unas tasas de crecimiento mucho menores que la de los socios comerciales estadounidenses o asiáticos por lo que la inversión en Europa pudiera resultar menos atractivo para la empresa latinoamericanas, finalmente el tipo de cambio del Euro con respecto al resto de divisas se ha mantenido bastante alto hasta fechas muy recientes lo que encarecía en gran manera cualquier proyecto de expansión hacia Europa de la empresa latinoamericana, optando por otros destinos de negocio en donde los incipientes grupos empresariales latinoamericanos pudieran asumir desembolsos financieros imprescindibles para proyectar su empresa hacia el exterior.

Se puede observar que en los últimos años se ha producido una reorientación en el proceso de internacionalización de las empresas latinoamericanas y Europa ha pasado a convertirse en uno de los objetivos empresariales prioritarios para las empresas que llegan del otro lado del Atlántico, lo cual se encuentra dentro de un fenómeno de empresas latinoamericanas que se han convertido en verdaderos

agentes globales y un nuevo modelo de expansión de las empresas originarias de lo que hasta poco se denominaba “países en vía de desarrollo” (Casanova, 2010).

Las causas que pueden explicar este cambio de estrategia en la internacionalización de los grupos de empresa de América Latina son varias, pero sin duda hay que mencionar la reciente crisis económica de los países de la Unión Europea que ha reducido los precios de los activos empresariales lo que permite encontrar buenas oportunidades de negocio a precios muy competitivos, lo cual se ve apoyando por la creciente debilidad del tipo de cambio del Euro; (Castro et al, 2012), por otra parte los hombres de negocio latinoamericano comienzan a ver la importancia de un enorme mercado con un alto poder adquisitivo y con empresas líderes en múltiples sectores que pueden resultar excelentes socios comerciales en el proceso de expansión y diversificación internacional.

Al margen de las nuevas ventajas aparecidas en el marco europeo hay también que subrayar como factores impulsores de este nuevo viraje hacia Europa, el estancamiento de la economía estadounidense y la incertidumbre u oscilaciones de ciertos mercados asiáticos, todo lo que ha propiciado la búsqueda de alternativas comerciales más sólidas y que permitan una diversificación de riesgo internacional.

Finalmente también debemos de destacar la nueva estrategia de la Unión Europea que tiene como uno de sus principales objetivos estrechar los lazos comerciales-económicos con América Latina a través de toda una serie de acuerdos comerciales que permitan contrarrestar en parte el tradicional protagonismo económico-comercial en esa zona de otros países (Estados Unidos/China).

La llegada de las empresas latinoamericanas a Europa no parece seguir un patrón uniforme y si bien se aprecia una cierta preferencia de las empresas latinoamericanas por desembarcar en Europa a través de “países latinos”, muy especialmente España y Portugal, en base a una mayor cercanía cultural e institucional si bien es cierto que aquellas empresas que están más enfocadas a actividades de investigación y desarrollo esta tendencia va a variar y aparecen nuevos países de entrada en la zona de la UE (Alemania, Reino Unido, Bélgica), (Costa et al, 2015).

Las razones que impulsan a las empresas latinoamericanas para seleccionar uno u otro país europeo pueden ser más o menos complejas, pero deben de ser entendidas siempre desde una estrategia particular de dirección y gestión de la empresa. En el proceso general de internacionalización de cualquier empresa y su

intento de acceder a nuevos mercados hay que destacar ciertos financieros (coste laboral, impuestos) así como otros de carácter más genérico (cultura) que ayudan a explicar en gran manera los criterios de elección del punto de entrada hacia Europa.

En este contexto es importante hacer referencia general al posicionamiento de España como puente de entrada que sirva de intermediario para las empresas latinoamericanas que tratan acceder al gran mercado europeo, analizando alguno de los factores que pudieran ser decisivos para seleccionar el país europeo que sirva de plataforma para la posterior expansión por el viejo continente.

2. Proximidad cultural

El factor de proximidad cultural puede ser, sin lugar a dudas, un atractivo importante para escoger a un país como punto de penetración hacia el mercado europeo y en ese caso hay que subrayar la innegable cercanía cultural de los países latinoamericanos con respecto a ciertos países europeos debido a sus lazos históricos tradicionales (España y Portugal).

Este planteamiento sobre la importancia de encontrar entornos culturales parecidos para decidir el proceso de internacionalización de la empresa puede tener un impacto menor de lo esperado en el caso de la salida al exterior de las empresas latinoamericanas debido a dos hechos fundamentales, por una parte las empresas latinoamericanas gozan de una gran experiencia intercultural en mercados muy diferenciados desde el punto de vista cultural (Asia, Estados Unidos) por lo que se podría afirmar que nos encontramos ante empresas con un carácter verdaderamente global y con una marcada curva de aprendizaje cultural que les facilita su entrada en cualquier tipo de país. (Johanson y Vahlne, 2009).

Varios autores vienen haciendo referencia a la especial habilidad de gestión presentada por las empresas latinoamericanas en sus proyectos internacionales debido, entre otras cosas, a la facilidad para adaptarse a nuevos entornos por parte de los hombres de negocios latinoamericanos, basado probablemente en las difíciles condiciones en las que surgen dichas empresas en sus mercados de origen (inestabilidad económica, incertidumbre regulatoria, dependencia exterior, etc.), todo ello parece conformar un perfil especialmente preparado para los procesos de internacionalización de la empresa.

Al margen de cierta pérdida de relevancia del elemento cultural en el fenómeno de internacionalización empresarial dentro de un contexto de mundo

globalizado, sin lugar a dudas los nexos culturales existentes entre América Latina y España (idioma, organización, manejo del tiempo, forma de trabajo, sociedad, etc.) son elementos de indudable utilidad para facilitar las actividades de negocio de las empresas latinoamericanas que llegan a Europa por primera vez, tanto desde el punto de vista organizativo, recursos humanos, management y estrategia de marketing a seguir para implantarse en un nuevo mercado; si bien es cierto que el cálculo de la distancia cultural entre los países latinoamericanos y europeos, incluido España, utilizando la metodología establecida por Kogut and Singh (1988) y utilizando los datos de Hofstede (2017) nos muestran una evidente mayor distancia cultural de los países latinoamericanos con respecto a los países del centro y norte de Europa, comparado con el resto de países mediterráneos, pero sin embargo se aprecia una cierta convergencia cultural con los países del este de Europa (Hungría, Polonia, Rumania, etc.) en aquellas variables que se han seleccionado del índice de Hofstede (tiempo, jerarquía, nivel de incertidumbre, individualismo-grupo), lo que indica que la cercanía cultural se puede ver afectada por otros factores al margen de la historia o de compartir herramientas culturales tan importantes como el idioma (España).

En un mundo empresarial cada vez más globalizado y en el que las fronteras físicas resultan menos importante para el flujo de productos o inversiones también resulta relevante la importancia del conocimiento del entorno cultural de los nuevos mercados de expansión para poder crear ventajas competitivas en el terreno empresarial y reducir los costes asociados al inevitable proceso de adaptación al marco cultural existente en cada país. (Khurana y Talbot, 1998).

3. Coste producción

La primera causa que puede ayudar a comprender el proceso de elección de un determinado país europeo como base de expansión hacia la economía europea, puede ser la disponibilidad de los recursos o Inputs imprescindibles en el proceso de producción para esa empresa en concreto; puede ocurrir que dichos componentes necesarios para el proceso de fabricación no estén disponibles en otros países o bien haya algún país que presente una relación calidad/precio muy competitiva en relación con otros mercados. Esto es especialmente importante para aquellas empresas que producen bienes materiales, no servicios, y cuyo peso de la materia prima es muy importante en el conjunto de los costes totales del producto final.

En el caso de las empresas latinoamericanas es muy probable que en la mayoría de los casos los inputs necesarios para la producción de los bienes tenga un coste bastante mayor que el que puedan encontrar en sus países de origen o incluso mayor que otras regiones del mundo (Asia), sin embargo el proceso de deslocalización productiva hacia Europa obliga a buscar proveedores locales que estén situados más cerca de los nuevos mercados de consumo (Europa).

Uno de los componentes principales de cualquier cadena de suministro es la fuerza laboral, tanto por la necesidad de encontrar trabajo cualificado y especializado para las necesidades concretas de la empresa como por el elevado coste de la fuerza de trabajo y su impacto en el precio final del bien producido y su posible competitividad en los mercados internacionales; es por ello que uno de los factores mas determinantes a la hora de optar por un nuevo asentamiento de las actividades empresariales/productivas en el exterior, por lo que será imprescindible presentar una tabla comparativa de los costes laborales por hora en los diferentes países europeos para poder comprender por qué ciertas empresas escogen países europeos aparentemente “no estratégicos” como base de sus actividades exteriores.

Tabla 1: Costes laborales por hora (2015)

	$			$
Alemania	42,42		Estados Unidos	37,71
Bélgica	46,56		Japón	23,60
Eslovaquia	11,26		China (2013)	4,12
Estonia	11,02		India (2013)	1,59
España	23,65		Filipinas	2,16
Francia	37,59			
Hungría	8,25			
Irlanda	36,02			
Italia	31,48		Brasil	7,97
Países Bajos	36,53		Méjico	5,90
Polonia	8,53		Argentina	20,76
Portugal	11,08			
Reino Unido	31,44			
República Checa	10,29			

Fuente: The Conference board, Programa de comparación internacional de costs laborales https://www.conference-board.org/ilcprogram/index.cfm?id=38269.

La comparación de los quince países seleccionados de la Unión Europea nos indica claramente que existen entornos europeos muy diferenciados en cuanto a los costes salariales y no se puede hablar de un único mercado laboral; por un lado se encuentran los países del norte de Europa con unos costes muy por encima de la media (Alemania, Países Bajos, Bélgica, Reino Unido), lo cual no es incompatible con altos niveles de productividad y por otra parte otros destinos empresariales (Rumanía, República Checa, Hungría, Bulgaria) presentan unos costes laborales muy competitivos y muy parecidos a los que se puedan dar en otros mercados emergentes lo cual puede incidir en gran manera en su capacidad para atraer la inversión de empresas latinoamericanas interesadas en disfrutar de las ventajas de estar presente en un mercado de más de quinientos millones de habitantes, al tiempo que existen estudios que demuestran la relación directa entre los costes laborales y los flujos de inversión hacia esos países europeos (Wilinski, 2012).

En el apartado de los costes laborales hay que resaltar la especial evolución del posicionamiento de España en el contexto de la economía internacional ya que se ha pasado de ser una economía basada en la presencia de costes laborales muy bajos, especialmente competitivos con el resto de países de la UE, a una continua progresión de los costes laborales españoles debido al propio crecimiento de la economía, lo cual ha restado poder de competencia en relación con alguno de los nuevos socios comunitarios del este de Europa que debido a su renta per capita mucho menor disfrutan de un mercado laboral mucho más barato que puede ser especialmente atractivo para las inversiones extranjeras. Se puede afirmar que en este capítulo que España ha evolucionado de ser un país “emergente” a convertirse en un nuevo país desarrollado con alguna de las limitaciones empresariales de este tipo de economías (alto coste laboral).

En el caso de las empresas latinoamericanas el salario de los trabajadores y los diferentes gastos complementarios asociados a la actividad del empleado (cotización a la seguridad social, beneficios laborales) puede ser un factor muy sensible debido a que los mercados de origen de los países latinoamericanos se caracterizan, en líneas generales, por un nivel de salario medio muy por debajo de la mayoría de los países europeos y con una cobertura laboral mucho más pobre, (Santiso, 2008) por lo que sería comprensible que en cierto momento alguna de las empresas latinoamericanas que traten de entrar en Europa valoren de una forma muy positiva la presencia de costes laborales más reducidos, lo cual permitiría

mantener cierta coherencia en su estrategia competitiva general y evitaría tener que plantear una reordenación global de su modelo de negocio debido al impacto de un aumento sustancial de la carga laboral en el conjunto de los equilibrios financieros de la empresa; sin embargo no se puede olvidar que la gran mayoría de las empresas latinoamericanas que llegan a Europa ya se han asentado previamente en el mercado de Estados Unidos por lo que se puede afirmar su capacidad para adaptarse a costes salariales más altos compatibles con el mantenimiento de la competitividad empresarial.

La conclusión general del apartado referido a los costes laborales de los países europeos con respecto al resto del mundo nos muestra varios hechos concluyentes:

- El coste laboral disponible en ciertos países asiáticos carece de competidores directos en el marco de la zona europea, si bien es importante subrayar, tal como se mencionaba anteriormente, que existen países del este de Europa con unos costes laborales mucho más atractivos y competitivos que los existentes en otras zonas de los países desarrollados (Estados Unidos y Japón).
- Los costes laborales de alguno de los países latinoamericanos emisores de estas inversiones, por ejemplo Méjico o Brasil, son muy semejantes a los existentes en esos países europeos de bajo coste salarial, lo cual puede suponer un acicate para expandir sus operaciones hacia países con unos costes de producción relativamente bajos y parecidos al de los mercados latinoamericanos, debido la especialidad habilidad de las empresas latinoamericanas para aprovecharse de las situaciones de menor desarrollo o dificultad económica de otros mercados, (Rivera y Soto 2010).

4. Fiscalidad

Una razón importante en las decisiones sobre el proceso de deslocalización productiva y expansión internacional es la búsqueda de entornos fiscales más favorables en donde la empresa vea reducido en gran manera el importe de impuestos a pagar en relación con sus actividades de negocios principales; este factor puede convertirse en determinante, (Chamberlain, 2006) ya que existe una gran heterogeneidad en los impuestos sobre sociedades que se pagan en los diferentes países, o cual es incluso más relevante en el seno de la UE ya que hoy por hoy no existe una política fiscal única y cada país miembro tiene plena

discrecionalidad para establecer el tipo impositivo a aplicar por las actividades empresariales de las empresas que están asentadas en dicho Estado.

Las discrepancias entre las diferentes tasas societarias a pagar en cada país puede ser suficientemente importante para explicar la mayor o menor competitividad de un modelo de negocio y además va a impactar de forma fundamental en los beneficios finales después de impuesto de la compañía en cuestión.

El traslado de las empresas latinoamericanas hacia Europa, lo mismo que en muchos otros movimientos de internacionalización empresarial, se caracteriza por un coste elevado y por la necesidad de buscar "opciones empresariales" que ayuden a reducir dichos gastos y a hacer viable los resultados financieros de esa aventura empresarial, por lo que la regulación fiscal de los países se convierten en una herramienta clave para conseguir dichos objetivos, lo cual es especialmente relevante en un entorno empresarial (UE) caracterizado por altas tasas impositivas generalizadas que resultan especialmente agresivas para las empresas extranjeras, de sobra conocido las disputas de las empresas de Estados Unidos en Europa, acrecentando de forma exponencial el coste final para acceder a este bloque comercial.

En el seno del espacio económico europeo se pueden distinguir aquellos países que poseen un perfil fiscal especializado en la reducción o evasión de una parte importante de las obligaciones impositivas de las empresas que se asientan en su territorio (Luxemburgo) o aquellos otros países en los que se sigue una política de bajos impuestos como estrategia para atraer inversiones empresariales de otros países (Irlanda, Suiza), cuyos niveles impositivos pueden estar entre 10 o 20 veinte puntos porcentuales por debajo del resto de países europeos lo cual supone por si sola una importante razón para optar por estos países como destino para la entrada y asentamiento en Europa de las empresas extranjeras.

Tabla 2: Impuesto de sociedades (%)

	€			€
Alemania	30%		Estados Unidos	40%
Bélgica	34%		Japón	31%
Eslovaquia	21%		China	25%
Estonia	20%		India	30%
España	25%		Filipinas	30%

Francia	33,5%		Vietnam	20%
Hungría	9%			
Irlanda	12,5%			
Italia	24%		Brasil	34%
Países Bajos	25%		Méjico	30%
Polonia	19%		Argentina	35%
Portugal	21%		Chile	25,5%
Reino Unido	19%		Colombia	34%
República Checa	19%			

Fuente: KPMG https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online.html

Un análisis detallado la presión impositiva de las empresas en el escenario europeo nos muestra varios hechos relevantes en el contexto internacional.

- Las empresas latinoamericanas están acostumbradas a entornos de impuestos bastante agresivos, si bien es difícil cuantificar el grado de cumplimiento fiscal exacto de dichas actividades empresariales en sus países de origen.
- Los otros grandes países emergentes existente en el mundo asiático se caracterizan por un impuesto de sociedades bastante elevado que no tiene nada que ver con su competitividad en el coste laboral, por lo que se puede deducir que el entorno impositivo en los países asiáticos no resulta competitivo con respecto a un número importante de países de la zona europea.
- En Europa se puede decir que persisten ciertos “paraísos fiscales” que permiten a dichos países establecer bajos niveles de impuestos con un claro propósito de atraer inversiones internacionales, entre las que se incluirían las procedentes de América Latina.
- La presión fiscal existente en España se sitúa dentro de la banda superior de los distintos países europeos por lo que no se puede suponer que la política fiscal española pudiera ser una razón de peso para atraer inversiones desde el otro lado del Atlántico.

Conclusiones

- Europa se ha convertido en uno de los nuevos mercados objetivos en el proceso de internacionalización de las grandes empresas multinacionales latinoamericanas, tratando de superar una de las grandes asignaturas pendientes en el tablero empresarial global.
- Las empresas latinoamericanas se caracterizan tanto por una llegada tardía al proceso de globalización económica como por un acelerado y eficiente conocimiento de las normas de adaptación a los nuevos mercados objetivos.
- El factor de mayor o menor identificación cultural resulta cada vez más difícil de cuantificar en su importancia real debido a una experiencia internacional cada vez mayor de las empresas que salen al exterior y el consecuente "aprendizaje cultural" del que disfrutan dichas empresas, si bien todavía parece indudable que una mayor proximidad cultural facilita la salida al exterior de cualquier empresa.
- El mercado laboral es un elemento clave en el coste de producción final de cualquier empresa y en el caso europeo se puede apreciar diversos escenarios de mayor o menor coste que permite a la empresa latinoamericana optar por países con bajos costes laborales similares a los de otros países menos desarrollados o bien acceder a otros mercados laborales con un elevado coste pero en muchos casos presentando también una alta productividad.
- La falta de una política fiscal coordinada en el seno de los países que forman parte de la UE permite que aparezcan ciertos "paraísos fiscales" con unas tasas impositivas muy bajas y extremadamente competitivas, tanto con respecto a los países más desarrollados (Estados Unidos o Japón) como con respecto a los países emergentes del área asiática (India, China, etc.) lo cual puede marcar una diferencia en los flujos de inversión.
- El papel desempeñado por España en la llegada de empresas latinoamericanas a Europa aparece condicionado por una nueva dimensión y peso específico de todas las variables culturales, económicas y empresariales que afectan a los procesos de decisión y estrategia de las empresas latinoamericanas, lo cual implica un redefinición del posicionamiento de España en su función de puente hacia o desde América Latina.

- La gran diversidad existente entre los diferentes países europeos (empresa, macroeconomía, cultura, microeconomía, sociedad, etc.), hace que sea difícil definir un único modelo de entrada de las inversiones latinoamericanas en Europa pero al mismo tiempo permite que existan entornos de negocio con diferentes atractivos plenamente competitivos en un entorno de economía global.

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Hedging the EUR/USD Currency Rate Using Futures Contract in a Hedge Accounting - IFRS 9 Framework

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Abstract: This paper examines the possibility of hedging the EUR/USD currency rate using futures contracts so that the hedge is effective at the date of the hedging inception and three reporting dates that follow. The following methods for hedge ratio estimation were used: the Ordinary Least Squares Regression Method, the Bivariate Vector Autoregression Method and the Vector Error-Correction Method. In order to measure the hedge effectiveness the Standard Deviation Analysis and the Coefficient Variation Analysis were used. No evidence has been found of a hedge ratio that is effective at the date of inception and three reporting dates that follow.

Keywords: hedging, hedge accounting, EUR/USD, currency risk, IFRS 9, futures.

Zaštita od promjene tečaja EUR/USD korištenjem futures ugovora u sklopu Računovodstva zaštite sukladno MSFI-u 9

Sažetak

Ovaj rad ispituje mogućnost određivanja omjera zaštite valutnog para EUR/USD i futures ugovora na valutni par EUR/USD koji će biti učinkovit u trenutku određivanja zaštite i u tri izvještajna razdoblja koja slijede nakon uspostave zaštite. Za određivanje omjera zaštite korištene su Metoda regresije pomoću metode najmanjih kvadrata, Metoda bivarijantne vektorske autoregresije i Metoda vektorske korekcije pogreške. Kao metode mjerenja učinkovitosti zaštite korištene su Analiza koeficijenta varijacije i Analiza standardne devijacije. Nisu pronađeni dokazi o postojanju kombinacije metode određivanja omjera zaštite i metode mjerenja

učinkovitosti zaštite koja bi omogućila učinkovitost zaštite kod zaštite od promjene tečaja EUR/USD korištenjem futures ugovora na tečaj EUR/USD.

Ključne riječi: financijski instrumenti zaštite, hedging, računovodstvo zaštite, valutni rizik, EUR/USD, MSFI 9, futures.

UVOD

Upravljanje valutnim rizikom izuzetno je važno svim poslovnim subjektima koji su izloženi riziku promjene tečaja. U uvjetima normalnog poslovanja poslovni subjekti kao metodu zaštite od valutnog rizika mogu odabrati upravljanje bilancom ili neke od metoda zaštite. Međutim, kod ekonomskih subjekata čije je osnovno poslovanje financijske naravi troškovi usklađenja aktivnih i pasivnih izloženosti mogu biti veće od postignutih koristi. Naime, kod ekonomskih subjekata čije je osnovno poslovanje proizvodnja, kao i u mnogim drugim granama, gotovo je nemoguće neutralizirati rizike aktivnim upravljanjem bilance. Navedeno dovodi do zaštite korištenjem izvedenih instrumenata kao optimalnijeg rješenja.

U ovom radu ispituje se mogućnost zaštite od promjene tečaja valutnog para EUR/USD korištenjem futures ugovora EURO FX s Robne burze u Chicagu. Kao metode određivanja omjera zaštite rabe se: OLS (Metoda najmanjih kvadrata), VAR (Metoda bivarijantne vektorske autoregresije) i VECM (Metoda vektorske korekcije pogreške), a kao metode mjerenja učinkovitosti zaštite korištene su: Analiza koeficijenta varijacije i Analiza standardne devijacije.

RAČUNOVODSTVO ZAŠTITE I ZAŠTITA OD RIZIKA

Osnovne faze sustava upravljanja rizicima su identifikacijA rizika, kvantifikacija rizika, upravljanje rizicima te kontrola i izvješćivanje o rizicima (Šverko, 2007). U sklopu upravljanja rizicima subjekti provode zaštitu (engl. *hedging*). Svaki poslovni subjekt koji provodi zaštitu rukovodi se ekonomskim kriterijima, što dovodi do „ekonomske zaštite“ (engl. *economic hedge*), dok su uvjeti računovodstvena zaštite (engl. *hedge accounting*) strogo propisani (vidi MSFI 9). Problematike vezane uz Računovodstvo zaštite i njegove efekte izučavaju razni autori (usp. Coughlan, 2004; Lopes, 2006; Panaretou et al., 2013; Ramirez, 2007; Zhang, 2009).

Neki od kriterija koje propisuje MSFI 9 su sljedeći: odnos zaštite sastoji se od dozvoljenog instrumenta zaštite i instrumenta kojeg se štiti; na početku primjene

zaštite postoji formalna dokumentacija izgradnje i izbora modela zaštite i određivanja odnosa zaštite, kao i formalna dokumentiranost ciljeva i strategija *risk management*-a koji se odnose na datu zaštitu; postoji suštinski ekonomski odnos instrumenta zaštite i štićenog instrumenta; kreditni rizik nema dominantnu ulogu u promjeni vrijednosti koja je posljedica ekonomskog odnosa; količina instrumenata zaštite i instrumenata koje se štiti odgovara ekonomskoj zaštiti.

KVANTITATIVNE METODE U POSTUPKU ZAŠTITE

Teorijski okvir određivanja omjera zaštite

Postupak određivanja omjera zaštitite putem kvantitativnih metoda analiziran je u brojnim znanstvenim radovima (vidi Anderson i Danthine, 1981; Baille i Myers, 1991; Beil, 2013; Bhaduri i Durai, 2008; Bollerslev, 1986; Brooks et al., 2002; Cecchetti et al., 1988; Chorafas, 2007; Choudhry, 2004; Condamin et al., 2006; Coughlan, 2003; Coughlan et al. 2003; 2004; Dale, 1981; Ederington, 1979; Figlewski, 1984; 1985; FINCAD, 2011; Floros i Vougas, 2006; Ghosh, 1993; Hill i Schneeweis, 1981; 1982; Hull, 2012; Kocon, 2007; KPMG, 2012; Kroner i Sultan, 1993; Lee, 2000; Mrša, 2011; Mrša i Stanković, 2011; Myers, 1991; Myers i Thompson, 1989; Park i Switzer, 1995; Ramirez, 2007; Working, 1953) te istraženost fenomena postavlja odlčne temelje za provođenje računovodstva zaštite i upravljanje rizicima. U ovom će se radu koristiti sljedeće metode kao postupci određivanja omjera zaštite:

1) OLS - Metoda najmanjih kvadrata (engl. *Least Squares Method*) ili obična metoda najmanjih kvadrata (engl. *Ordinary Least Squares - OLS*), (usp. Bonga-Bonga i Umoetok, 2016; Ederington, 1979; Fan, 2014; Lien et al., 2002; Malliaris i Urrutia, 1991; Ripple i Moosa, 2007),

2) VAR – metoda bivarijatne vektorske autoregresije (Bonga-Bonga i Umoetok, 2016; Hamldar i Mehrara, 2014; Herbst 1989; Yang i Allen 2004),

3) VECM - vektorskog modela korekcije pogreške (Doležal, 2011; Ghosh, 1993; Johansen, 1988; Johansen i Juselius, 1990; Lien, 1996; Lien i Luo, 1994; Yang i Allen, 2004).

U radu će biti korišteni isključivo modeli koji određuju vremenski konstantan omjer zaštite, a sukladno zahtjvima računovodstva zaštite.

Kvantitativne metode za određivanje efikasnosti zaštite

Paralelno s provođenjem istraživanja o određivanju omjera zaštite, prvođena su mnoga istraživanja o mjerenju učinkovitosti zašite (vidi Awang et al., 2014; Bonga-Bonga i Umoetok, 2016; Cecchetti et al., 1988; Coughlan, 2003; Ederington, 1979; Finnerty i Grant, 2002; Floros i Vougas, 2006; Gagnon et al., 1998; Jianru i Jinghua, 2011; Yang i Allen, 2004; Ye i Chen, 2006). U ovom radu rabit će se idući postupci mjerenja učinkovitosti zaštite (vidi Bonga-Bonga i Umoetok, 2016; Ederington, 1979):

1) Analiza standardne devijacije,
2) Analiza koeficijenta varijacije.

PRIMJENA METODE ODREĐIVANJA OPTIMALNOG OMJERA ZAŠTITE

Određivanje omjera zaštite na primjeru valutnog para EUR/USD

U ovom se poglavlju određuje optimalan omjer zaštite futuresa i spot cijena za valutni par EUR/USD primjenom prethodno prikazanih kvantitativnih metoda. Podatci koji se koriste su dnevni valutni tečajevi na zatvaranju dana i dnevne cijene futuresa s najbližim dospijećem na valutu iskazanu na kraju dana trgovanja. Korišteni su podatci valutnog omjera EUR/USD[1] i podatci futuresa EURO FX trgovanih na Robnoj burzi u Chicagu (Chicago Mercantile Exchange)[2]. Futures ugovor obnavlja se na prvi dan mjeseca isporuke te se primjenjuje vremenski ponderirana metoda na način da se u zadnjih pet dana do obnove postupno zamjenjuje 20% starog futuresa s novim futuresom. Podatci obuhvaćaju i ekstremna kretanja na tržištu tijekom i nakon financijske krize. Razdoblje na temelju kojeg se procjenjuje omjer zaštite jest od 01.01.2007. do 30.06.2013., a razdoblja na kojima se testira dobiveni omjer zaštite jesu:

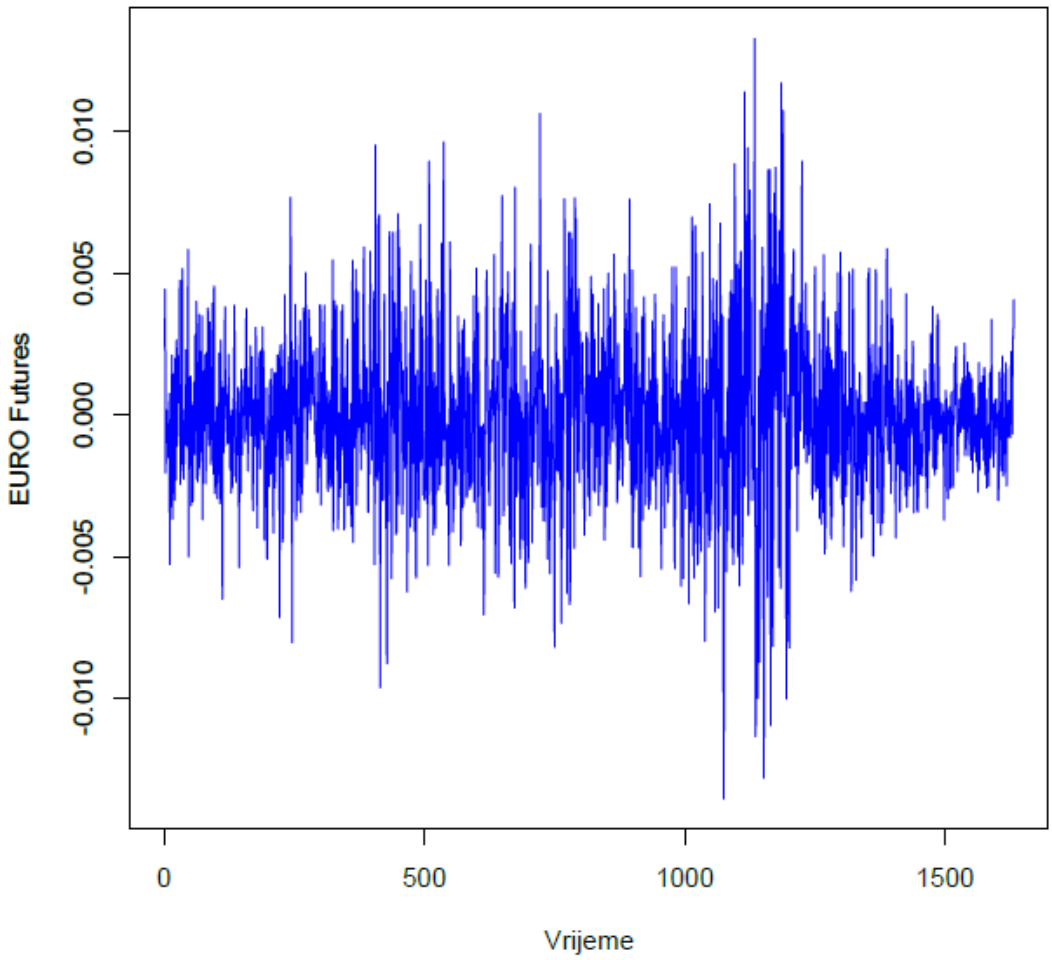
Test 1 od 01.10.2012. do 30.09.2013.
Test 2 od 01.01.2013. do 31.12.2013.
Test 3 od 01.04.2013. do 31.03.2014.

[1] https://www.quandl.com/CURRFX/EURUSD
[2] https://www.quandl.com/SCF/CME_EC1_FW

Testovi učinkovitosti zaštite imaju dvojaku ulogu. Koriste se za *out-of-sample* provjeru primijenjenih metoda te u svrhu simulacije poslovnog procesa u tri kvartala nakon započete zaštite. Obrade podataka vršene su putem statističkog software-a otvorenoga koda R.

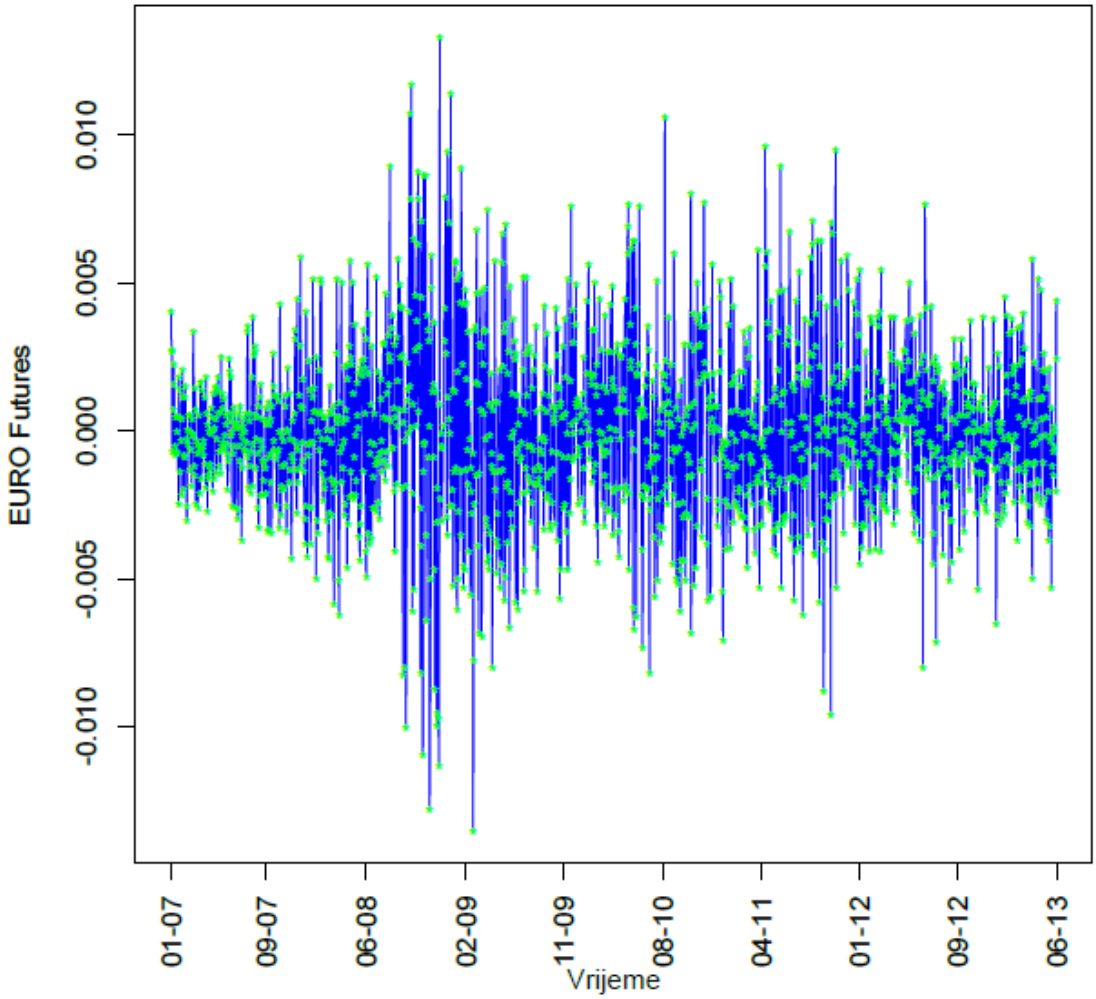
U nastavku su slike koje prikazuju futurese valutnog para EUR/USD u ovisnosti o rednom broju (vidi sliku 1), futurese valutnog para EUR/USD u ovisnosti o datumu (vidi sliku 2), spot cijene valutnog para EUR/USD u ovisnosti o poretku (vidi sliku 3), spot cijene valutnog para EUR/USD u ovisnosti o datumu (vidi sliku 4).

Slika 1. Prikaz futuresa valutnog para EUR/USD u ovisnosti o rednom broju.



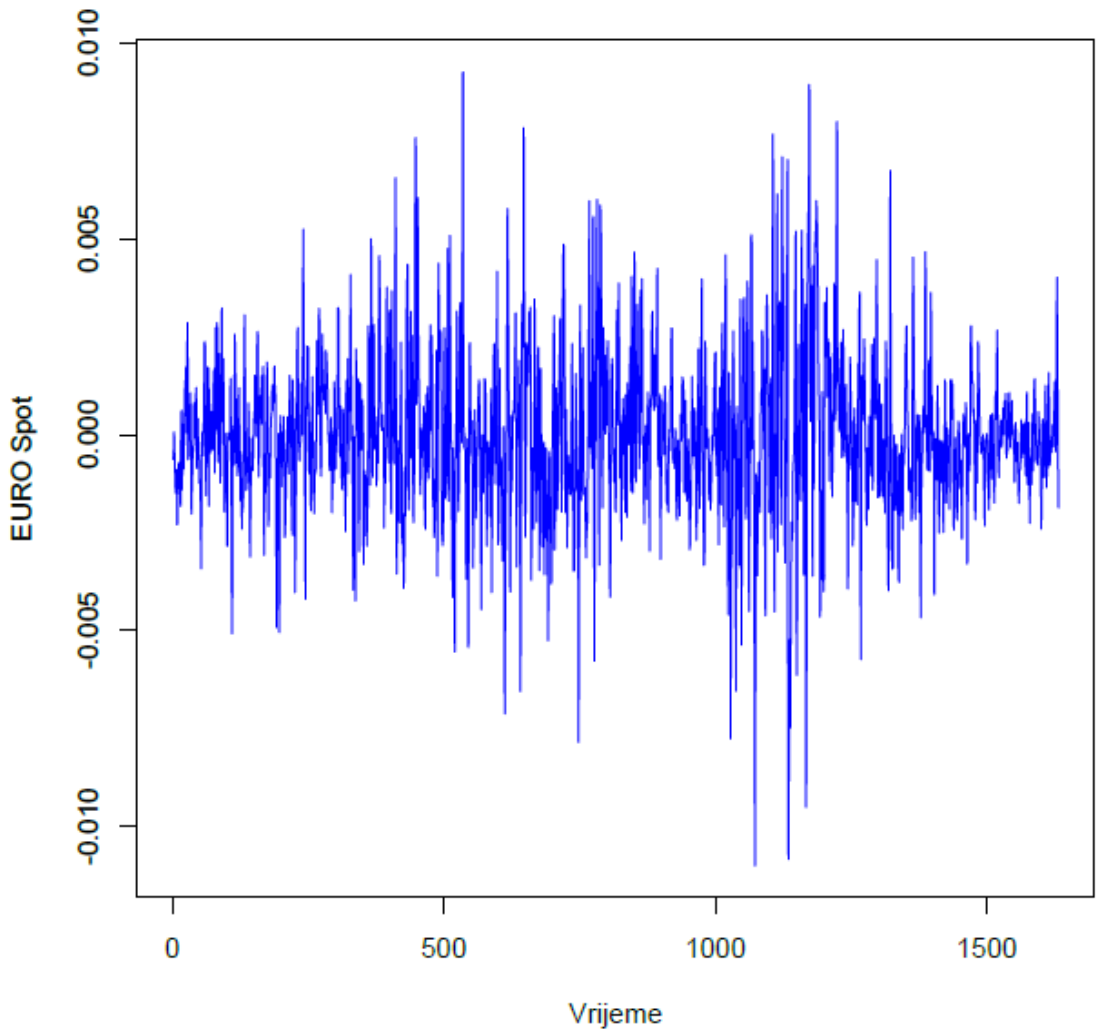
Izvor: Autorov izračun

Slika 2. Prikaz futuresa valutnog para EUR/USD u ovisnosti o datumu.



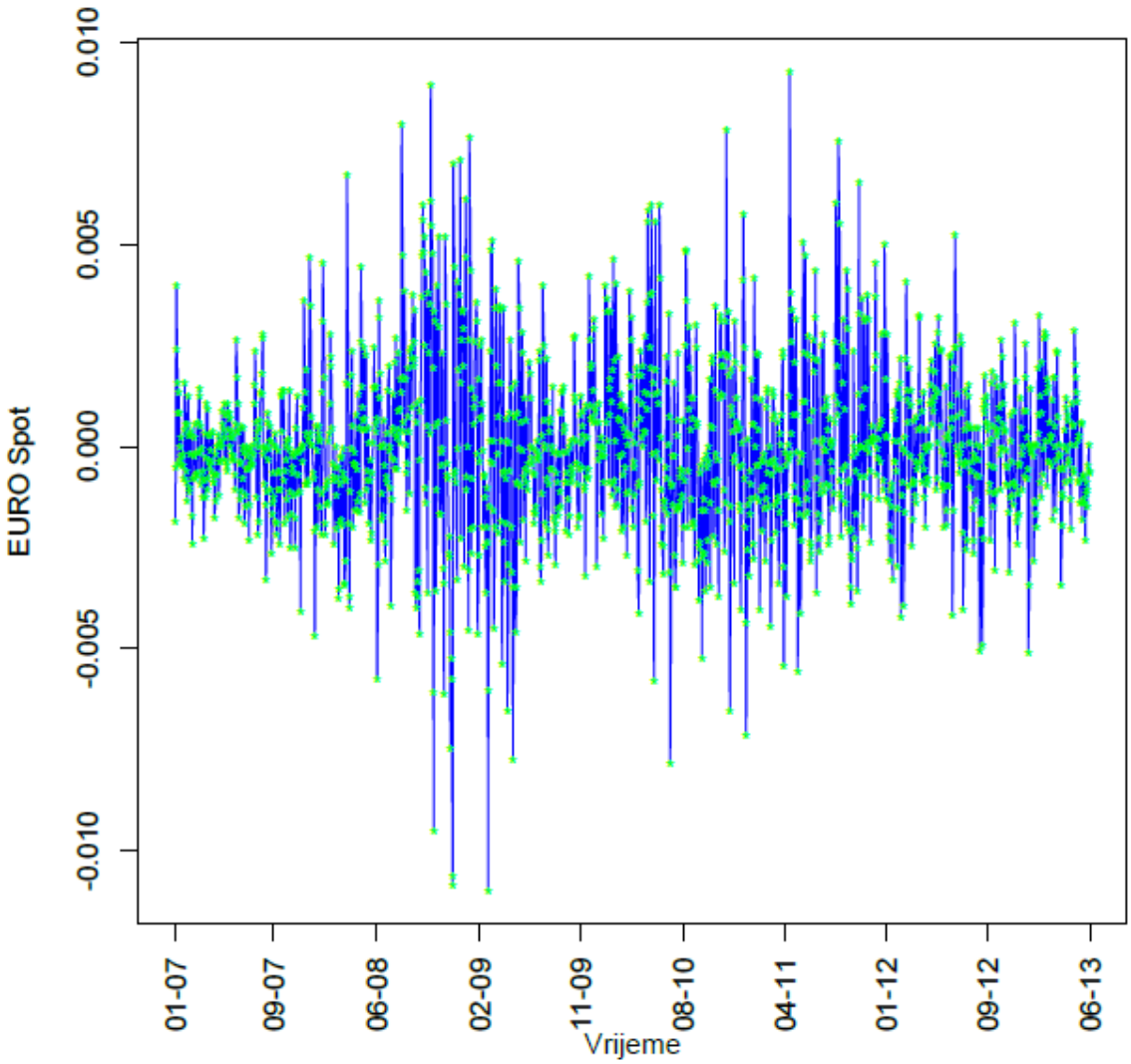
Izvor: Autorov izračun

Slika 3. Prikaz spot cijena valutnog para EUR/USD u ovisnosti o poretku.



Izvor: Autorov izračun

Slika 4. Prikaz spot cijena valutnog para EUR/USD u ovisnosti o datumu.



Izvor: Autorov izračun

Promatrajući prethodne grafove futuresa i spot cijena valutnog para EUR/USD prikazane u ovisnosti o poretku, odnosno datumu, primjećuje se da su te dvije varijable korelirane. Također, može se primijetiti da se podatci grupiraju oko 0 bez prevelikih odstupanja, odnosno varijance, što ukazuje na moguću stacionarnost, osim u razdoblju od pred kraj 2008. godine do početka 2009. godine, što je posljedica prisutnih šokova na tržištu.

Početna analiza futuresa i spot cijena valutnog para EUR/USD

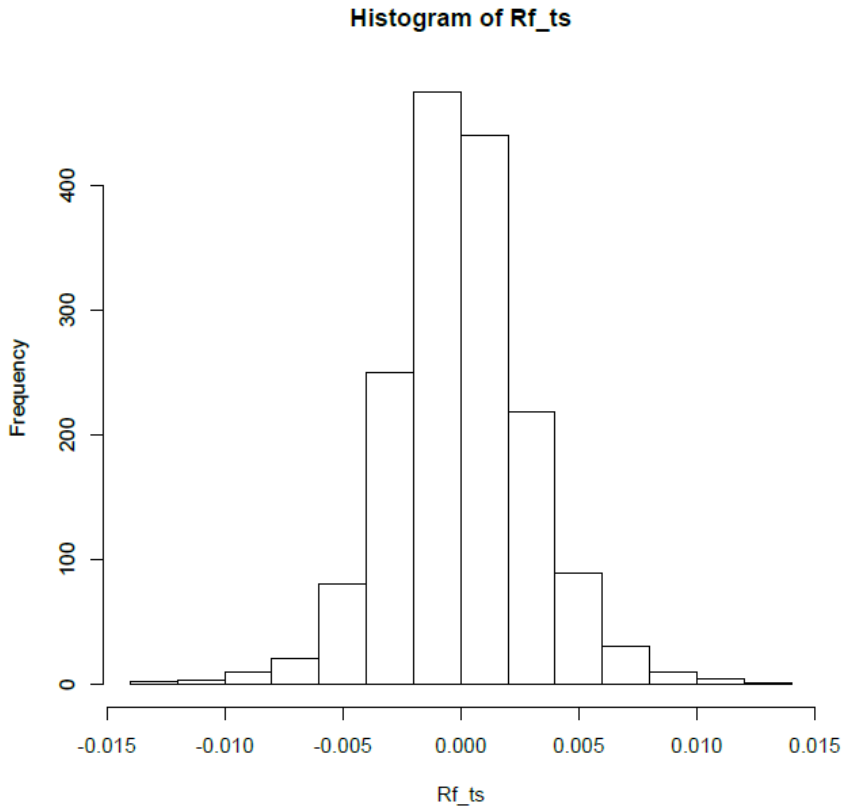
Osnovna obilježja podataka futuresa navedena su u tablici 1, koja prikazuje pet osnovnih statistika: minimum, donji kvartil, medijan, očekivanje, gornji kvartil, maksimum. Iz tablice je vidljivo da su srednje vrijednosti, medijan i očekivanje, oko 0 i podatci nemaju velikih odstupanja sudeći po minimumu i maksimumu te je varijanca mala, stoga se pretpostavlja kako se radi o minimalnoj volatilnosti u podatcima.

Tablica 1. Osnovna statistička obilježja futuresa valutnog para EUR/USD.

minimum	donji kvartil	medijan	očekivanje	gornji kvartil	maksimum
-0,01.35430	-0.00178674	-0,0000608493	0,00000264770	0,001.65454	0.0132756

Izvor: Autorov izračun

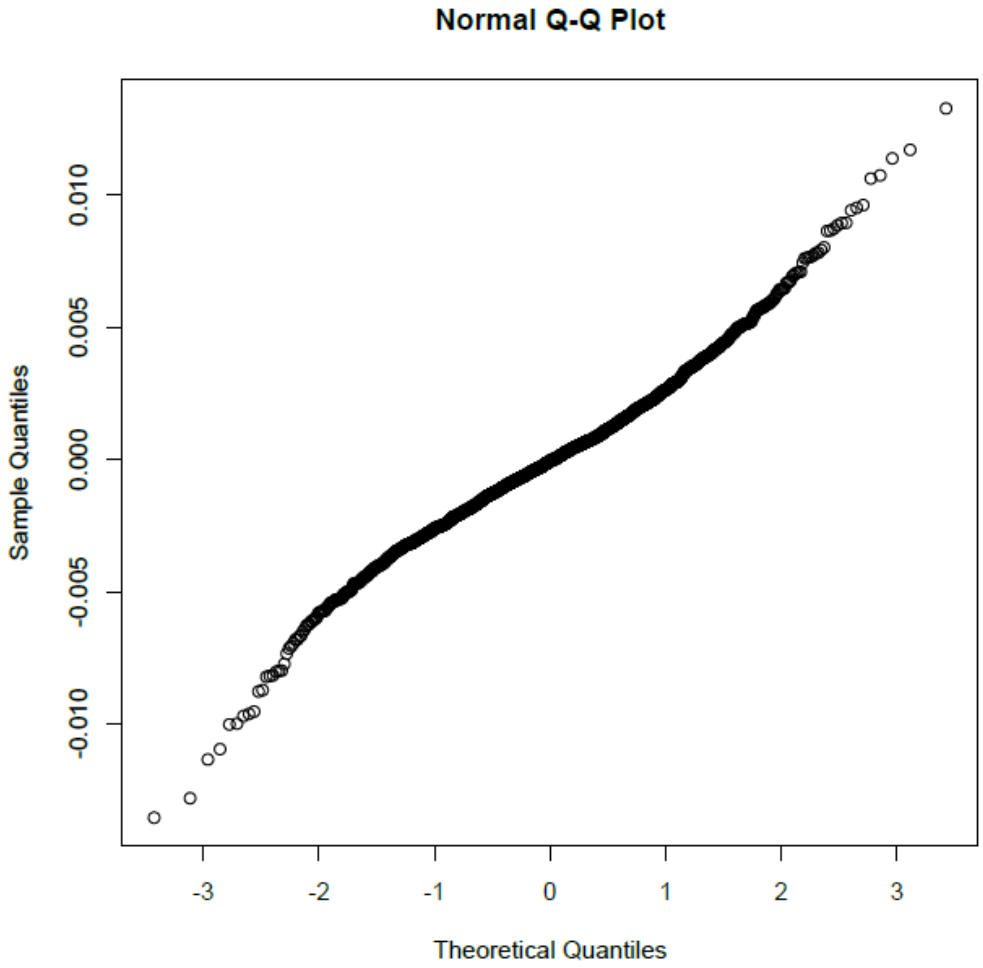
Slika 5. Histogram futuresa valutnog para EUR/USD.



Izvor: Autorov izračun

Iz histograma futuresa valutnog para EUR/USD vidljivo je da je sustav podataka stabilan te da se većina podataka nalazi oko medijana, odnosno sredine. Histogram prati Gaussovu raspodjelu te se smatra da podatci dolaze iz normalne distribucije.

Slika 6. Q-Q graf futuresa valutnog para EUR/USD.



Izvor: Autorov izračun

Iz Q-Q grafa futuresa valutnog para EUR/USD vidljivo je da empirijski podatci prate pretpostavku teorijske normalne distribucije, osim par outlinera pri krajevima grafa koji su posljedica većih odstupanja krajem 2008. godine i početkom 2009. godine. Osnovna obilježja spot cijena prikazana su u tablici 2, koja sadržava pet osnovnih statistika.

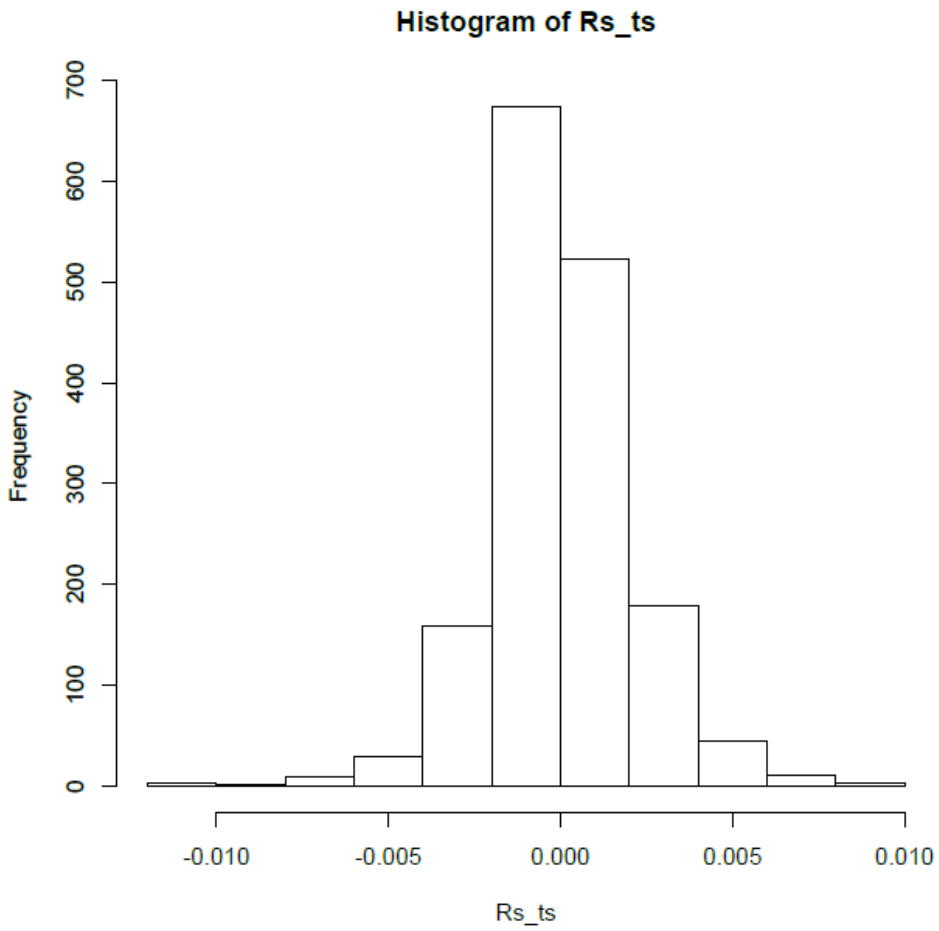
Tablica 2. Osnovna statistička obilježja spot vrijednosti valutnog para EUR/USD.

minimum	donji kvartil	medijan	očekivanje	gornji kvartil	maksimum
-0,0109960	-0,00111719	-0,0000984644	-0,00000408862	0,00106974	0,00924836

Izvor: Autorov izračun

Iz tablice je vidljivo da su srednje vrijednosti, medijan i očekivanje, oko 0 i podatci nemaju velikih odstupanja. Histogram prati Gaussovu raspodjelu te se smatra da podatci dolaze iz normalne distribucije.

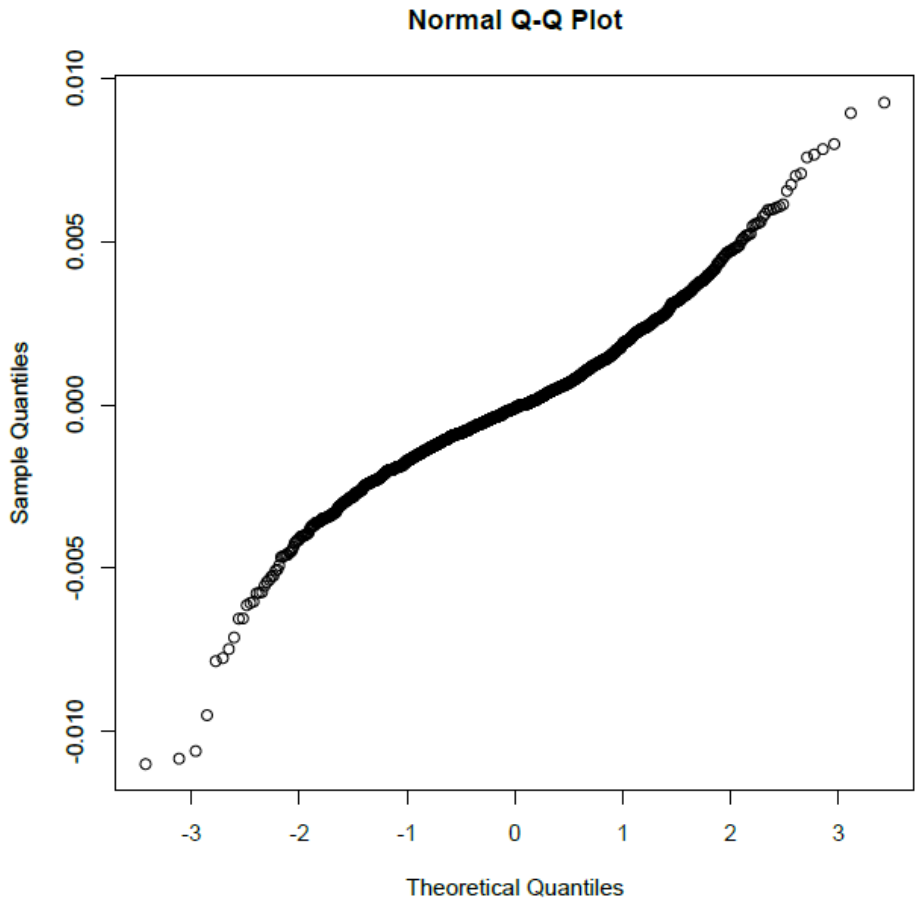
Slika 7. Histogram spot cijena valutnog para EUR/USD.



Izvor: Autorov izračun

Iz histograma spot cijena valutnog para EUR/USD vidljivo je da je sustav podataka stabilan te da se većina podataka nalazi oko medijana, odnosno sredine. Histogram prati Gaussovu raspodjelu te se smatra da podatci dolaze iz normalne distribucije.

Slika 8. Q-Q graf spot cijena valutnog para EUR/USD.



Izvor: Autorov izračun

Iz Q-Q grafa spot cijena valutnog para EUR/USD vidljivo je da empirijski podatci prate pretpostavku teorijske normalne distribucije, osim par outlinera pri krajevima grafa koji su posljedica većih odstupanja krajem 2008. godine i početkom 2009. godine.

Test stacionarnosti na primjeru valutnog para EUR/USD

Proveden je test stacionarnosti podataka kako bi se osigurale ispravne pretpostavke modela. Vremenski ovisne vjerojatnosne distribucije za povrate mogu dovesti do pristrane procjene optimalnog omjera zaštite kod nekih metoda. Sljedeća tablica (3) prikazuje rezultate ADF i KPSS testova.

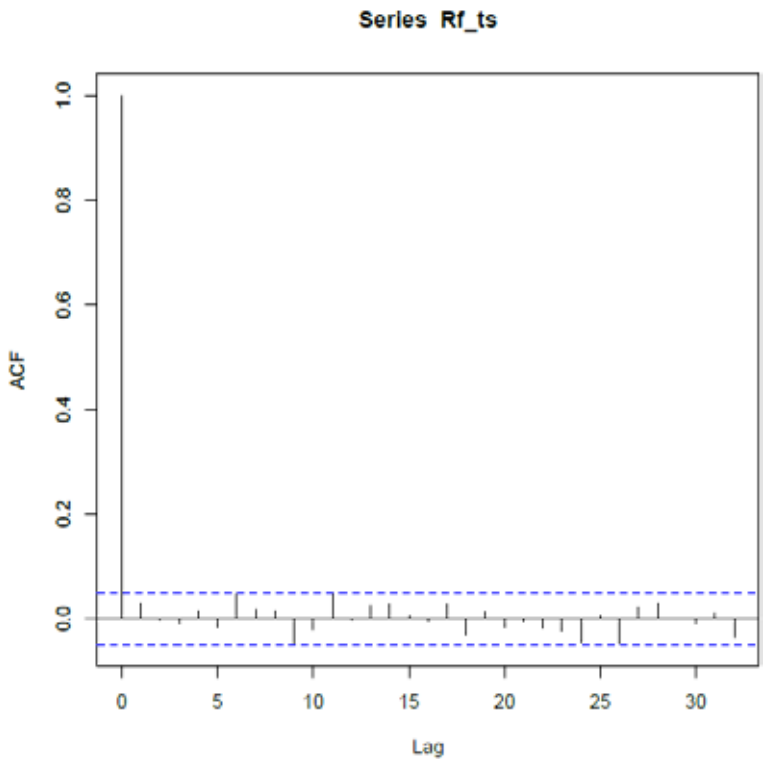
Tablica 3. Rezultati ADF i KPSS testa za valutni par EUR/USD.

Varijabla	ADF testna statistika	ADF p- vrijednost	KPSS testna statistika - Level	KPSS testna statistika - trend
R_f	-28.1427	0.01	0,0535	0,0411
R_s	-26.3478	0.01	0,0618	0,049

Izvor: Autorov izračun

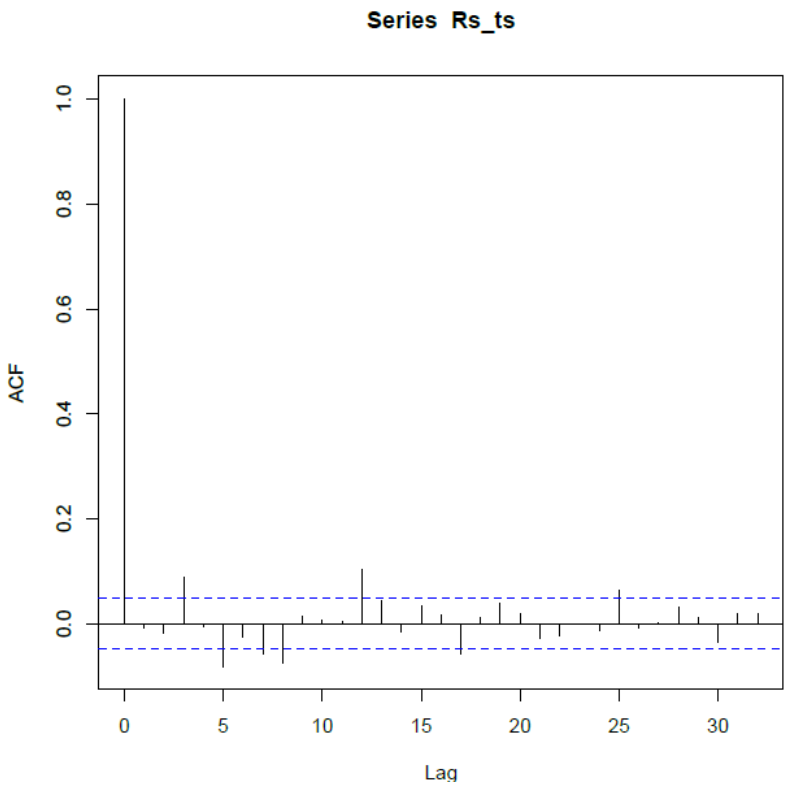
S obzirom na to da su obje p-vrijednosti manje od 0,05 odbacuje se Ho hipoteza u korist H1, dakle odbacuje se pretpostavka da postoji jedinični korijen, odnosno potvrđuje se pretpostavka o stacionarnosti. KPSS test traži visoku p-vrijednost. Sve p-vrijednosti su >0.05, dakle pretpostavka je potvrđena. Grafički je moguće vidjeti je li vremenski niz stacionaran ACF grafom, odnosno autokorelacijskom funkcijom te je iz sljedećih grafova (slike 9 i 10) vidljivo da su oba niza stacionarna. Ukoliko se podatci većinom nalaze ispod isprekidane linije onda je vremenski niz stacionaran (prva linija u grafu ima uvijek vrijednost 1). ACF graf futuresa valutnog para EUR/USD potvrđuje zaključak koji je dobiven testom, dakle futures valutnog para EUR/USD stacionaran je vremenski niz. ACF graf spot cijena valutnog para EUR/USD također potvrđuje zaključak koji je dobiven testom, dakle spot cijene valutnog para EUR/USD stacionaran su vremenski niz.

Slika 9. ACF graf futuresa valutnog para EUR/USD.



Izvor: Autorov izračun

Slika 10. ACF graf spot cijena valutnog para EUR/USD.



Izvor: Autorov izračun

Test kointegriranosti na primjeru valutnog para EUR/USD

S obzirom da je vremenska serija futuresa i spot cijena valutnog para EUR/USD izvedena jedna iz druge, može postojati kointegracijska veza između njih. Uvjet za postojanje kointegracije je da obje pojave sadrže trend, odnosno da su integrirane s istim redom integracije. Na temelju analize integriranosti i kointegriranosti varijabli može se definirati odgovarajući VAR ili VECM model. Test ima hipoteze r=0 i r=1. Ako je r=0 varijable nisu kointegrirane. Odbacuje se nul hipoteza o nepostojanju kointegriranosti te se ne može prihvatiti hipoteza o postojanju kointegracije jer su u oba slučaja testne statistike veće od kritične vrijednosti.

Tablica 4. Rezultati Johansenovog testa za valutni par EUR/USD.

H_0	H_1	Max eigenvalue	Test statistics	5 %
r = 0	r <= 1	0.6462816	1692.94	14.90
r = 1	r <= 2	0.1593953	282.85	8.18

Izvor: Autorov izračun

Metoda jedne jednadžbe procjenjene korištenjem metode najmanjih kvadrata na primjeru valutnog para EUR/USD

Prva metoda za procjenu optimalnog omjera zaštite je metoda jedne jednadžbe procjenjene korištenjem metode najmanjih kvadrata (OLS) kontinuirano složenih povrata futuresa i spota valutnog para EUR/USD. Koeficijent regresije predstavlja vrijednost optimalnog omjera zaštite.

Tablica 5. Izlazne vrijednosti metode jedne jednadžbe procjenjene korištenjem metode najmanjih kvadrata na primjeru valutnog para EUR/USD.

	Koeficijent	standardna greška	p vrijednost
Alfa	-4.099e-06	5.192e-05	0,937
Beta	3.898e-03	1.752e-02	0.0824
R^2	**3.037e-05**		

Izvor: Autorov izračun

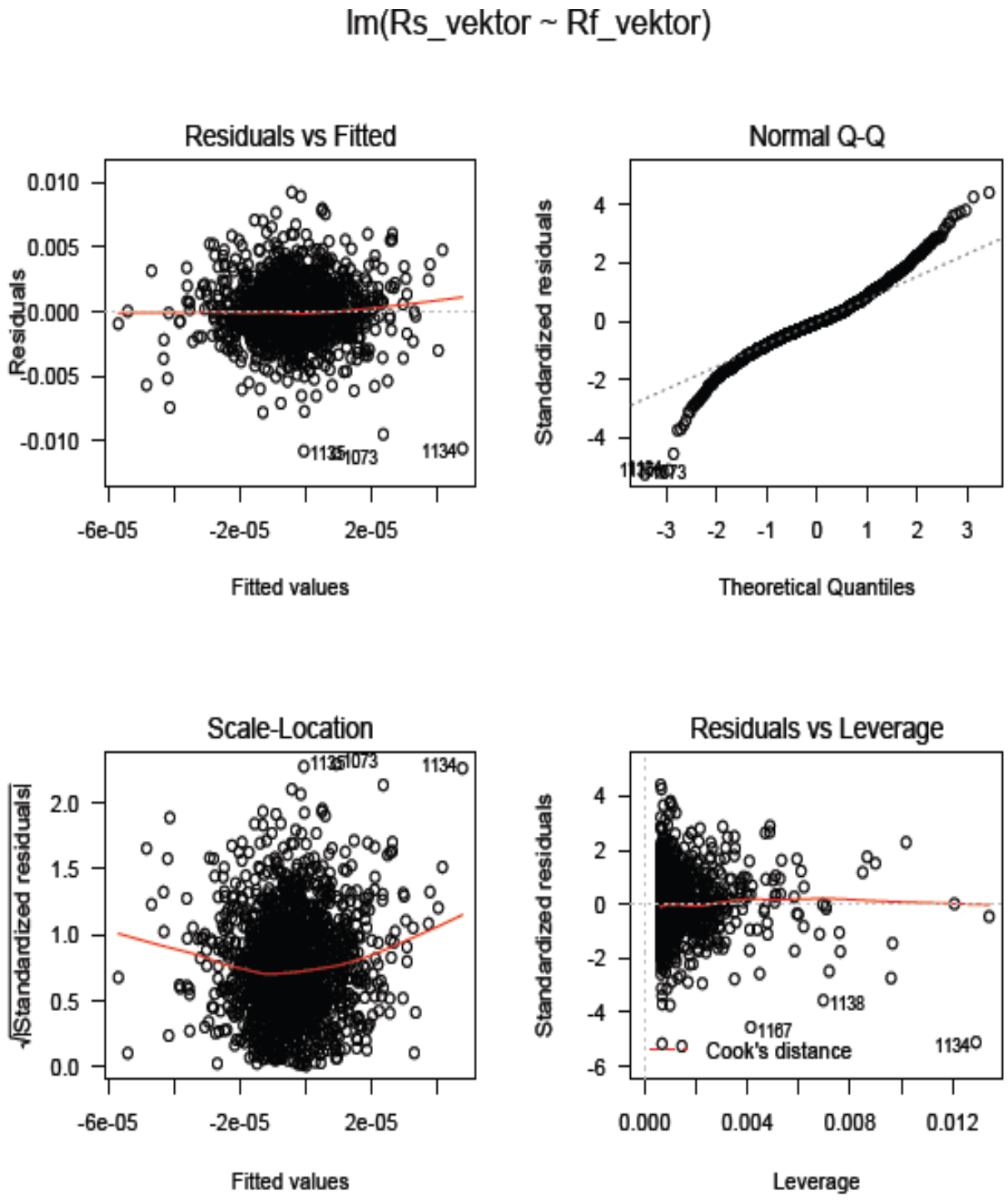
Primjećuje se da je koeficijent regresije statistički značajan ($p<0.001$), ali i da je R^2 relativno malen, što navodi na zaključak da ovaj model ne opisuje u potpunosti podatke za valutni par EUR/USD. Omjer zaštite je 0.0038998. Izazov s kojim se suočava ova metoda jest taj da ne uzima u obzir serijsku korelaciju reziduala. Sljedeća tablica (6) pokazuje Box-Pierce test reziduala koji testira prisutnost serijske korelacije. Box-Pierce test reziduala ukazuje na prisutnost serijske korelacije, naime sve p-vrijednosti su male.

Tablica 6. Box-Pierce test: Autokorelacijska funkcija reziduala određena metodom jedne jednadžbe procjenjene korištenjem metode najmanjih kvadrata na primjeru valutnog para EUR/USD.

Lag	X^2	p - vrijednost
1	398.7318	<0,001
5	403.1231	<0,001
20	422.7935	<0,001

Izvor: Autorov izračun

Slika 11. Grafovi reziduala OLS metode za valutni par EUR/USD.



Izvor: Autorov izračun

Na slici 11 prikazani su razni grafovi reziduala. Reziduali su grupirani oko nule bez velikih odstupanja i izgledaju kao da dolaze iz normalne distribucije. Ponašaju se kao *bijeli šum*, odnosno ne sadržavaju trend i cikličnost, što navodi na zaključak da su podatci dobro prilagođeni modelu.

Primjena metode bivarijatne vektorske autoregresije (VAR) na primjeru valutnog para EUR/USD

Sljedeća tablica (7) sadrži procjenjene parametre modela za optimalnu dužinu LAG-a, a u zagradi se nalaze vrijednosti varijance.

Tablica 7. Procjenjeni parametri modela za optimalnu dužinu LAG-a za valutni par EUR/USD.

	R_s	R_f
$beta_1$	7.083e-01 (2.528e-02)	1.466e-01 (2.447e-02)
$beta_2$	-4.266e-01 (3.042e-02)	1.294e+00 (2.944e-02)
$gama_1$	1.614e-01 (1.868e-02)	-4.806e-01 (1.808e-02)
$gama_2$	1.413e-02 (1.439e-02)	8.379e-03 (1.393e-02)
alfa	2.388e-05 (8.544e-05)	-5.363e-07 (8.270e-05)

Izvor: Autorov izračun

Reziduali VAR modela, a ne procjenjeni parametri, važni su podatci potrebni za procjenu optimalnog omjera zaštite. U sljedećoj tablici (8) daju se podatci potrebni za izračun omjera zaštite.

Tablica 8. Reziduali VAR modela i omjer zaštite procjenjen korištenjem VAR metode za valutni par EUR/USD.

Statistika	vrijednost
sigma_sf	-5.993e-07
sifma_f^2	2.774e-06
h*	-0.2160418

Izvor: Autorov izračun

Omjer zaštite za valutni par EUR/USD određen primjenom VAR metode je negativan. Brojni autori navode mogućnost negativnog omjera zaštite (Batten, MacKay i Wagner, 2013; Ben-David, 2013; Das i Hanouna, 2009; Hentschel i Smith, 1996; Naik i Yadav, 2003; Spierdijk i Zaghum, 2010). Sumirajući zaključke o ponašanju poduzeća koje poduzima zaštite u ovisnosti o predznaku omjera zaštite, Gagnon, Lypny i McCurdy (1998: 209) navode "kad je omjer zaštite pozitivan poduzeće koje poduzima zaštitu zauzet će kratku poziciju u futuresima, a kad je omjer zaštite negativan poduzeće će zauzeti dugu poziciju u futuresima". Isti autori zaključuju kako kod derivata najčešće postoji uravnoteženo tržište (engl. *zero net-supply*) te nije potrebno postavljati ograničenje predznaka omjera, ali je potrebno provjeriti ograničenja regulatora. Analogno, može se zaključiti kako je potrebna analiza tržišta i regulative kako bi se utvrdilo smije li omjer zaštite biti negativan prilikom određivanja omjera zaštite.

Primjena metode vektorske korekcije pogreške (VECM) na primjeru valutnog para EUR/USD

Kao što je već napomenuto, VECM metoda dodaje ispravak grešaka (engl. *adds error correction*) VAR metodi. U sljedećoj tablici (9) nalaze se procjenjeni parametri VECM metode zajedno s varijancama.

Tablica 9. Procjenjeni parametri i varijance VECM metode za valutni par EUR/USD.

	R_s	R_f
lambda	-0.3583 (0.0315)	-0.5633 (0.0417)
$beta_1$	-0.2061 (0.0265)	-0.0785 (0.0350)
$beta_2$	-0.5981 (0.0268)	0.9542 (0.0354)
$gama_1$	0.2165 (0.0237)	-0.3524 (0.0314)
$gama_2$	0.0050 (0.0154)	0.0142 (0.0203)
alfa	1.8e-05 (9.1e-05)	1.8e-05 (0.0001)

Izvor: Autorov izračun

Slično kao i kod VAR metode, reziduali VECM metode koriste se za procjenu optimalnog modela zaštite.

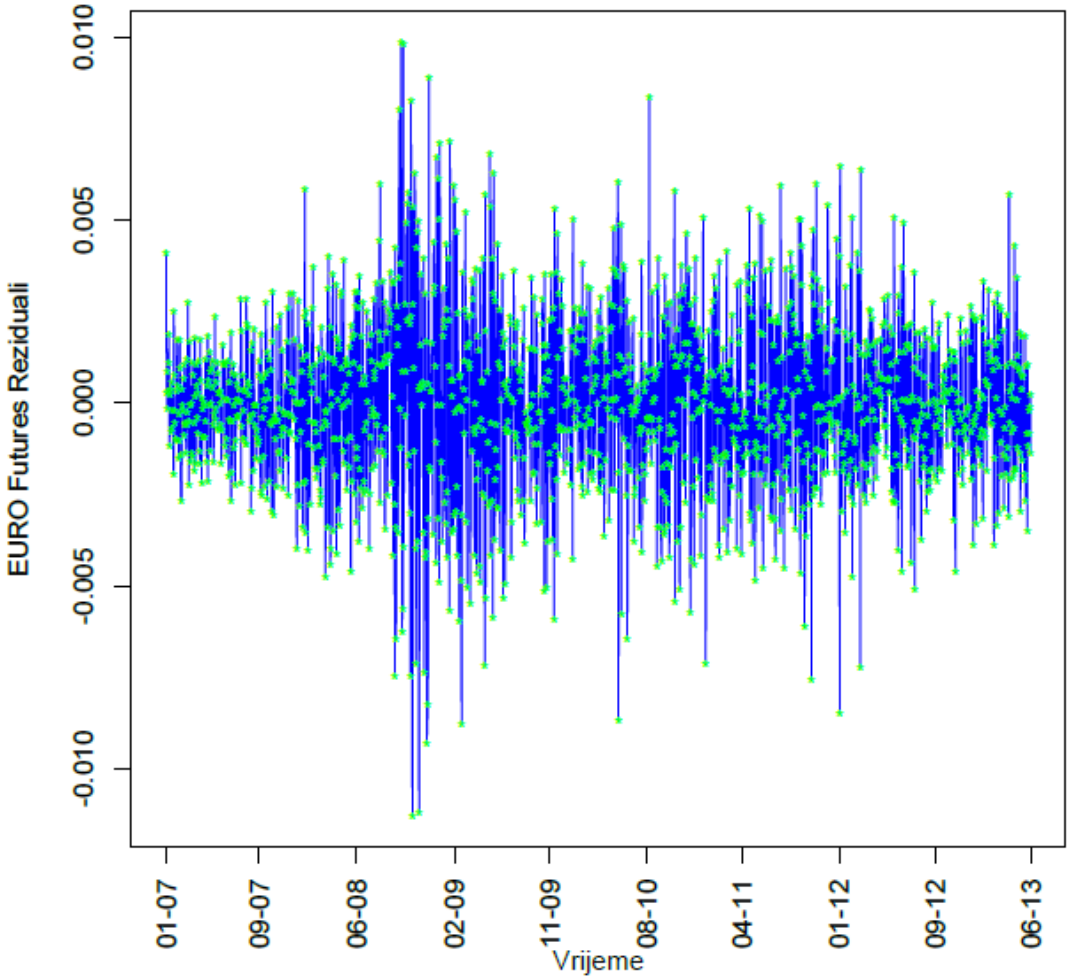
Tablica 10. Reziduali VECM modela i omjer zaštite procjenjen korištenjem VECM metode za valutni par EUR/USD.

Statistika	Vrijednost
sigma_sf	-0.4114028
$sifma\_f^2$	1.00
h*	-0.4114028

Izvor: Autorov izračun

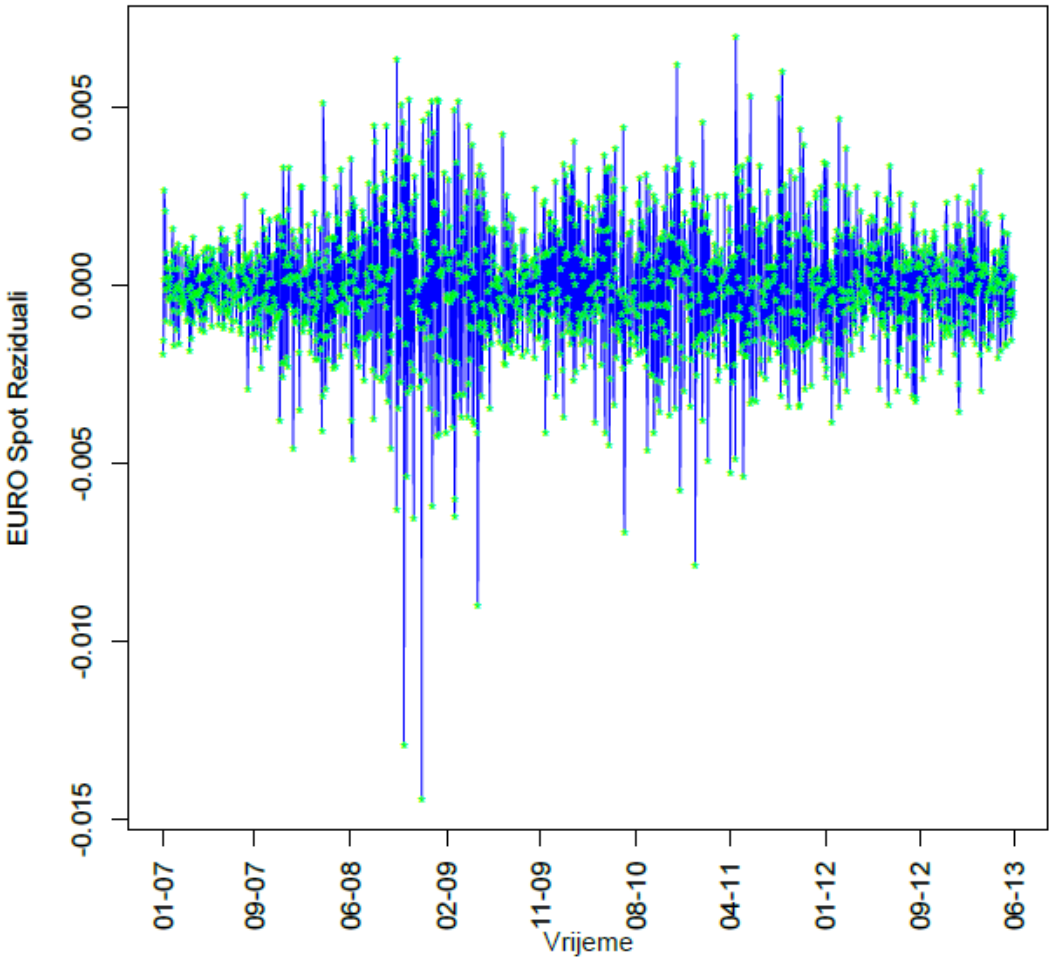
Omjer zaštite primjenom VAR metode iznosi -0.411. Sljedeće dva grafa (slike 12 i 13) prikazuju reziduale futuresa i spot cijena valutnog para EUR/USD putem VAR modela. Prije samog testiranja uvjetne heteroskedastičnosti, iz grafova se da naslutiti da obje serije podataka prikazuju vremensku ovisnost volatilnosti ili ARCH efekte.

Slika 12. Reziduali futuresa valutnog para EUR/USD.



Izvor: Autorov izračun

Slika 13. Reziduali spot cijena valutnog para EUR/USD.



Izvor: Autorov izračun

Za testiranje prisutnosti uvjetne heteroskedastičnost koristi se White test. White test je statistički test koji utvrđuje je li varijanca reziduala varijabli u modelu regresije konstantna, odnosno testira se homoskedastičnost. Dakle, nulta hipoteza White testa jest homoskedastičnost, a alternativna je heteroskedastičnost. Kako se vidi iz sljedeće tablice (11), p-vrijednost jako je mala pa se može odbaciti nulta hipoteza u korist alternative.

Tablica 11. Rezultati White testa za valutni par EUR/USD.

Tip White testa	Statistika	broj stupnjeva slobode	p-vrijednost
No cross terms	275.7718	30	0.0000

Izvor: Autorov izračun

PRIMJENA METODE MJERENJA UČINKOVITOSTI ZAŠTITE

U nastavku će se izvršit mjerenje učinkovitosti zaštite (engl. *effectiveness of hedging methods*) u okviru primjene podataka na primjeru valutnog para EUR/USD korištenjem Analize standardne devijacije i Analize koeficijenta varijacije. Pouzdanost i uvriježenost navedenih metoda potvrđena je u brojnim suvremenim istraživanjima (Bonga-Bonga i Umoetok, 2016; Figlewski, 1984; Gagnon et al., 1998; Howard i D'Antonio, 1984; Janru i Jinghua, 2011; Yang i Allen, 2004).

Određivanje učinkovitosti zaštite na primjeru valutnog para EUR/USD

Primjena Analize standardne devijacije na primjeru valutnog para EUR/USD

U sljedećoj tablici (12) prikazuje se smanjenje varijance u odnosu o metodi koja je korištena kako bi se odredila učinkovitost zaštite na primjeru valutnog para EUR/USD.

Tablica 12. Rezultati Analize standardne devijacije na primjeru valutnog para EUR/USD.

Metoda	h*	smanjenje
OLS	0.0038998	-0.12%
VAR	-0.2160418	-4.72%
VECM	-0.4114028	-15.96%

Izvor: Autorov izračun

Dobiveni su negativni koeficijenti koji nisu smisleni jer primjenom ove mjere učinkovitosti zaštite ne dolazi do smanjenja rizičnosti.

Primjena Analize koeficijenta varijacije na primjeru valutnog para EUR/USD

Primjenom Analize koeficijenta varijacije uspoređuju se učinkovitosti zaštite na primjeru valutnog para EUR/USD. U sljedećoj tablici (13) prikazani su koeficijenti varijacije raznih modela zaštite za podatke koji su služili za procjenu modela, odnosno za *in-sample* podatke.

Tablica 13. Rezultati Analize koeficijenta varijacije na primjeru valutnog para EUR/USD.

Metoda	h*	koeficijent
OLS	0.0038998	-0.148%
VAR	-0.2160418	NaN
VECM	-0.4114028	NaN

Izvor: Autorov izračun

Prema rezultatima za *in-sample* podatke niti jedna od mjera ne dovodi do smanjenja rizičnosti. Izlazne su vrijednosti negativne ili se ne mogu izračunati.

SIMULACIJA PONAŠANJA ZAŠTITE NAKON ZAPOČETE ZAŠTITE

U nastavku se iznose rezultati simulacije ponašanja zaštite kroz tri razdoblja nakon započete zaštite. Kako je u analizi slučaja zaštita započeta 30.06.2013., simulacija se provodi na iduća tri poslovna kvartala, odnosno 30.09.2013., 31.12.2013. i 31.03.2014. te se za potrebe simulacije koristite sljedeći testovi:

Test 1 predstavlja 30.09.2013.
Test 2 predstavlja 31.12.2013.
Test 3 predstavlja 31.03.2014.

U svakom od testova obuhvat podataka za testiranje učinkovitosti je "posljednjih godinu dana" do izvještajnog datuma, odnosno obuhvat podataka je u svakom od testova sljedeći:

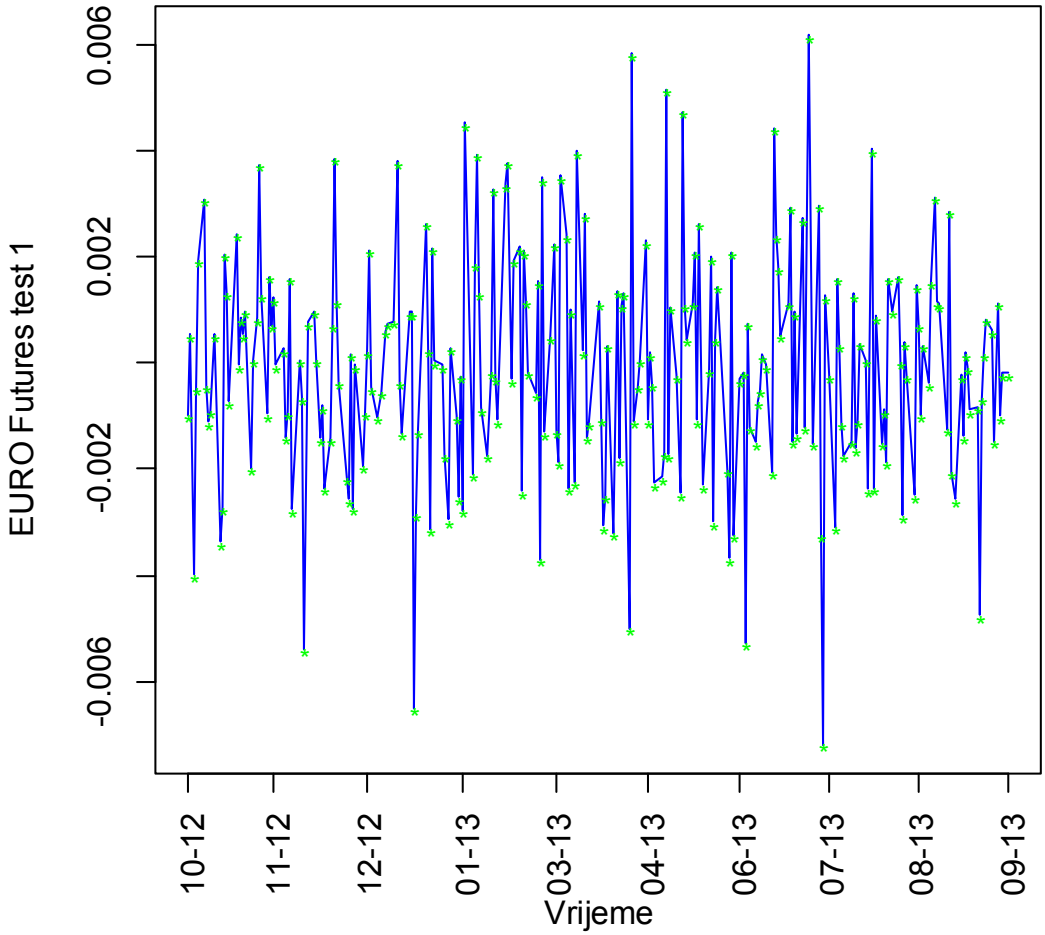
Test 1 od 01.10.2012. do 30.09.2013.
Test 2 od 01.01.2013. do 31.12.2013.
Test 3 od 01.04.2013. do 31.03.2014.

Za potrebe simulacije poslovnog procesa korišteni su *out-of-sample* podatci, i to puno kraćeg vremenskog obuhvata, kako bi se pored simulacije poslovnog procesa istražio i utjecaj obuhvata podataka na učinkovitost zaštite i na poslovni proces zaštite novčanog tijeka.

Simulacija na primjeru valutnog para EUR/USD

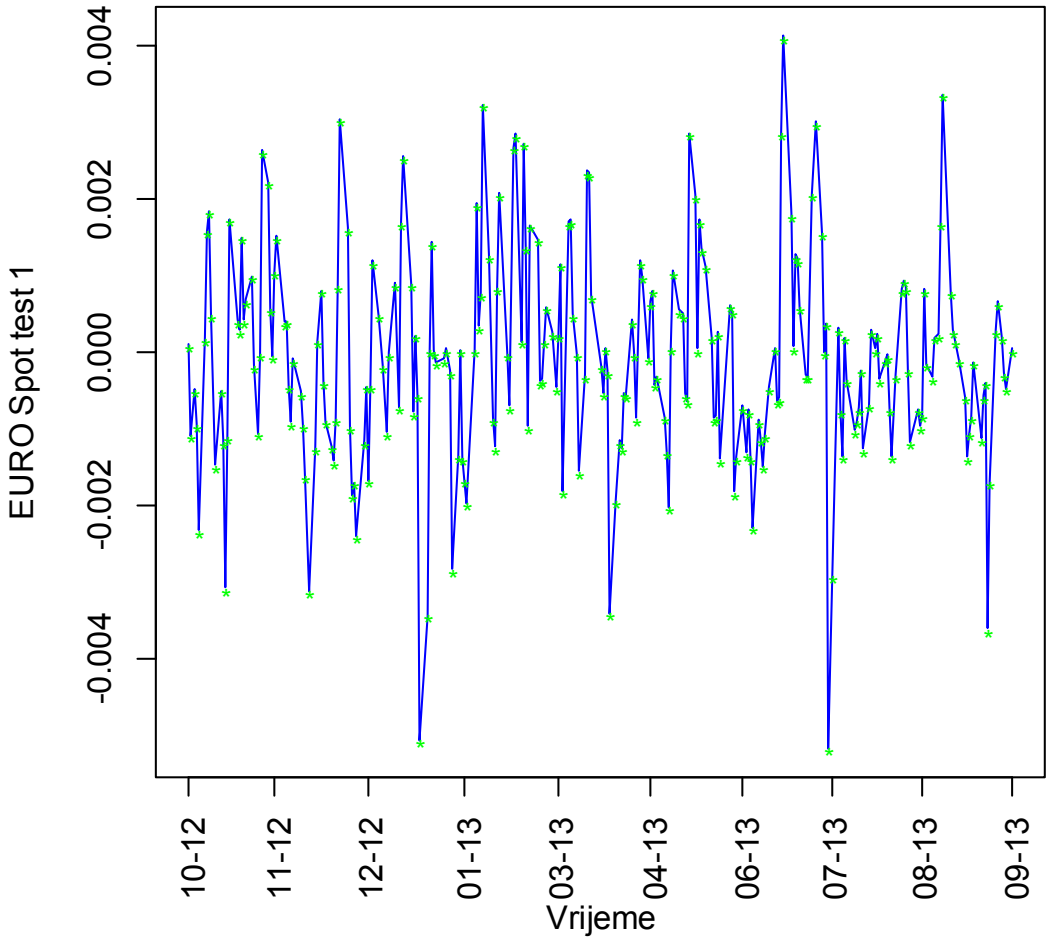
Kako je prikazano u prethodnim poglavljima, zaštita valutnog para EUR/USD korištenjem futuresa nije pogodna jer nije utvrđen niti jedan omjer zaštite kod kojeg bi došlo do smanjenja rizika. No, kako bi se ispitalo ponašanje učinkovitosti u ovisnosti o obuhvatu podataka i vremenu, analiziraju se *out-of-sample* podatci za ustanovljene omjere zaštite. U sljedećim grafovima (slike od 7 do 12) prikazuju se *out-of-sample* podatci.

Slika 14. Prikaz *out-of-sample* podataka za futurese valutnog para EUR/USD u Testu 1.



Izvor: Autorov izračun

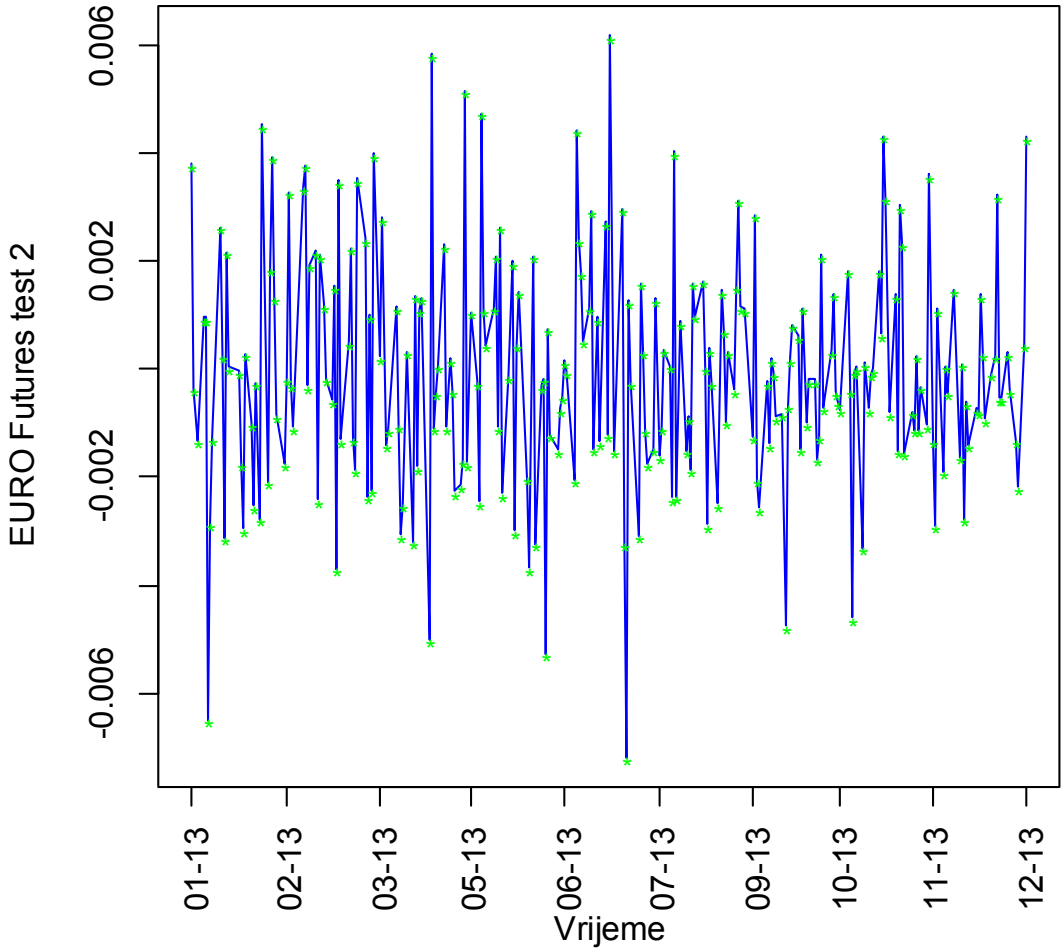
Slika 15. Prikaz *out-of-sample* podataka za spot cijene valutnog para EUR/USD u Testu 1.



Izvor: Autorov izračun

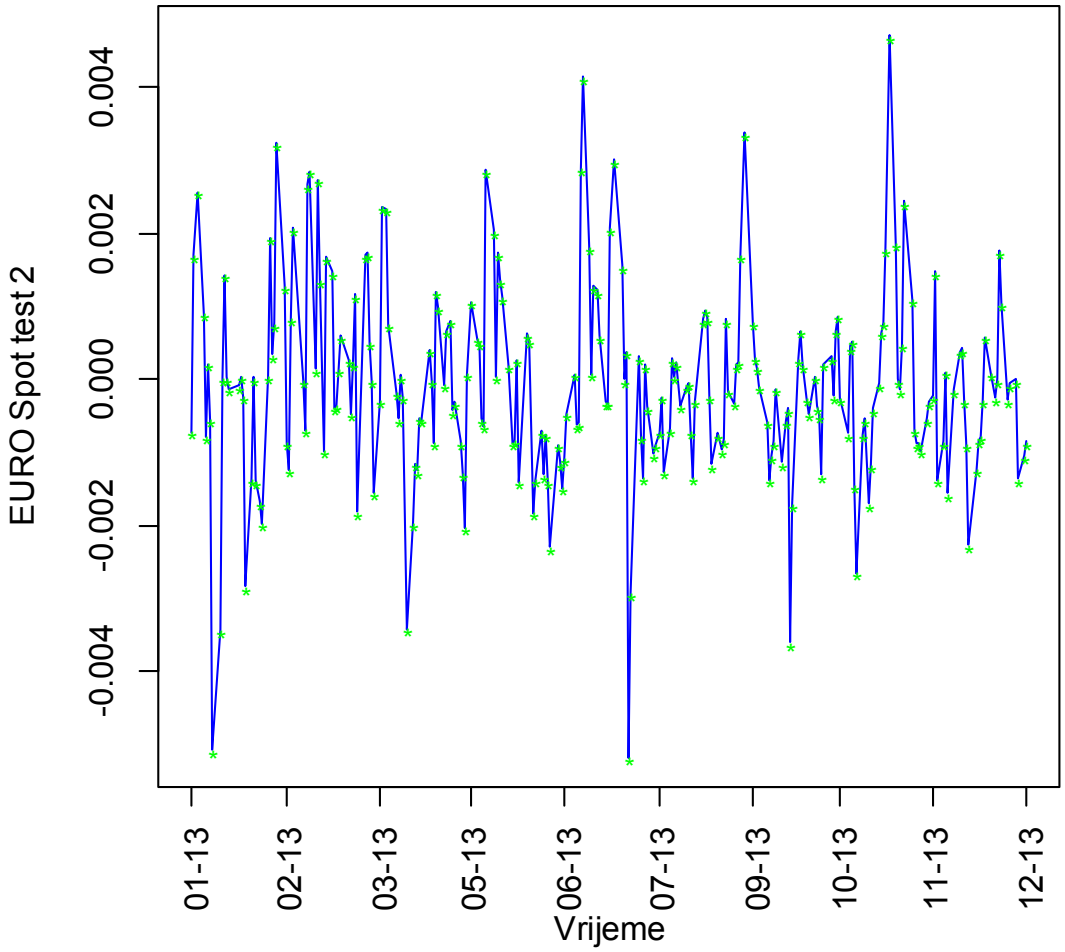
Out-of-sample podatci izgledaju jednako kao i *in-sample* podatci te se grupiraju oko nule bez prevelikih odstupanja i bez vidljivog trenda ili cikličnosti. Graf je oštrijeg oblika jer je puno manje podataka nego u *in-sample* podatcima.

Slika 16. Prikaz *out-of-sample* podataka za futurese valutnog para EUR/USD u Testu 2.



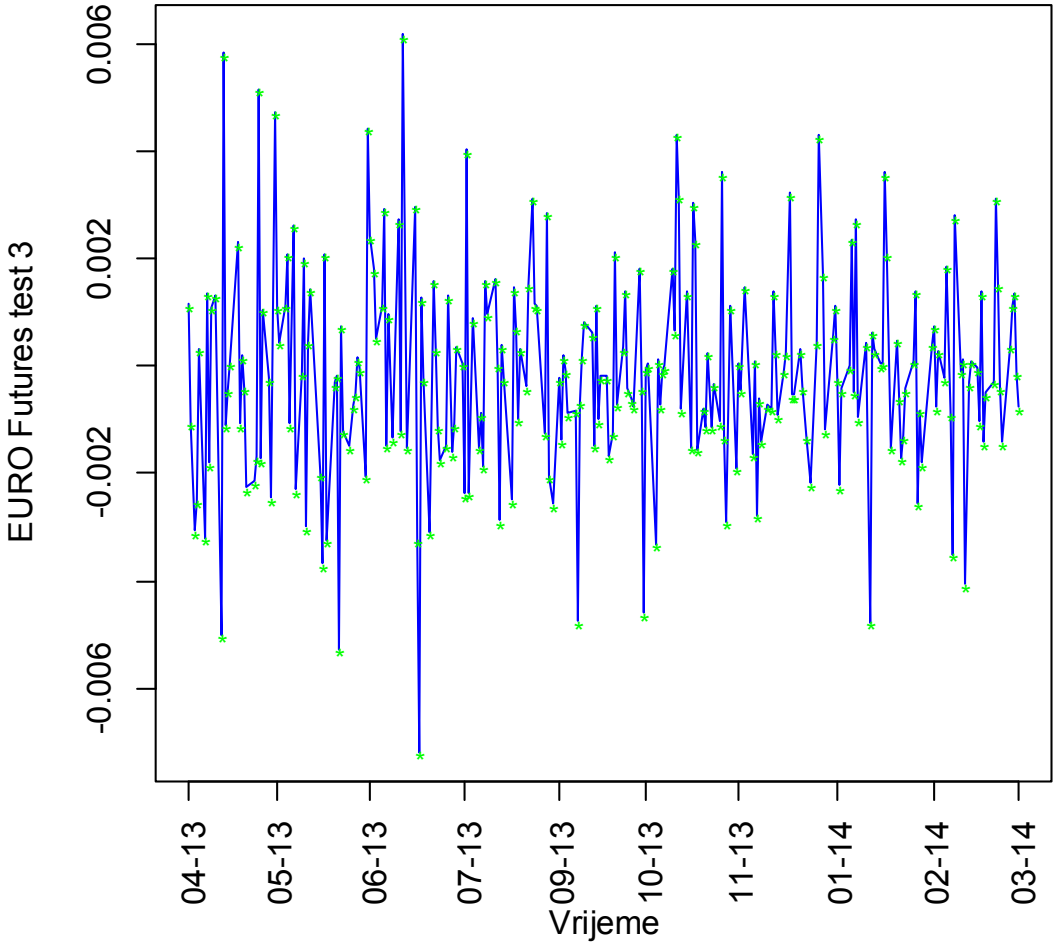
Izvor: Autorov izračun

Slika 17. Prikaz *out-of-sample* podataka za spot cijene valutnog para EUR/USD u Testu 2.



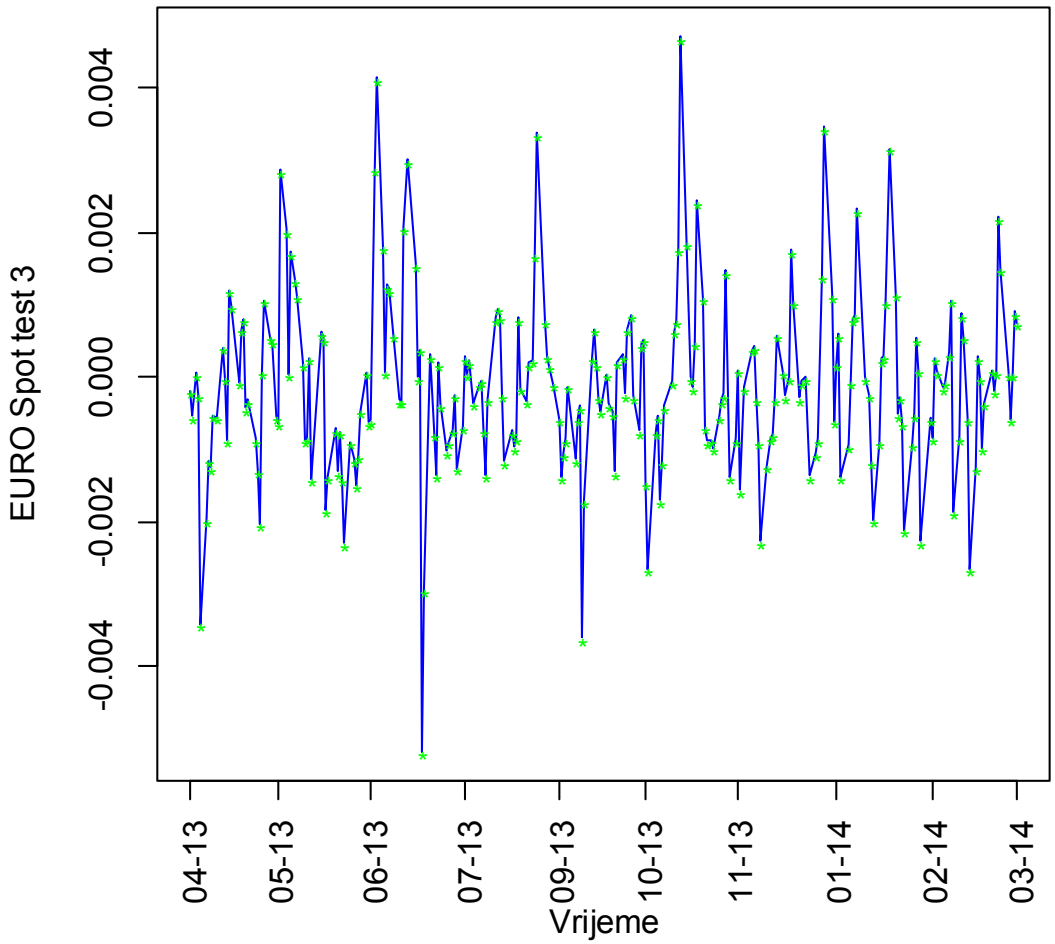
Izvor: Autorov izračun

Slika 18. Prikaz *out-of-sample* podataka za futurese valutnog para EUR/USD u Testu 3.



Izvor: Autorov izračun

Slika 19. Prikaz *out-of-sample* podataka za spot cijene valutnog para EUR/USD u Testu 3.



Izvor: Autorov izračun

U sljedećoj tablici (14) prikazano je smanjenje varijance u ovisnosti o korištenoj metodi na *out-of-sample* podatcima.

Tablica 14. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 1 uz metodu Analize standardne devijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	smanjenje
OLS	0.0038998	-0.022%
VAR	-0.2160418	-4.26%
VECM	-0.4114028	2.41%

Izvor: Autorov izračun

Rezultati u prethodnoj tablici (14) pokazuju da je VECM metoda najučinkovitija i jedina dovodi do minimalnog smanjenja rizičnosti.

Tablica 15. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 2 uz metodu Analize standardne devijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	smanjenje
OLS	0.0038998	-0.023%
VAR	-0.2160418	1.283%
VECM	-0.4114028	2.158%

Izvor: Autorov izračun

Prema rezultatima u prethodnoj tablici, VECM metoda je najučinkovitija, ali je njezino smanjenje jako malo, što vrijedi i za smanjenje VAR metode. Negativni rezultat kod OLS metode nije smislen jer ne pokazuje smanjenje rizičnosti.

Tablica 16. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 3 uz metodu Analize standardne devijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	smanjenje
OLS	0.0038998	0.3754%
VAR	-0.2160418	0.7162%
VECM	-0.4114028	0.075%

Izvor: Autorov izračun

Rezultati u prethodnoj tablici (16) pokazuju da je VAR metoda najučinkovitija. Važno je primijetiti da metode daju jako malo smanjenje varijance. Smanjenja su manja od 1%, što se ne smatra učinkovitim smanjenjem. Vidljivo je kako je uz date omjere zaštite u određenim slučajevima učinkovitost zaštite pozitivna u *out-of-sample* podatcima. Tablica za *out-of-sample* podatke za Analizu koeficijenta varijacije prikazuju se u nastavku.

Tablica 17. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 1 uz metodu Analize koeficijenta varijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	koeficijent
OLS	0.0038998	2999.1%
VAR	-0.2160418	NaN
VECM	-0.4114028	NaN

Izvor: Autorov izračun

Prema rezultatima za *out-of-sample* podatke iz Testa 1 jedino je OLS koeficijent značajan te se stoga smatra učinkovitom zaštitom. Preostali koeficijenti se ne mogu izračunati te stoga ne izražavaju mjeru smanjenja volatilnosti.

Tablica 18. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 2 uz metodu Analize koeficijenta varijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	koeficijent
OLS	0.0038998	-154%
VAR	-0.2160418	NaN
VECM	-0.4114028	NaN

Izvor: Autorov izračun

Prema rezultatima za *out-of-sample* podatke iz Testa 2 niti jedna mjera ne pokazuje značajno smanjenje rizičnosti.

Tablica 19. Simulacija ponašanja zaštite za valutni par EUR/USD u Testu 3 uz metodu Analize koeficijenta varijacije kao metodu mjerenja učinkovitosti zaštite.

Metoda	h*	koeficijent
OLS	0.0038998	163.52%
VAR	-0.2160418	NaN
VECM	-0.4114028	NaN

Prema rezultatima za *out-of-sample* podatke iz Testa 3 jedino OLS daje značajnu mjeru smanjenja rizičnosti.

ZAKLJUČAK

U ovom radu ispitano je postoji li kombinacija metode određivanja omjera zaštite i metode mjerenja učinkovitosti zaštite kojom se postiže učinkovita zaštita kad se štiti valutni par EUR/USD korištenjem futures ugovora na EUR/USD. Kao metode odreživanja omjera zaštite korištene su OLS (Metoda najmanjih kvadrata), VAR (Metoda bivarijantne vektorske autoregresije i VECM (Metoda vektorske

korekcije pogreške), a kao metode mjerenja učinkovitosti zaštite korištene su Analiza koeficijenta varijacije i Analiza standardne devijacije. Nisu pronađeni dokazi o postojanju vremenski stabilno učinkovitog omjera zaštite, kako u trenutku uspostave zaštite tako niti u tri izvještajna razdoblja koja slijede.

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‘...When the Internal Working Models Block the Possibilities of the Extraneous Mind to Heal the Extraneous ‘I’...’

(Mentallization Within the Process of Therapeutic Care for Children, Raised out of Their Families)

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Abstract: The report is an attempt for a profound analysis of how the traumatic memories from the family history and the attachment disorders of institutionalized children reflect on their perceptions about love and trust as reciprocally connected emotions. It explores also the impact of those on child’s skills for working over, sublimating and acting out one’s unstructured inner emotional world in all its pain. The emphasis is on the disorganized style of attachment as consequence of experienced violence or of abnormal family dysfunctions, causing a dissociative state of the children’s “I” and consequently – difficulties in developing an organized and coherent pattern of self-affirmation.

Keywords: mentallization, attachment, extraneous “I”, secure basis, emotional self-control.

‘Когато вътрешните работни модели блокират възможностите чуждият ум да излекува чуждия аз’

(Ментализация и привързаност в процеса на терапевтична грижа за деца, отглеждани извън семействата си)

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Резюме: Докладът е опит за задълбочен анализ на това, как травматичните спомени от семейната история и привързаността на институционализираните деца отразяват възприятията им за любовта и доверието като взаимно свързани емоции. Той изследва и влиянието на тези конструкти върху уменията на детето за работа, сублимиране и действие на неструктурирания вътрешен емоционален свят в цялата му болка. Акцентът е върху неорганизирания стил на привързаност, в следствие на насилие или на необичайни семейни дисфункции, което води до разпадане на състоянието на "Аз" на децата и следователно - трудности при разработването на организиран и съгласуван модел на самоутвърждаване.

Ключови думи: ментализация, привързаност, външен "Аз", сигурна основа, емоционален самоконтрол.

През последните години в институциите и резидентните услуги се настаняват все повече деца и юноши със сериозни емоционални и поведенчески проблеми, в резултат от тежка лична история на изоставяне, неглижиране, насилие в семейството и други травматични събития. Тяхното поведение е „базирано на болката", което само по себе си означава и необходимост от терапевтично отношение – отношение на грижовно, емпатийно, емоционално безопасно придружаване, проникващо отвъд думите и търсещо важните означаващи и опорни идентификационни точки.

Има много изследвания, които показват връзката между афективния дефицит в ранното детство и сериозните поведенчески трудности в периода на юношеството. Става дума за прояви на псевдоавтономност, които включват статусни нарушения като бягства, скитничество, употреба на упойващи вещества, самонараняване и суицидни опити, поведения в конфликт със закона. Това, обаче, са по-скоро симптоми на формиране на идентичност,

основана на твърде рано натрупания и повтарящ се травматичен опит на загуби и лошо отношение, на преживявания на истинско обезкореняване, заключващи в свят на дълбоко психично страдание, на изтласквано, но съществуващо, отвъд знанието, усещане за несвързаност със себе си и другите. Симптомът придобива стойност на метафора на забравата, превръща се в загадка, в една необикновена маска, която прикрива същностна липса, липсата на това, да бъдеш [3].

Децата в институции и резидентни услуги често не намират думи, с които да опишат чувствата си и да заявят себе си, и проектират идентификации с надеждата „да бъдат разбрани и да разберат собствения си Аз" или екстернализират страданието си от неасимилираните присъствия на другите в поведенчески прояви. Травматичните преживявания често водят до една специфична ментална организация на дисоциация, целяща да минимизира страдание, което не може да бъде интегрирано. Тя се явява защитна стена пред емоционалната тежест на събития, които индивидът предпочита да изолира като част от личната си история и да приеме ролята на страничен наблюдател, защото менталното „отделяне" до голяма степен лимитира болката и дистреса.

Неоспорим факт е, че за да расте детето с усещане за здрав Аз и базисна удовлетвореност от себеостойностяването си чрез собствените репрезентационни модели, нагласи, ментални схеми, даващи отговори на въпроса: „дали изобщо разбирам себе си и нормално ли е да се чувствам така?", то има нужда от сигурна привързаност и достатъчно надеждна подкрепяща среда. Като се изхожда от тезиса на Уиникът, че независимостта се постига чрез „натрупването на спомени за обгрижването, чрез проекцията на лични потребности и интроекцията на детайли от обгрижването и развитието на доверие в обкръжението" [5,33], проблемът е какво се случва с дете, преживяло поредица от раздели и премествания, често „поверявано" на чужди грижи, лутащо се между бягството „от и към" семейството – неговото, но в същото време емоционално имагинерното, в което никой не му е помагал да извлича полза както от задоволяването на нужди, екзистенциални търсения и необходимости, така и от срещата с фрустрациите?! И как, когато първите или приеманите като изначално съкровени обектни отношения, създаващи „базисна свързаност на егото", са отношения на неприсъствие, неотзивчивост,

ненадеждност и емоционална индиферентност, да се понесе изстрадваното всеки ден състояние на неинтегрираност по отношение на себе си и другите?

В теорията си за привързаността Боулби определя възможността за създаване на емоционални връзки с другите като основна характеристика на ефективното функциониране на личността и психичното здраве [1]. В началото детето има нужда от „сигурна база" [1], с помощта на която да се развива и да изследва света. Вътрешните работни модели, които ще интегрира като еквивалент на привързаността, ще бележат и бъдещите междуличностни отношения. Тези репрезентационни психични карти всъщност са в основата на вярванията за себе си и другите, както и на интерперсоналните очаквания на детето. Ако потребностите на детето са оставали незадоволени, то формира модел за другите като ненадеждни и негрижовни, а за себе си – като отблъскващо и незаслужаващо обич. И обратно, дете, чиито нужди са били задоволявани по последователен, любящ и подкрепящ начин, впоследствие то счита другите за надеждни и заслужаващи доверие, а себе си – за мил и привлекателен човек [1]. Можем да разглеждаме привързаността като реципрочна и взаимно влияеща и регулираща се система в интеракциите между детето и обгрижващия значим Друг. Тя не само въвежда в един свят на сигурност, топлота и приютеност, но и позволява уверени и автономни активности в хода на жизнения път, а нерядко е и протектиращата,здрава и силна основа, помагаща в справянето с трудни и болезнени моменти. Сигурната привързаност всъщност е синоним на любовта, истинска и устойчива връзка, която преодолява пространството и времето и мултиплицира позитивни репрезентации на значимите други като фигури на доверие и опора. Ако детето е ценено и обичано, то изгражда същата представа за себе си. И обратно, нарушенията в привързаността и разделите го поставят в едно „не-истинско-битие", лишено от любов и носещо белезите на страданието от усещането за забравеност, несигурност, „не-съвсем-някой в собствения свят или в ничието присъствие".

Много често, подрастващите в институции и резидентни услуги срещат сериозни затруднения да се обвържат с продължителни и любящи отношения, поради липсващата основна фигура на привързаност или емоционалната неангажираност на „някой или поредния грижещ се". Това води не само до афективни, но и до когнитивни и социални дефицити в развитието им. Детето

интернализира липсата на адекватна грижа, обич и защита във вид на самообвинения. То се възприема като безпомощно, неспособно да обича и се чувства отговорно за това [3,с. 89]. Интернализираните негативни послания стават част от неговия Аз-образ, а континуитетът на преживяванията се прекъсва, блокиран от психичната болка. *Така опит, несъвместим с представите за себе си, има тенденцията да не се допуска в съзнанието и когато съществува несъгласуваност, но индивидът не я осъзнава, той е потенциално уязвим на тревожност и дезорганизация*.

Липсата на „отразяване" от и чрез другите на всичко, което детето изпитва, затруднява способностите му да се разпознава като самостойност и като социален субект и създава основите на фалшив селф – чужд и непонятен, защото в дезорганизираното си лутане в сигналите и желанията на другите е капсулирал или се е отказал от истинската си същност. Ментализацията е важно умение за справяне, което е необходимо за добрата емоционална регулация. Питър Фонаги и Антъни Бейтман формулират този термин като способност да се рефлексира и разбира психичното състояние на себе си и на другия, да се постига инсайт относно това какво чувства другият и защо [цит. по 4, с. 66]. С други думи, ментализацията позволява да правим връзки между наблюдаемите поведения и подлежащите им вътрешни емоционални преживявания.

Всъщност, изграждането на психични механизми за тълкуване и разбиране на поведението на околните е една от основните функции на сигурната привързаност. Последната не просто ни помага да оцелеем, тя подпомага нашето превръщане в хора с ясна идентичност и самостоятелен, добре организиран психичен свят. Отношението на привързаност е средата, в която всички ние се научаваме да познаваме, разбираме и придаваме смисъл на себе си и другите. Значимите възрастни, които обясняват и рефлектират върху своите и детските емоционални състояния, помагат на децата да развият силна способност за ментализация, чрез която преживяванията могат да бъдат разбрани и интегрирани, афектите подлежат на самоконтрол, осъзнава се взаимовлиянието на мисли, чувства и поведения, собствени и на другите, в контекста на личностната и социалните идентичности.

Какво всъщност е ментализиращата интеракция? Когато говорим за развитие в норма, родителят или грижещият се се опитва да разбере

психичното състояние на детето – неговите нужди, фрустрации, болки, афекти – и обикновено отразява емоционалните преживявания така, че растящият Аз да ги възприема не като принадлежащи на значимия възрастен, а като свои собствени.

Съществен елемент от способността за ментализация е въображението, тъй като позволява възприемането на нещата от перспективата на другия. Ние имаме допускания и предположения за емоционалните преживявания на обкръжаващите ни, но те могат да се окажат ограничени или неточни. Ефективната ментализация зависи от два ключови компонента: –Точност, която се постига чрез непрекъснатото съпоставяне на нашите интерпретации с реалните чувства и други преживявания на детето. –Обхватност, отнасяща се до мисловното разгръщане и понататъшно задълбочаване на наблюденията ни.

Като вид метакогнитивна дейност, ментализацията позволява да се възприема и интерпретира човешкото поведение от гледната точка на различни психични състояния, потребности, желания, чувства, убеждения, цели и причини. Това е социален феномен, който зависи от себерефлексията, саморегулацията и себеорганизацията [4,с. 66]. Чрез него се случва истинското свързване с другите и се развива устойчива Аз-концепция, осмисляща социалното присъствие и целеполагането, подпомагаща адаптацията към различни ситуации, придаваща усещане за емоционална пълнота.

Според P. Fonagy и M. Target, несигурно привързаните деца имат метакогнитивни дефицити, демонстрирани като трудности в разпознаването на мисли, емоции и намерения на другите [4,с. 67]. Загубата на майчината любов поражда несигурност и тревожност, която ще се повтаря и в по-късните етапи от живота. Ериксън [1] твърди, че любовта, доверието и тревожността са основни детерминанти на изграждащата се идентичност. И както положи-телните, така и отрицателните емоции могат да се интернализират и превърнат в устойчива вътрешна позиция, към която индивидът ще се връща през целия си живот.

Когато родителите не откликват консистентно на нуждите на детето, и особено при злоупотреба, тежко неглижиране, насилие, около 80% от децата развиват дезорганизирана привързаност и несигурен (негативен) вътрешен работен модел. Те започват да се чувстват необичани, застрашени, безсилни и

безпомощни, а другите възприемат като ненадеждни, неотзивчиви, заплашителни и отхвърлящи. Често не успяват да развият компетентно усещане за себе си и са склонни да се откажат от собствените си желания и нужди. Всъщност, децата с дезорганизирана привързаност се оказват емоционално и физически зависими от някой, който в разрушителните си форми на родителско поведение се превръща в източник на страх.

Детското израстване и оцеляване се случват без необходимата външна регулираща подкрепа, а това резултира в разстройства в чувствата за себе си, с висока степен на алиенация и самота и деформирана представа за собственото тяло; в неспособност за контролиране на импулсите и агресия; в липса на доверие и сакрална връзка с другите. Ако внимателно се вгледаме в различните поведенчески индикатори, ще видим, че повечето от тях са признаци на душевно страдание от деформираната връзка с Другия.

Когато родителят системно не отразява детските емоции адекватно и точно, когато се държи агресивно, отхвърлящо или тревожно, когато се фокусира върху собствените си преживявания, детето не може да открие психичния си аз в неговия ум. Питър Фонаги и неговите колеги обозначават това неасимилирано присъствие на чужди негативни психични състояния в детския ум с термина „чужд аз” [2]. За да се поддържа собствената психична интегрираност и независимост от чуждия аз, последният бива непрекъснато екстернализиран навън, в другите. „В случай на дезорганизирана привързаност детето постепенно се идентифицира с умственото състояние на безпомощност и/или враждебност на родителя, състояния, които се проявяват като функция на преживяването на родителя, като изплашен или плашещ по отношение на детето.

За да преживява себе си като кохерентно, хармонично, здраво цяло във времето и пространството, свързано с миналото си и с продуктивното бъдеще, Аз-ът се нуждае на всеки етап от живота си от откликващо, присъстващо и идентифициращо обкръжение, разбиращо и отговарящо на неговата емоционално-чувствена и потребностно-мотивационна структура, но в същото време и позволяващо му да проникне във вътрешния свят на значимите Други и да потърси подкрепа .

В институциите и резидентните услуги сензитивността към личната история и травматичния опит на децата е в основата на

терапевтичното отношение и адекватната интервенция. При ментализиране в по-проблемни моменти, особено ако са натоварени със силни негативни емоции, е важно подкрепящата фигура да е наясно със собственото си поведение на привързаност, да бъде внимателна към промените в емоционалните състояния на детето и причините за тях, да наблюдава и верифицира начините, по които разчита различните му реакции, да се отнася с уважение към описанията и изразите му, да е позитивна и обнадеждаваща, но едновременно с това питаща и любопитна. Детето бавно започва да се научава да ментализира чрез преживяването, че то самото е ментализирано, разбрано и подкрепено от някой друг – човек, който е чувствителен към поведенията му и винаги ги свързва с подлежащите им чувства.

Безспорните ползи от този процес са в научаването на емоционалния език, намаляване на импулса към отреагирване и защитните бариери, изграждане на смисъл за себе си и света, нарастващо разбиране на мотивите и действията на околните.

Съществуват два ментализационни подхода. *При явното ментализиране конкретните поведения и подлежащите им емоции са във фокуса на разговора. Скритото ментализиране се извършва интуитивно*. При него отсъства съзнателната рефлексия върху конкретните подлежащи чувства и психични състояния, но те все пак се подразбират. За децата от институции и резидентни услуги началните преживявания на ментализиране могат да бъдат обърквaщи, плашещи и заливащи ги. Ето защо е важно да се знае следното: *колкото по-несигурен е стилът на привързаност, толкова по-скрито трябва да е ментализирането, като уменията за маркиране и отразяване на детските чувства трябва да се упражняват в ситуации с ниско ниво на емоционална възбуда.*

Явната ментализация може да се извършва само когато емоциите са регулирани. За „емоционалното си презареждане" децата имат нужда от „сигурно убежище" и „сигурна основа", както и от подпомагащи ментализационния капацитет значими възрастни, които осигуряват напътствие и общуване, чувство на компетентност, близост, усещане, че си нужен. Сензитивността на грижещите се към детските сигнали и симптоми, способността им за правилна интерпретация и последователно емоционално откликване учат подрастващата личност, че светът е предсказуем, че може да

влияе върху него, че може да се справя успешно с нов опит. Така „Аз” се превръща във верифициран и потвърден конструкт, в който се постига кохерентност на идентичността, притежание на разума и чувствата, способност да се разберат и заявят потребности, желания, мисли и преживявания. Предоставянето на ориентирана към взаимоотношенията психо-социална подкрепа в същността си означава отделяне на място в дома, сърцето и ума от страна на някой, който може да използва уменията, способностите и опита си, за да даде шанс на детето и семейството да се излекуват.

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Ratio Analysis Financial Statements as a Component of the Analytical Procedures in the Formation of Audit Evidence

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Abstract: This article describes essence of analytical procedure. It is well-proven that analytical procedure is a basic instrument of receipt of proofs by a public accountant, element of audit of the financial accounting. Composition of analytical procedures is considered. Recognized the need for the development and improvement of methodological recommendations on the preparation of the audit report on the financial condition of the company.

Keywords: audit activity, audit evidence, analytical procedures, financial reporting, ratio analysis of the financial condition of the enterprise.

Коефіцієнтний аналіз фінансової звітності, як складова аналітичних процедур при формуванні аудиторських доказів

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Анотація: У статті розглянуті аналітичні процедури, уточнена їх сутність. Доведено, що аудиторські процедури є основним інструментом отримання аудиторських доказів, найважливішим елементом аудиторської перевірки фінансової звітності. Розглянуто склад аналітичних процедур. Визнано потребу роз-

робки та удосконалення методичних рекомендацій щодо підготовки аудиторського висновку стосовно фінансового стану підприємства.

Ключові слова: аналітичні процедури, аудиторські докази, аудиторська діяльність, фінансова звітність, коефіцієнтний аналіз фінансового стану підприємства.

Найважливішим аспектом аудиторської діяльності є отримання надійної та достовірної інформації, яка дозволить аудитору зробити адекватні висновки щодо фінансової звітності клієнта, іншими словами, отримати якісні аудиторські докази для складання аудиторського висновку. При проведенні аудиторської перевірки для одержання аудиторських доказів важлива роль належить аналітичним процедурам, які у вітчизняній аудиторській практиці ще не знайшли достатнього та ефективного застосування. Аналітичні процедури є процесом дослідження та оцінки фінансової інформації, які виконуються шляхом вивчення та порівняння взаємозалежностей. Аналіз роботи вітчизняних аудиторів та аудиторських фірм свідчить, що існують певні суперечності на рівні як понятійного апарату, так і безпосереднього їх використання. Це суттєво знижує ефективність аудиторських процедур в цілому і негативно впливає на достатність аудиторських доказів, через що, відповідно, виникають проблеми з якістю результатів аудиту.

Теоретичні та практичні аспекти розвитку застосування аналітичних процедур в аудиторській діяльності досліджено у наукових працях багатьох вітчизняних авторів: Т. Барановської [1], Н.Білецької [2], Ф. Бутинця [3], Т. Каменської [4], С. Калабухової [5] , Є. Мниха [6], О. Петрик [7], О. Подолянчук [8], Н. Проскуріної [9], К. Суріної [10] та інших. Проте в умовах розвитку економіки та підвищенням вимог до якості проведення аудиту, до доказовості і обґрунтованості аудиторських висновків, виникає потреба в подальшій диверсифікації аудиторських послуг та включенням до їх складу аналітичних процедур з аналізу господарської діяльності суб’єктів господарювання.

Аудиторські докази — це інформація, отримана при формулюванні висновків, на яких ґрунтується думка аудитора. До них відносяться первинні документи, бухгалтерські записи, за якими складається фінансова звітність та інша підтверджувальна інформація. Міжнародні стандарти аудиту (МСА) розглядають основні аспекти аудиторських доказів у стандарті МСА 500 «Аудиторські дока-

зи». Згідно цього стандарту, аудиторські докази повинні бути достатніми для формування обгрунтованих висновків, на яких базується думка аудитора. Докази збираються за кожним твердженням, нерідко один доказ може підтвердити кілька тверджень. МСА 500 „Аудиторські докази” встановлює наступні процедури одержання доказів: інспектування (перевірка записів, документів або матеріальних активів); спостереження (вивчення процесів або процедур, виконуваних іншими особами); запити й підтвердження (пошук і одержання інформації в обізнаних осіб у межах або за межами суб'єкта.); підрахунок (перевірка точності арифметичних розрахунків або виконання самостійних розрахунків) та аналітичні процедури (аналіз значимих показників і тенденцій) [11].

Переконливість аналітичних висновків аудитора, перш за все, залежить від якості проведеного аналізу і за необхідності підтверджується іншими аудиторськими процедурами. За МСА 520 «Аналітичні процедури» на етапі планування аудитори проводять попередній аналітичний огляд підприємства, який включає оцінку фінансового стану та оцінку безперервності його діяльності (рис.1). Оцінка фінансового стану підприємства проводиться на основі результатів виконання таких аналітичних процедур, як порівняння показників фінансових звітів за поточний рік з показниками за попередні періоди; порівняння фінансових звітів з будь-якими бюджетами, прогнозами або очікуваннями управлінського персоналу; аналіз основних фінансових показників діяльності підприємства; аналіз тенденцій зміни важливих фінансових коефіцієнтів; вивчення непояснених або непередбачених статей фінансових звітів.

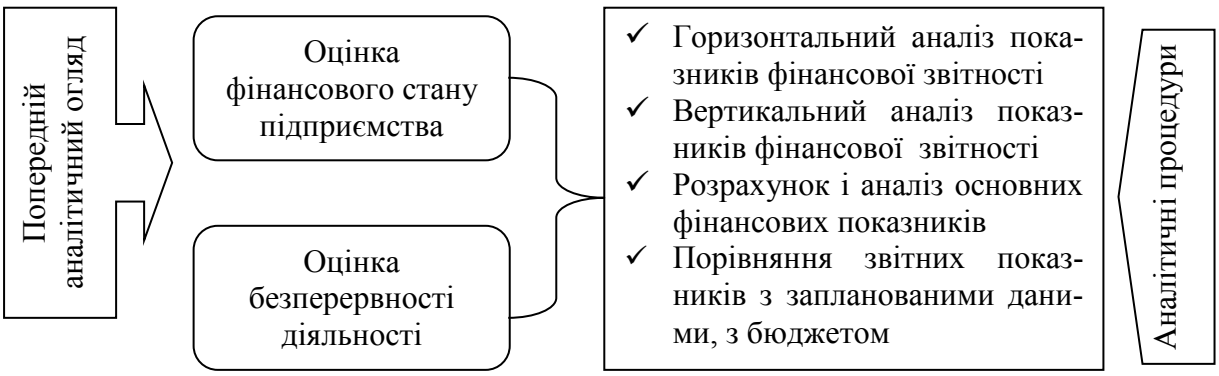

Рис. 1. Застосування аналітичних процедур на етапі попереднього аналітичного огляду

Джерело: Розроблено автором на основі [11] .

Аналітичні процедури складаються з аналізу важливих коефіцієнтів і тенденцій, а також з вивчення результатів відхилень і взаємозв'язків, які відрізняються від прогнозованих сум або суперечать іншій відповідній інформації. Основною метою застосування аналітичних процедур є виявлення наявності невідповідних або неправильно відображених фактів і результатів господарської діяльності, які визначають потенційний ризик та потребують особливої уваги аудитора. Аналіз коефіцієнтів, тенденцій зміни від попередніх періодів, бюджетів і результатів діяльності інших суб'єктів господарювання може виявитися корисним для точної обробки великого обсягу проведених операцій підприємством та оцінки аудитором заходів внутрішнього контролю підприємства. Аудитор на підставі звітних даних підприємства може проводити поглиблений аналіз його економічного стану: визначити економічний розвиток підприємства, його майновий та фінансовий стан, ліквідність, доходність та рентабельність діяльності. Така оцінка дозволяє виявити позитивні і негативні тенденції розвитку підприємства.

Для формування аудиторського висновку щодо оцінки фінансового стану акціонерних товариств та визначення безперервності їх функціонування аудитори керуються «Методичними рекомендаціями щодо підготовки аудиторського висновку при перевірці відкритих акціонерних товариств та підприємств – емітентів облігацій (крім комерційних банків)», затвердженими Протоколом засідання Аудиторської палати України № 99 від 23.02.2001 р. [12]. Згідно цих рекомендацій, основні напрями аналізу, передбачають розрахунок таких показників:

- ✓ Показники майнового стану підприємства;
- ✓ Показники ліквідності підприємства;
- ✓ Показники платоспроможності (фінансової стійкості) підприємства;
- ✓ Показники ділової активності підприємства;
- ✓ Показники рентабельності;
- ✓ Показники рентабельності (ринкової активності).

Обов'язковими показниками для формування аудиторського висновку є показники абсолютної ліквідності, фінансової стійкості, структури капіталу. Інші показники наводяться у висновку на розсуд аудитора [12]. На основі аналізу показників фінансового стану аудитор може зробити висновок про реальність та перспективи фінансового стану акціонерного товариства та оцінити достовірність його безперервного функціонування та ймовірність банкрутства як суб'єкта господарювання.

Дана методика оцінки фінансового стану охоплює основні найважливіші напрями аналізу, включаючи і показники ринкової активності (прибутковість акцій, коефіцієнт дивідендного доходу, коефіцієнт виплати дивідендів), що дає змогу зробити комплексну оцінку інвестиційної привабливості компанії на фондовому ринку. В ній наведено на основі форм бухгалтерської звітності алгоритм розрахунку зазначених показників, але всі формули розрахунків орієнтовані на форми звітності, які діяли до 2013 року. Порядок розрахунку рекомендованих показників, що використовуються при формуванні аудиторського висновку, наведено в табл. 1.

Таблиця 1

Алгоритм розрахунку фінансових показників (коефіцієнтів).

Показник	Формула розрахунку	Нормативне значення
1. Аналіз майнового стану підприємства		
1.1. Коефіцієнт зносу основних засобів	$\frac{ф.1стр.032}{ф.1стр.031}$	зменшення
1.2. Коефіцієнт оновлення основних засобів	$\frac{ф.5стр.260(гр.5)}{ф.1стр.031(гр.4)}$	збільшення
1.3. Коефіцієнт вибуття основних засобів	$\frac{ф.5стр.260(гр.8)}{ф.1стр.031(гр.3)}$	має бути менше за коефіцієнт оновлення основних засобів
2. Аналіз ліквідності підприємства		
2.1. Коефіцієнт покриття	$\frac{ф.1стр.260}{ф.1стр.620}$	>1
2.2. Коефіцієнт швид-	$\frac{ф.1(стр.260-стр.100-стр.110-стр.120-стр.130-стр.140)}{ф.1стр.620}$	0,6 – 0,8

кої ліквідності		
2.3. Коефіцієнт абсолютної ліквідності	$\frac{ф.1(стр.220+стр.230+стр.240)}{ф.1стрп.620}$	>0 збільшення
2.4. Чистий оборотний капітал (тис. грн.)	$ф.1(стр.260-стр.620)$	>0 збільшення
3. Аналіз платоспроможності		
3.1. Коефіцієнт платоспроможності (автономії)	$\frac{ф.1стр.380}{ф.1стр.640}$	>0,5
3.2. Коефіцієнт фінансування	$\frac{ф.1(стр.430+стр.480+стр.620+стр.630)}{ф.1стр.380}$	<1 зменшення
3.3. Коефіцієнт забезпеченості власними оборотними засобами	$\frac{ф.1(стр.260-стр.620)}{стр.620}$	>0,1
3.4. Коефіцієнт маневреності власного капіталу	$\frac{ф.1(стр.260-стр.620)}{стр.380}$	>0 збільшення
4. Аналіз ділової активності підприємства		
4.1. Коефіцієнт оборотності активів	$\frac{ф.2стр.035}{ф.1(стр.280(гр.3)+стр.280(гр.4))/2}$	збільшення

4.2. Коефіцієнт оборотності кредиторської заборгованості	$\frac{ф.2стр.035}{ф.1(\sum(стр.520/стр.600)гр.3+\sum(стр.520/стр.600)гр.4)/2}$	збільшення
4.3. Коефіцієнт оборотності дебіторської заборгованості	$\frac{ф.2стр.035}{ф.1(\sum(стр.150/стр.210)гр.3+\sum(стр.150/стр.210)гр.4)/2}$	збільшення
4.4. Строк погашення дебіторської заборгованості (днів)	$\frac{Тривалість\_періоду}{Коефіцієнт\_оборотності\_дебіторської\_заборгованості}$	зменшення
4.5. Строк погашення кредиторської заборгованості (днів)	$\frac{Тривалість\_періоду}{Коефіцієнт\_оборотності\_кредиторської\_заборгованості}$	зменшення
4.6. Коефіцієнт оборотності матеріальних запасів	$\frac{ф.2стр.040}{ф.1(\sum(стр.100/стр.140)гр.3+\sum(стр.100/стр.140)гр.4)/2}$	збільшення
4.7. Коефіцієнт оборотності основних засобів (фондовіддача)	$\frac{ф.2стр.035}{ф.1(стр.031(гр.3)+стр.031(гр.4))/2}$	збільшення
4.8. Коефіцієнт оборотності власного капіталу	$\frac{ф.2стр.035}{ф.1(стр.380(гр.3)+стр.380(гр.4))/2}$	збільшення

5. Аналіз рентабельності підприємства		
5.1. Коефіцієнт рентабельності активів	$\frac{ф.2стр.220\_або\_стр.225}{ф.1(стр.280(гр.3)+стр.280(гр.4))/2}$	>0 збільшення
5.2. Коефіцієнт рентабельності власного капіталу	$\frac{ф.2стр.220\_або\_стр.225}{ф.1(стр.380(гр.3)+стр.380(гр.4))/2}$	>0 збільшення
5.3. Коефіцієнт рентабельності діяльності	$\frac{ф.2стр.220\_або\_стр.225}{ф.2стр.035}$	>0 збільшення
5.4. Коефіцієнт рентабельності продукції	$\frac{ф.2стр.100(або\_стр.105)+стр.090-стр.060}{ф.2(стр.040+стр.070+стр.080)}$	>0 збільшення
6. Аналіз прибутковості		
6.1. Коефіцієнт прибутковості	$\frac{ф.2стр.320}{ринкова\_вартівсть\_1\_акції}$	
6.2. Коефіцієнт дивідендного доходу	$\frac{ф.2стр.340}{ринкова\_вартівсть\_1\_акції}$	
6.3. Коефіцієнт виплати дивідендів	$Виплата\_дивідентів\_на\_1\_акцію$ $\frac{ф.2стр.340}{ф.2стр.320}$	

Примітки: ф. 1 - "Баланс підприємства"; ф. 2 - "Звіт про фінансові результати"; ф. 5 - "Примітки до річної фінансової звітності". Джерело: [12].

Хоча дана методика достатньо повно висвітлює аналітичний механізм оцінки фінансового стану підприємства і на дату її прийняття була достатньо

вичерпною, але з урахуванням змін у формах фінансової звітності, які відбулися в 2013 році, постає необхідність в уточненні та стандартизації загальної методики розрахунків тих чи інших показників. Згідно НП(С)БО 1 «Загальні вимоги до фінансової звітності», затвердженим наказом Міністерства фінансів України від 07.02.2013 р. № 73, пропонуємо наступний порядок розрахунку показників (табл.2.):

Таблиця 2

Алгоритм розрахунку фінансових показників (коефіцієнтів).

Показник	Формула розрахунку	Норма-тивне значення
1. Аналіз майнового стану підприємства		
1.1. Коефіцієнт зносу основних засобів	$\frac{ф.1 стр.1012}{ф.1 стр.1011}$	Змен-шення
2. Аналіз ліквідності підприємства		
2.1. Коефіцієнт покриття (загальної ліквідно-сті)	$\frac{ф.1 стр.1195}{ф.1 стр.1695}$	1-1,5
2.2. Коефіцієнт швидкої (проміжної) ліквідності	$\frac{ф.1(стр.1165+стр.1160+стр.1155+стр.1135+стр.1130+стр.1125)}{ф.1 стр.1695}$	0,6 – 0,8
2.3. Коефіцієнт абсолютної ліквідності	$\frac{ф.1(стр.1160+стр.1165)}{ф.1 стр.1695}$	0,2-0,35
2.4. Чистий оборотний капітал (тис. грн.)	$ф.1(стр.1195-стр.1695)$	>0 збіль-шення
3. Аналіз платоспроможності		
3.1. Коефіцієнт платоспромо-жності (фінансо-вої автономії)	$\frac{ф.1 стр.1495}{ф.1 стр.1900}$	0,4-0,6
3.2. Коефіцієнт фінансової стійкості	$\frac{ф.1(стр.1495+стр.1595)}{ф.1 стр.1900}$	0,7-0,9

3.3. Коефіцієнт забезпеченості власними оборотними засобами	$\frac{ф.1(стр.1195 - стр.1695)}{стр.1695}$	>0,1
3.4. Коефіцієнт маневреності власного капіталу	$\frac{ф.1(стр.1195 - стр.1695)}{стр.1495}$	>0,1 збільшення
4. Аналіз ділової активності підприємства		
4.1. Коефіцієнт оборотності активів	$\frac{ф.2стр.2000}{ф.1((стр.1300(гр.3) + стр.1300(гр.4))/2}$	збільшення
4.2. Коефіцієнт оборотності кредиторської заборгованості	$\frac{ф.2стр.2000}{ф.1(\sum(стр.1610 - стр.1630)гр.3 + \sum(стр.1610 - стр.1630)гр.4)/2}$	збільшення
4.3. Коефіцієнт оборотності дебіторської заборгованості	$\frac{ф.2стр.2000}{ф.1(\sum(стр.1125, стр.1130, стр1135, стр.1155)гр.3 + \sum(стр.1125, стр.1130, стр.1135, стр.1155)гр.4)/2}$	збільшення
4.4. Строк погашення дебіторської заборгованості (днів)	$\frac{Тривалість\_періоду}{Коефіцієнт\_оборотності\_дебіторської\_заборгованості}$	зменшення
4.5. Строк погашення кредиторської заборгованості (днів)	$\frac{Тривалість\_періоду}{Коефіцієнт\_оборотності\_кредиторської\_заборгованості}$	зменшення
4.6. Коефіцієнт оборотності матеріальних запасів	$\frac{ф.2стр.2050}{ф.1(стр.1100гр.3 + стр.1100гр.4)/2}$	збільшення
4.7. Коефіцієнт оборотності основних за-собів (фондо-віддача)	$\frac{ф.2стр.2000}{ф.1(стр.1011(гр.3) + стр.1011(гр.4))/2}$	збільшення
4.8. Коефіцієнт оборотності власного капіталу	$\frac{ф.2стр.2000}{ф.1(стр.1495(гр.3) + стр.1495(гр.4))/2}$	збільшення

5. Аналіз рентабельності підприємства		
5.1. Коефіцієнт рентабельності активів	$\frac{ф.2стр.2350\_або\_стр.2355}{ф.1(стр.1300(гр.3)+стр.1300(гр.4))/2}$	>0 збільшення
5.2. Коефіцієнт рентабельності власного капіталу	$\frac{ф.2стр.2350\_або\_стр.2355}{ф.1(стр.1495(гр.3)+стр.1495(гр.4))/2}$	>0 збільшення
5.3. Коефіцієнт рентабельності діяльності	$\frac{ф.2стр.2350\_або\_стр.2355}{ф.2стр.2000}$	>0 збільшення
5.4. Коефіцієнт рентабельності продукції	$\frac{ф.2стр.2190(або\_стр.2195)+стр.2180-стр.2120}{ф.2(стр.2050+стр.2130+стр.2150)}$	>0 збільшення
6. Аналіз прибутковості		
6.1. Коефіцієнт прибутковості	$\frac{ф.2стр.2610}{ринкова\_вартівсть\_1\_акції}$	
6.2. Коефіцієнт дивідендного доходу	$\frac{ф.2стр.2650}{ринкова\_вартівсть\_1\_акції}$	
6.3. Коефіцієнт виплати дивідендів	$\frac{Виплата\_дивідентів\_на\_1\_акцію}{\frac{ф.2стр.2650}{ф.2стр.2610}}$	

Джерело: розроблено автором на основі: [13].

Отже, як показує проведене дослідження, одним із головних завдань підвищення якості аудиторських послуг є удосконалення методичного забезпечення щодо формування аудиторських доказів при перевірці фінансового стану підприємств. Однак розрахунок відносних показників (коефіцієнтів) і їх порівняльні оцінки відповідно до теоретичних значень не вичерпують можливостей якісного аналізу стану суб'єктів господарювання. Це завдання подальших досліджень.

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• *аналітичні процедури будуть більш ефективні там, де більша сукупність кількісних і якісних показників (синтетичних та аналітичних) у характеристиці окремих економічних явищ або процесів;*

Аналітичне забезпечення аудиторських доказів сприяє зменшенню ризику аудиторської перевірки та аудиторського висновку. Процес використання аналітичних процедур вимагає чіткого розмежування аналітичних прийомів відповідно до мети дослідження та максимального зосередження на використанні аналітичних результатів за методикою комплексного економічного аналізу.

Transformation of Expression as a Mean of Developing Mathematical Thinking

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Abstract: The article discusses the issue how the transformations of geometric and arithmetic progressions can develop learners' mathematical thinking.

Преобразование выражений как средство развития математических мышлений

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Аннотация: В статье поставлен вопрос: как способствуют развитию преобразовании геометрических и арифметических прогрессий математического мышления учащихся.

Вопрос о целях обучения тому или иному предмету является чрезвычайно важным. Цели обучения отражают потребности общества, которые стоят перед ним в данный момент. Известный русский математик академик П.Л. Чебышев указывал, что преподавание математики имеет три цели:

1) развитие умственных способностей,

2) доставление сведений, необходимых для высокообразованного человека,

3) приготовление к специальным занятиям физико-математическими науками и приложениями их к практической деятельности.

Формирование мировоззрения школьников осуществляется в ходе изучения всех школьных дисциплин. Математика вносит свой вклад в решение этой важнейшей задачи. В развитии математического мышления учащихся основную роль играют преобразование алгебраических выражений. Тема «Преобразование выражений» включает в себе три вопроса: «Свойства действий над числами», «Тождественные преобразования выражений», «Доказательство тождеств».

Цели нашей статьи:

- формировать навык вычисления суммы n первых членов арифметической прогрессии, умение применять полученные знания при решении задач;
- способствовать развитию логического мышления;
- воспитовать вычислительную культуру.

Задача 1. Доказать, что если числа $a_1,\ a_2,\ a_3,\ldots,a_n$ образуют арифметическую прогрессию, то $\frac{1}{a_1a_2}+\frac{1}{a_2a_3}+\Lambda+\frac{1}{a_{n-1}a_n}=\frac{n-1}{a_1a_n}$ $(a_1\neq 0,\ \Lambda\ ,a_n\neq 0)$.

Доказательство. Имеем:

$d=a_2-a_1=\Lambda=a_n-a_{n-1},\ a_n=a_1+d(n-1)$.

$$+\begin{cases}\frac{1}{a_1a_2}=\frac{1}{d}\cdot\frac{a_2-a_1}{a_1a_2}=\frac{1}{d}\cdot\left(\frac{1}{a_1}-\frac{1}{a_2}\right),\\ \frac{1}{a_2a_3}=\frac{1}{d}\cdot\frac{a_3-a_2}{a_2a_3}=\frac{1}{d}\cdot\left(\frac{1}{a_2}-\frac{1}{a_3}\right),\\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda\ \Lambda,\\ \frac{1}{a_{n-1}a_n}=\frac{1}{d}\cdot\frac{a_n-a_{n-1}}{a_{n-1}a_n}=\frac{1}{d}\cdot\left(\frac{1}{a_{n-1}}-\frac{1}{a_n}\right).\end{cases}$$

$$\frac{1}{a_1a_2}+\frac{1}{a_2a_3}+\Lambda+\frac{1}{a_{n-1}a_n}=\frac{1}{d}\cdot\left(\frac{1}{a_1}-\frac{1}{a_n}\right)=\frac{1}{d}\cdot\frac{a_n-a_1}{a_1a_n}=\frac{n-1}{a_1a_n}.$$

Что и требовалось доказать.

Задача 2. Доказать, что для всякой арифметической прогрессии $a_1,\ a_2,\ a_3,\ldots,a_n$ имеет место тождество

$$\frac{1}{\sqrt{a_1}+\sqrt{a_2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+\Lambda+\frac{1}{\sqrt{a_{n-1}}+\sqrt{a_n}}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}.$$

Доказательство. Имеем:

$$d=a_2-a_1=\Lambda=a_n-a_{n-1},$$

$$\frac{1}{\sqrt{a_1}+\sqrt{a_2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+\Lambda+\frac{1}{\sqrt{a_{n-1}}+\sqrt{a_n}}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}},$$

$$\frac{\sqrt{a_2}-\sqrt{a_1}}{a_2-a_1}+\frac{\sqrt{a_3}-\sqrt{a_2}}{a_3-a_2}+\Lambda+\frac{\sqrt{a_н}-\sqrt{a_{н-1}}}{a_н-a_{н-1}}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}},$$

$$\frac{\sqrt{a_2}-\sqrt{a_1}}{d}+\frac{\sqrt{a_3}-\sqrt{a_2}}{d}+\Lambda+\frac{\sqrt{a_н}-\sqrt{a_{н-1}}}{d}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}},$$

$$\frac{\sqrt{a_2}-\sqrt{a_1}+\sqrt{a_3}-\sqrt{a_2}+\Lambda+\sqrt{a_n}-\sqrt{a_{n-1}}}{d}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}},$$

$$\frac{\sqrt{a_n}-\sqrt{a_1}}{d}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}\Leftrightarrow\frac{a_n-a_{n-1}}{d\left(\sqrt{a_n}+\sqrt{a_1}\right)}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}.$$

То есть

$$\frac{d(n-1)}{d\left(\sqrt{a_n}+\sqrt{a_1}\right)}=\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}.$$

Задача 3. Известно, что для некоторой арифметической прогрессии имеет место равенство $\frac{S_m}{S_n}=\frac{m^2}{n^2}$.

Доказать, что $\frac{a_m}{a_n}=\frac{2m-1}{2n-1}$.

Доказательство. Имеем :

$$S_m=\frac{2a_1+(m-1)d}{2}\cdot m,\qquad S_n=\frac{2a_1+(n-1)d}{2}\cdot n.$$

По условию

$$\frac{(2a_1+(m-1)d)\cdot m}{(2a_1+(n-1)d)\cdot n}=\frac{m^2}{n^2},$$

Или

$$2a_1n+dn(m-1)=2a_1m+dm(n-1)\Leftrightarrow(m-n)(2a_1-d)=0.$$

Поскольку $m\neq n$, $a_1=\frac{d}{2}$.

Следовательно $\frac{a_m}{a_n}=\frac{a_1+(m-1)d}{a_1+(n-1)d}=\frac{\frac{d}{2}+(m-1)d}{\frac{d}{2}+(n-1)d}=\frac{2m-1}{2n-1}$.

Задача 4. Обозначая через S_1, S_2 и S_3 сумма n_1 первых членов, n_2 первых членов и n_3 первых членов некоторой арифметической прогрессии, показать, что

$$\frac{S_1}{n_1}(n_2-n_3)+\frac{S_2}{n_2}(n_3-n_1)+\frac{S_3}{n_3}(n_1-n_2)=0.$$

Доказательство.

$$S_1=\frac{2a_1+(n_1-1)d}{2}\cdot n_1,$$
$$S_2=\frac{2a_1+(n_2-1)d}{2}\cdot n_2,$$
$$S_3=\frac{2a_1+(n_3-1)d}{2}\cdot n_3.$$

Или

$$\frac{S_1}{n_1}=a_1+\frac{d}{2}(n_1-1), \qquad (1)$$
$$\frac{S_2}{n_2}=a_1+\frac{d}{2}(n_2-1), \qquad (2)$$
$$\frac{S_3}{n_3}=a_1+\frac{d}{2}(n_3-1). \qquad (3)$$

Умножаем полученные равенства соответственно на

(n_2-n_3), (n_3-n_1), (n_1-n_2)

и складываем произведения, получаем:

$$\frac{S_1}{n_1}(n_2-n_3)+\frac{S_2}{n_2}(n_3-n_1)+\frac{S_3}{n_3}(n_1-n_2)=$$
$$=a_1(n_2-n_3)+\frac{d}{2}(n_2-n_3)+a_1(n_3-n_1)+\frac{d}{2}(n_3-n_1)+a_1(n_1-n_2)+\frac{d}{2}(n_1-n_2)=$$
$$=a_1(n_2-n_3+n_3-n_1+n_1-n_2)+\frac{d}{2}[(n_1-1)(n_2-n_3)+(n_2-1)(n_3-n_1)+(n_3-1)(n_1-n_2)]=0$$

То есть

$$\frac{S_1}{n_1}(n_2-n_3)+\frac{S_2}{n_2}(n_3-n_1)+\frac{S_3}{n_3}(n_1-n_2)=0.$$

Задача 5. Доказать, что если числа a, b и c образуют арифметическую прогрессию, то числа вида $\frac{1}{\sqrt{b}+\sqrt{c}}$; $\frac{1}{\sqrt{c}+\sqrt{a}}$; $\frac{1}{\sqrt{a}+\sqrt{b}}$ также образуют арифметическую прогрессию.

Доказательство. По условию числа a, b и c составляют арифметическую прогрессию, то есть

$$b-a=c-b.$$

Докажем, что

$$\frac{1}{\sqrt{c}+\sqrt{a}}-\frac{1}{\sqrt{b}+\sqrt{c}}=\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{1}{\sqrt{c}+\sqrt{a}}. \qquad (1)$$

Имеем:

$$\frac{1}{\sqrt{c}+\sqrt{a}}-\frac{1}{\sqrt{b}+\sqrt{c}}=\frac{\sqrt{b}-\sqrt{a}}{\left(\sqrt{c}+\sqrt{a}\right)\left(\sqrt{b}+\sqrt{c}\right)}=\frac{b-a}{\left(\sqrt{b}+\sqrt{a}\right)\left(\sqrt{c}+\sqrt{a}\right)\left(\sqrt{b}+\sqrt{c}\right)}. \qquad (2)$$

Аналогично

$$\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{1}{\sqrt{c}+\sqrt{a}}=\frac{\sqrt{c}-\sqrt{b}}{\left(\sqrt{c}+\sqrt{a}\right)\left(\sqrt{b}+\sqrt{a}\right)}=\frac{c-b}{\left(\sqrt{b}+\sqrt{a}\right)\left(\sqrt{c}+\sqrt{a}\right)\left(\sqrt{c}+\sqrt{b}\right)}$$

Так как

$$b-a=c-b,$$

получим

$$\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{1}{\sqrt{c}+\sqrt{a}}=\frac{b-a}{\left(\sqrt{b}+\sqrt{a}\right)\left(\sqrt{c}+\sqrt{a}\right)\left(\sqrt{c}+\sqrt{b}\right)}. \qquad (3)$$

Из соотношений (2) и (3) вытекает равенство (1).

Задача 6. Доказать, что если числа a^2, b^2 и c^2 образуют арифметическую прогрессию $(a\neq -b,\ b\neq -c,\ c\neq -a)$, то числа вида $\frac{1}{b+c}$; $\frac{1}{c+a}$; $\frac{1}{a+b}$ также образуют арифметическую прогрессию.

Доказательство. По условию числа a^2, b^2 и c^2 составляют арифметическую прогрессию, то есть

$$b^2-a^2=c^2-b^2.$$

Докажем, что

$$\frac{1}{c+a}-\frac{1}{b+c}=\frac{1}{a+b}-\frac{1}{c+a} \qquad (1)$$

Имеем:

$$\frac{1}{c+a}-\frac{1}{b+c}=\frac{b-a}{(c+a)(b+c)}=\frac{b^2-a^2}{(c+a)(b+c)(a+b)} \qquad (2)$$

Аналогично

$$\frac{1}{a+b}-\frac{1}{c+a}=\frac{c-b}{(a+b)(c+a)}=\frac{c^2-b^2}{(a+b)(c+a)(c+b)}$$

Так как

$$b^2-a^2=c^2-b^2$$

получим

$$\frac{1}{a+b}-\frac{1}{c+a}=\frac{b^2-a^2}{(a+b)(c+a)(c+b)} \qquad (3)$$

Из соотношений (2) и (3) вытекает равенство (1).

Задача 7. В конечной геометрической прогрессии известни ее первый член a, последний член b, и сумма S всех ее членов. Найти сумму квадратов всех членов этой прогрессии.

Решения. Пусть $b_1, b_2, \ldots, b_n$ - данная геометрическая прогрессия, у которой $b_1=\mathrm{a},\ b_n=b,\ \ S_n=S$. Требуется найти

$$b_1^{\ 2}+b_2^{\ 2}+b_3^{\ 2}+\ldots=b_1^{\ 2}\left(1+q^2+q^4+\ldots\right)=a^2\cdot\frac{1-q^{2n}}{1-q^2}, \qquad (1)$$

где $q-$знаменатель прогрессии.

Согласно условию, имеем

$$\begin{cases} aq^{n-1}=b, \\ \dfrac{a\left(1-q^n\right)}{1-q}=S. \end{cases}$$

Из первого уравнения следует, что $q^{n-1}=\dfrac{b}{a}$, то есть $q^n=\dfrac{b}{a}q.$ Поставив это выражение в втором уравнение системы, получим

$$\frac{a\left(1-\dfrac{b}{a}q\right)}{1-q}=S;\ \ a-bq=S-Sq;\ (S-b)q=S-a;\ q=\frac{S-a}{S-b}.$$

Значит,

$$q^n=\frac{b}{a}\cdot\frac{S-a}{S-b}. \qquad (2)$$

Поставим выражение (2) в равенство (1):

$$a^2\left(\frac{1-\frac{b^2(S-a)^2}{a^2(S-b)^2}}{1-\frac{(S-a)^2}{(S-b)^2}}\right)=\frac{a^2-\frac{b^2(S-a)^2}{(S-b)^2}}{1-\frac{(S-a)^2}{(S-b)^2}}=\frac{a^2(S-b)^2-b^2(S-a)^2}{(S-b)^2-(S-a)^2}=$$

$$=\frac{(aS-ab-bS+ab)(aS-ab+bS-ab)}{(S-b-S+a)(S-b+S-a)}=\frac{S(a-b)((a+b)S-2ab)}{(a-b)(2S-(a+b))}=\frac{(a+b)S-2ab}{2S-(a+b)}S.$$

Задача 8. Сократить дробь

$$\frac{x^8+x^6y^2+x^4y^4+x^2y^6+y^8}{x^4+x^3y+x^2y^2+xy^3+y^4}.$$

Числитель представляет собой сумму пяти членов геометрической прогрессии, первый член которой равен x^8, а знаменатель равен $x^{-2}y^2$, следовательно, в числителе получим

$$\frac{x^8\left(1-\left(x^{-2}y^2\right)^5\right)}{1-x^{-2}y^2}=\frac{x^8-x^{-2}y^{10}}{1-x^{-2}y^2}=\frac{x^{10}-y^{10}}{x^2-y^2}.$$

Аналогично, в знаменателе имеем

$$\frac{x^4\left(1-\left(x^{-1}y\right)^5\right)}{1-x^{-1}y}=\frac{x^4-x^{-1}y^5}{1-x^{-1}y}=\frac{x^5-y^5}{x-y}.$$

Разделив первое выражение на второе, находим

$$\frac{\frac{x^{10}-y^{10}}{x^2-y^2}}{\frac{x^5-y^5}{x-y}}=\frac{x^5+y^5}{x+y}=x^4-x^3y+x^2y^2-xy^3+y^4.$$

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Specific Features of Application of the Main Types of Communicative Lexical Exercises in English Language Teaching Students of Economic Specialities

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Abstract: The article describes the main features of application and types of communicative lexical exercises for development of speech efficiency of students of the Economic specialities. The authors analyze different types of exercises: response, situational, discussion, compositional, initiative ones. The article shows the principal peculiarities of the organization of speech interaction and the use of English as a means of communication. Authors investigate such concept as verbal efficiency, and its role of students training in English. The authors underline the importance of using communicative lexical exercises and the aim to prove the necessity of application of these exercises in educational process.

Keywords: communicative lexical exercises, English language teaching, verbal efficiency, Economic specialities, response, communicative situation, discus-sion, compositional exercises.

Introduction

The main directions of upgrading of the modern higher school (HIGHER EDUCATION INSTITUTION) are connected with the idea of creation and use of the main applications and types of communicative lexical exercises for development of verbal efficiency of students of the Economic specialities. Teachers' task is in enhancement of these applications and types as leading types of activity, identification of conditions of quality improvement of training among which verbal efficiency has important value.

Scientific statement of a problem of the correct application of types of communicative lexical exercises is caused by a compelling need of updating of training system.

Verbal efficiency is effectiveness of speech activity, capability to independent generation of the developed statement [7, p. 22].

The aim of our research is the analysis and investigation of features of types of communicative lexical exercises in students training.

The object of the research is system of communicative lexical exercises on economic specialties.

The subject of research is features of application of types of communicative lexical exercises for development of verbal efficiency.

The problem, subject and aim of the research predetermined need of the solution of the following tasks:

1. To show a complete scheme of application of various applications and types of exercises for development of speech productivity (response, situational, discussion, compositional, initiative).

2. To characterize a communicative (speech) situation as model of real contact.

3. To develop system of exercises for development of speech productivity.

4. To show a complete picture of typical problems which can accompany students in the course of correction by the teacher of mistakes at the time of speaking of students on the foreign-language speech.

5. To develop practical recommendations for teachers.

Scientific novelty and the importance of research is following:

1. The system of exercises is worked out for development of students speech productivity.

2. Various acceptances and types of exercises for development of productivity of the speech are described (response, situational, discussion, compositional, initiative).

3. Practical recommendations for teachers are developed.

4. Typical problems which can accompany students in the course of correction by the teacher of mistakes at the time of speaking of students on the foreign-language speech are determined.

Studying the question

Types of communicative lexical exercises

In English teaching various methods and types of exercises for development of speech productivity are used. They are response, situational, discussion, compositional, initiative ones.

Response exercises (English response means the answer, reaction) assume response to a remark of the interlocutor [3, p. 20]. For example, we ask students to answer the same question, without repeating answers of fellow students:

1. Are you interested in Economics?

- Yes, I am.
- Very much!
- Yes, of course.
- Yes, I am interested in Economics.
- Yes, it's my favourite subject.
- Yes, I will be an economist.
- Yes, I like to read books on Economics.

2. What types of business do you know?

- The most common forms of private business organizations are sole proprietorships, partnerships and corporations.
- Private businesses and Government Organizations.
- Sole trader, Partnership, Private Limited Company, Public Limited Company.

Useful exercise in this plan is the periphrasis:

1) Express the same idea in other words

1. He manages the company (He runs the firm).
2. His pay is high (His salary is high).
3. Manager is satisfied with our projects (Director is pleased with our projects).

2) Paraphrase the following words and expressions using your active vocabulary

1. Personnel (Staff)
2. To be responsible for (to be in charge of)
3. Buyer (customer)

At estimation of activity speech interaction "student-student" or "student-group" is organized. As a rule, assessment of students is same and terse: "I like (dislike)", therefore at estimation we give a task: " Agree with it and add the information or don't agree and prove". We offer students speech phrases support or questions which can be used at job evaluation.

Response exercises develop skills of the unprepared speech.

During the organization of communication necessary condition is the communicative (speech) situation – model of real contact in which speech behavior of interlocutors is implemented in their social and communicative roles (for example, in role-playing games).

Basis of role plays is organized communication of students according to their role and game plot. This type of technique is very appropriate in case of intensive studying of language by students (economists) as all students have different level of training on language (elementary, pre-intermediate, intermediate). Such type of activity promotes fast and effective acquisition of English, communication, establishment of the friendly relations between students, the easy atmosphere and, as a result, forming of friendly staff. The proof of it is the game "Catch a Ball". The essence of this game is working off of economic vocabulary by students. The group of ten students is divided into five teams on two persons. Each team has its own task. The teacher throws a ball and announces tasks. The team which will react and will grab a ball faster than others gets point. At the same time, if the team grabs a ball in advance or if the task didn't concern it, loses points. Tasks for teams - to establish the word on the set subject quickly (sales – prodazhi, business – biznes, advertizing – reklama, prices – tseny, negotiations – peregovory). It is rather simple task, but it demands fast reaction, cooperation, fast perception and understanding of English words from teams.

Also interesting team game is "Guess a Word". One of participants of team comes to a board on which he should write the word on the subject "Economics" which his team explained him. Each of participants of team tries to explain (without calling directly) this word. That participant who guesses the word writes all the guesses on a board. The team approves written to them or denies. Each of participants of team tries as it is possible to describe more in details this word or to help other participant of team to make it if it is impossible to it. Thus, everyone has an opportunity to express the opinion or to help someone with his statement. A game is quite interesting as words which need to be explained to team are extraordinary (for example, to run a business, start-up, to make a profit on …). The teacher's interference with this game is minimum. His role is in thinking up some interesting word for team and to follow the game course. Practically all the time of a game is devoted to colloquial practice and at the same time not only those students who speak, but also those who listen are very active as they should understand and remember remarks of the partners in team, correlate them to a

situation, determine its correctness and correct, if necessary, add something special. At the same time each of students has an opportunity to guess words at a board, after the word is guessed to a board there is other participant of team. In the course of such speech interaction one of the main tasks in training - communication in English - is solved.

We consider it important to refuse application of such type of tasks as preparation of dialogue on the set subject in pairs. We don't exclude learning of ready dialogues, but in this case the purpose is storing of lexical and grammatical structures, but not development of speech productivity in any way. In advance prepared dialogue inherently is unnatural. Therefore, giving a task to prepare dialogue, we ask students to think over the role. Pairs are determined accidentally that assumes inevitable improvisation. It, in turn, develops flexibility of thinking and, strangely enough can seem, fluency of the speech because the student is forced to think of how to react to a remark of the interlocutor, but not painfully to remember the learned phrase.

For example, «Discuss with your collogue all rules you should follow at the negotiations» (students can choose different roles themselves, for example: CEO, Deputy manager, Office manager, Accountant, Auditor, Lawyer, etc.).

Also we exclude a monologue as the isolated type of speech activity and we consider him as a communication process component, a dialogue component. Any monological statement has to have the addressee irrespective of in what form it is submitted – oral or written, and assumes response (personal assessment, question, answer, etc.). For example,

Speak on:

1. Explain why it is very important for both sides to agree on the overall procedure and objectives, what objectives are stated first (the addressee is the one who participates in negotiations).

2. Explain what tactics can be used to create the climate of cooperation, what style of language will help you to do it successfully (the addressee is the staff of the organization).

3. Distinguish between the American and Japanese ways of conveying the meaning in discussions. Which style do you support? (the addressees are the participants of a discussion).

Such approach requires revision of evaluation criteria, namely, there is a question of assessment of the grammatical part of speech. In this case more important criterion we find the solution of a communicative task, therefore, we don't consider it necessary to reduce assessment for the insignificant grammatical mistakes which aren't influencing communication commission.

The educational discussion and commenting are discussion exercises. The scope of the educational discussion is defined by the training program of discipline and interests of students [11, p. 120-130].

Discuss with how to introduce and check acceptance of objectives, how to create the climate of cooperation, how to make suggestions less direct and cross-cultural differences in conveying the meaning in discussions.

The text of problem character containing the different points of view on a problem, a popular expression or the interesting quote can act as a speech incentive.

We offer students the following task: three statements.

- Money has no smell.
- Lend your money and lose your friend.
- Time is money.

Do they express the same idea or different ideas? Comment on the statement with which you agree or categorically disagree. Explain why.

"Discussion game" attracts interest of students. It is more convenient to hold a discussion game on the basis of the text which plays a role of information support. If students know a conversation subject in the necessary degree, the text is optional. Each student has to act with certain remarks (information – a question – a consent – an objection). As a support we give phrases. For example, a discussion game on the basis of the following text:

Schools of Economic Thought

Economists deal with facts. However, their personal beliefs and other factors may influence how they think about those facts and fit them into theories. Therefore, all economists will not agree on the best solution to a problem. Economists from one group or “school” of thought may believe that their theories are better at predicting a certain result than are the theories of other schools of economists.

Economists will also not tell you whether the results they predict will be good or bad. Those judgments depend on ***values.*** Values are the beliefs and

characteristics that a person or group considers important. Economists will research an economic problem and will predict whether a proposed solution will work. However, they will not judge whether the predicted outcome of that solution is a good outcome or a bad one.

Explain how values influence economists and help group them into "schools." (Information (it is given in the text) – a question (students make up the main and most important questions for a discussion, express the main ideas) – a consent (they express a consent on these ideas and questions) – an objection (they express disagreement, explaining their point of view)).

These exercises and techniques motivate students to express their own opinion that promotes generation of the statement.

As compositional exercises we use making up situations on the basis of several offers, the story assumption, the story on behalf of the character (for example, on behalf of the economist, manager, banker, the story on a ready plot on the basis of "the cable description" (barebone technique) when students are offered to add it with details.

"Minute of free speaking" can become habitual for students at the lesson when they are offered to define the subject concerning them in (Prices, Money, Advertising and others) and within 5-10 minutes to prepare the short one-minute statement on it. Such technique develops logic, generation of the ideas, speed of a solution.

To compositional ones logically adjoin the exercises developing such valuable quality in possession of the foreign-language speech as initiative – ability to draw attention of the interlocutor, to begin a conversation, to offer a subject, to obtain the necessary information, that is to achieve the communicative aims.

It is promoted by techniques "Find adherents" and "Interview". "Search of adherents" is suitable at division of students into groups. Each participant receives a card with "his" opinion on a problem. By means of 1-3 questions during certain time (1 minute) they need to find the adherents. Making cards and handing them to students, it is expedient to consider their personal interests.

For preparation of "interview" students think over several questions and tactics of its carrying out. In a definite time (3-5 minutes) participants need to interview as the bigger number of people is possible, following rules of speech etiquette and to

present the results. Questions shouldn't be much and they have to assume the concrete answer.

During speaking of students it isn't necessary to interrupt as it breaks the atmosphere of communication. We completely agree with V. Rivers because "… the pupil whose each error is corrected by the teacher not only loses the main idea of the statement, but also desire to continue a conversation" [8, 54].

Corrections should be done quietly, without interrupting the speech of students, or to analyze mistakes at the end of occupation. Some mistakes which aren't influencing communication commission are admissible to be ignored not to suppress speech activity of students [10, 55].

Conclusion

Application of system of techniques and exercises for development of speech productivity has its own results. Students of 1, 2 and 3 courses, where English is taught, should speak fluently, not be afraid of change of language partners, retell the plot of foreign-language text by their own words and expressions. They shouldn't have special difficulties of creative tasks (creative writing or speaking), for example, writing of an essay, commenting of an aphorism or a quotation.

Thus, application of the described exercises and techniques of the organization of speech interaction, helps inclusion in work of all students, the speech resources, requires active mobilization, induces students to a free speaking and use of language as means of communication, receipts of information and achievement of result of joint activities.

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Teenage Crime and Its Prevention Through Physical Culture and Sports

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Abstract: The article substantiates the prevention of juvenile delinquency as a way of organizing leisure time for children and adolescents; as one of the means of their recovery; as a means of correcting the physical and psycho-emotional state; as a way of distracting children and adolescents from the pernicious influence of their criminal environment; As a way to familiarize with regular physical training and sports. It is stated that the proposed directions of preventive sports and sports activities, which help protect adolescents from the harmful influence of criminal environment, bring success.

Keywords: adolescents, crime, prevention, physical culture, sports.

Подростковая преступность и ее профилактика средствами физической культуры и спорта

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Аннотация: В статье обоснована профилактика подростковой преступности как способ организации досуга детей и подростков; как одно из средств их оздоровления; как средство коррекции физического и психоэмоционального состояния; как способ отвлечения детей и подростков от тлетворного влияния окружающей их криминальной среды; как способ приобщения к регулярным занятиям физической культурой и спортом. Указывается, что предложенные направления профилактической физкультурно-спортивной деятельности, позволяющей защитить подростков от пагубного влияния криминальной среды, приносят успех.

Ключевые слова: подростки, преступность, профилактика, физическая культура, спорт.

Введение. В последние годы в Украине отмечается значительный рост преступности среди детей, подростков и молодежи. Дети у нас сегодня тотально не защищены. Не защищены прежде всего от криминального мира и криминальной среды как дома, так и на улице. Об этом свидетельствует хотя бы такой факт; при непрекращающемся росте детской преступности постоянно снижаются число семей, стоящих на учете в полиции из-за отрицательного влияния на детей, и количество лиц, привлекаемых к уголовной ответственности за вовлечение несовершеннолетних в преступную деятельность [1].

Цель работы – определить направления профилактической физкультурно-спортивной деятельности, позволяющей защитить подростков от пагубного влияния криминальной среды.

Материалы и методы исследования. Анализ специальной литературы, систематизация информации.

Результаты исследования и их обсуждение. Рост подростковой преступности вызывает тревогу у родителей детей, педагогов, сотрудников правоохранительных органов. В то же время существующая система предупреждения правонарушений, распространения наркотиков, включая различные виды воспитательного воздействия, уже давно отстает от явлений и процессов, которые происходят в молодежной среде, и, как следствие этого, она утратила готовность в полной мере противостоять различным негативным явлениям. Поэтому в сложившейся ситуации необходимы поиски новых моделей, форм, методов и средств предотвращения данных негативных явлений и борьбы с ними. Одно из важных мест в системе профилактики правонарушений, распространения наркотиков могут занять физическая культура и массовый спорт, которые как социально значимые виды деятельности отвечают потребностям формирующейся личности и обеспечивают успешную социализацию. Являясь основной частью общей культуры личности, физическая культура и спорт во многом определяют ее социальный и нравственный статус и могут быть важными факторами предупреждения и преодоления педагогической и социальной запущенности детей и подростков [4].

Бесспорно, занятия физическими упражнениями не могут быть панацеей от всех бед, но они могут стать средствами формирования психофизической устойчивости и самоконтроля детей и подростков, быть своеобразной защитой от приобщения к наркотикам и совершения противоправных действий. Вовлечение молодых людей, особенно с девиантным (отклоняющимся) поведением, в физкультурно-спортивную деятельность позволит в той или иной степени противостоять распространению антисоциальных явлений, вредных привычек, способствовать здоровому образу жизни, стать одной из альтернатив приему психоактивных веществ и склонности к правонарушениям [3].

В различных учебно-воспитательных программах занятия физическими упражнениями должны рассматриваться с нескольких позиций: как способ организации досуга детей и подростков; как одно из средств их оздоровления; как средство коррекции физического и психоэмоционального состояния; как способ отвлечения детей и подростков от тлетворного влияния окружающей их криминальной среды; как способ приобщения к регулярным занятиям физической культурой и спортом.

Вовлекая подростков в спортивную деятельность, необходимо учитывать мотивы их прихода в спортивную секцию, знать их положительные качества и отрицательные наклонности. Основные методы вовлечения; индивидуальный, групповой, индивидуально-выборочный. Основные средства; на побуждающем этапе — беседы, убеждение, просмотр видеофильмов, ознакомление с новыми видами физических упражнений, проведение показательных уроков, физические упражнения и т.п.; на формирующем этапе — беседы, убеждение, контроль за посещаемостью занятий, успеваемостью в школе, дисциплиной, выполнением поручений тренера, подготовка к соревнованиям и участие в судействе соревнований, физические упражнения, тестирование и т.д. [2].

Учебно-воспитательный процесс, как показывают проведенные исследования и практический опыт, должен характеризоваться систематичностью (занятия 3 – 4 раза в неделю), непрерывностью (круглогодично). Занятия нужно проводить в удобное для учащихся время (с 17 до 20 часов).

В ходе учебно-воспитательного процесса необходимо подбирать средства и методы физического воспитания исходя из интересов и потребностей подростков (атлетическая гимнастика, восточные единоборства, спортивные игры и др.); преподносить учебный материал на понятном и доступном подросткам уровне, но его освоение должно происходить с определенным усилием, в противном случае процесс обучения теряет свою привлекательность. Только при соблюдении этих условий занятия спортом вызывают у подростков положительные эмоции.

Очень важно также: усложнение упражнений, увеличение нагрузки осуществлять постоянно, но постепенно, по мере формирования интереса к занятиям; начиная с первого занятия предъявлять одинаковые требования ко всем занимающимся; опираться на сознательность и активность занимающихся, на их положительные стороны, развивая в подростках самолюбие, уверенность в своих силах; своевременно и правильно применять методы принуждения, наказания и поощрения, использовать метод поощрения даже при неудачном выполнении упражнения; вводить в каждый урок элементы новизны, ставить конкретные цели и задачи для каждого учащегося; поощрять самостоятельность при выполнении упражнений; включать занимающихся в любимую и нелюбимую работу (чередование игрового материала с упражнениями, требующими проявления воли, усидчивости); использовать метод соревнования внутри тренировочной группы, где судьями выступают сами учащиеся; сообщать необходимые знания

о правильной технике, методике выполнения упражнений; проводить групповой анализ успехов и недостатков в учебно-тренировочной деятельности; осуществлять контроль над выполнением поручений тренера, следить за дисциплиной, внешним видом занимающихся, посещаемостью занятий, подготовкой и уборкой мест занятий; проводить совместно со школьными педагогами контроль над успеваемостью в школе; приучать подростков вести дневник тренировки, планировать собственные нагрузки; создавать педагогические ситуации, в которых «тревожные» подростки могли бы действовать уверенно, без напряжения и страха (выполнение упражнений в облегченных условиях); при неуверенности учащегося иметь несколько вариантов выполнения задания; обучать преодолению неуверенности путем самоприказа, извлечению максимальной пользы из неудачи; предоставлять фору «тревожным» и т.п.; поощрять «тревожных» учащихся за трудолюбие, преодоление неуверенности, за незначительный, минимальный успех, за самостоятельность; предоставлять агрессивным подросткам ведущую роль при выполнении упражнений (прием нормативов, тестирование, проведение эстафет); педагогически правильно выполнять расстановку занимающихся в ходе изучения учебного материала; первыми выполняют упражнения агрессивные; если задание простое по технике, то ведущая роль предоставляется «тревожным»; создавать такие педагогические ситуации, при которых у агрессивных учащихся также могут быть неудачи; извлекать максимальную пользу из неудачного выполнения упражнения агрессивными подростками; временно отстранять агрессивных подростков от выполнения упражнений, но с обязательным их присутствием на занятии; справедливо разрешать все конфликты; проводить групповые беседы, акцентируя внимание на положительных сторонах деятельности учащихся, умалчивая об отрицательных; поддерживать инициативу, самостоятельность, взаимопомощь при освоении упражнений.

На начальном этапе тренировок основной метод проведения занятий – круговой в сочетании с повторно-серийным. Физиологическая нагрузка – в пределах 130 – 160 уд./мин. На формирующем этапе – круговой, повторно-серийный методы. По мере формирования интереса к занятиям физической культурой и спортом следует использовать методы «до отказа» и соревновательный. ЧСС должна находиться в пределах 140 – 160 уд./мин. На совершенствующем этапе – методы повторно-серийный, «до отказа», соревновательный, самостоятельные занятия с физиологической нагрузкой по ЧСС до 170 уд./мин.

Тестирование исходного уровня физического и психоэмоционального состояния подростков необходимо проводить после комплектования учебной группы спустя месяц после начала занятий. Повторное тестирование – в конце учебного года.

Для объективной оценки результатов тестирования подростков особенности их поведения сравниваются с показателями успеваемости, в том числе со стабильностью получаемых оценок, отношением к учебе и физкультурно-спортивной деятельности, интересами и потребностями, характером взаимоотношений с одноклассниками, учителями, родителями. Обобщенные данные лучше всего заносить в специально разработанную индивидуально-психологическую карту.

Вывод. Предложенные выше направления профилактической физкультурно-спортивной деятельности, позволяющей защитить подростков от пагубного влияния криминальной среды, как показывает опыт, приносят успех. Но для этого необходимо соблюсти еще два важнейших условия: все физкультурно-спортивные занятия должны быть бесплатными, доступными для каждого подростка, а педагоги, ведущие эти занятия, должны иметь достойную, равноценную их нелегкому труду заработную плату.

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Problems of Polish Romanticism in the Perception of Literary Critic Mihal Grabovskyj (According to the Materials of Correspondence)

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Abstract: This article is devoted to integrated research into correspondence of polish literary man M. Grabovskyj, analyzed literary and philosophic views of master in a diachronic aspect, his aesthetic priorities, described the evolution of general vital references of theoretician, and outlined the division into periods of creation and philosophic views of figure. A lot of attention is given to elucidation letters' genres of M. Grabovskyj and its style.

For the first time it is the attempt of new valuation of his achievements and intentions, consideration and description epistolary heritage of M. Grabovskyj, which include theoretical-literary dialogues with the famous polish artists of XIX c.

In the first period (1823 – 1843) it is possible to trace imitations of the ideas of German romanticism, their adaptation to Polish literature and his own forming of romantic essence of national criticism. The second period, 1843 – 1863, is determined as a tendentious and didactic. There are his romantic liberalism changed to the radical views, which had an uncompromised nature.

Keywords: Romanticism, epistolary heritage, literary critic, style, philosophic principles.

Проблематика польського романтизму в рецепції літературного критика Міхала Грабовського (на матеріалі листування)

Ірина Руденко

Анотація: У статті здійснено аналіз епістолярної спадщини М. Грабовського в діахронічному аспекті, окреслено її проблематику, простежено еволюцію естетичних поглядів митця на основі домінантних переконань адресанта та їх стильових особливостей. У перший період (1823 – 1843 рр.) можна простежити наслідування ідей німецького романтизму, їх адаптацію до польської літератури та власне формування романтичної сутності національної критики. Другий період, 1843 – 1863 рр., визначено як тенденційно-дидактичний, коли на зміну романтичному лібералізму чітко виокремилась радикалізація естетичних поглядів, які набували безкомпромісного характеру.

Ключові слова: романтизм, епістолярій, критика, стиль, філософські принципи.

Постановка проблеми. Ані спогади сучасників, ані публічні праці, ані музеї не здатні так відтворити атмосферу й умови, в яких жив і працював письменник, як це можна побачити з його листування. Епістолярій митця надзвичайно багато розкриває не лише для уявлення про перебіг особистого життя, а й поглиблює знання епохи, поступу художньої, філософсько-естетичної та суспільної думки, взаємин між діячами доби. Приватне листування – надзвичайно цінне автентичне першоджерело для осмислення творчої індивідуальності митця з усім спектром понять цієї структури: особистість, світогляд, індивідуальний стиль тощо [2, с. 62]. Така спадщина становить невід'ємну частину творчого доробку М. Грабовського, допомагає глибше й точніше вивчити його життя, творчість, погляди та ідеї, оскільки складається з відомостей, які з тих чи інших причин не могли бути опублікованими в тогочасних часописах і програмах. Епістолярій митця охоплює проміжок часу з 1823 по 1863 рік, тобто майже весь творчий період польського літератора.

Актуальність статті. Творчість Міхала Грабовського (1804 – 1863) – видатного літературного критика, письменника-романіста, представника «української школи» в польському романтизмі, видавця, історика, етнографа, естета, громадського і культурного діяча середини XIX ст. була досить вагомою для польського романтизму. Його багатогранна й невтомна літературна праця, що тривала майже сорок років, була безпосередньо пов'язана з етапом формування національної самосвідомості поляків.

Літературно-критична діяльність М. Грабовського і досі є надзвичайно актуальною, адже сприяє поглибленому розумінню ґенези естетичної думки в польському романтизмі. У різні часи його літературно-критична творчість була предметом як беззаперечного наслідування, так і гострого засудження, зазнавала суттєвих викривлень або замовчувань, що у підсумку призвело до вилучення його спадщини з художнього контексту та, як наслідок, з наукового обігу. Через те в сучасній полоністиці назріла гостра потреба нового прочитання та осмислення його літературно-критичного доробку, неупередженої оцінки цієї видатної постаті.

Зокрема важливе значення для з'ясування критичних поглядів М. Грабовського має листування. У величезному його масиві (досі повністю не виданому та не дослідженому) містяться концептуальні міркування й оцінки як творчості окремих письменників, так і тогочасного літературного процесу.

Метою дослідження є визначити жанрову парадигму літературно-критичних матеріалів та листування; а також схарактеризувати проблематику епістолярію письменника, яка розширює і поглиблює уявлення про змістовність його літературно-критичної думки.

Методологічна база. Аксіологічний принцип зумовив здійснення оцінки естетичних і критичних ідей літературознавця, а також його літературно-критичних статей та листування; типологічний метод дозволив класифікувати та систематизувати критичні описи в кореслрлнденції М. Грабовського; еволюційний, за допомогою якого досліджено подальший розвиток та джерела світоглядних позицій польського діяча; філологічний – що став основним з огляду на вивчення та опис статей, рецензій і листування письменника.

Аналіз кореспонденції М. Грабовського неможливо здійснити без чіткого окреслення **предмету дослідження**, тому в першу чергу визначимо поняття листа. Серед багатьох визначень будемо користуватись запропонованим В. Кузьменком, який зазначав, що лист письменника – це твір літературного та історіографічного жанру, позначений яскраво вираженою психологічною інтроспекцією та особистісним ставленням автора до дійсності й конкретного адресата, написаний з урахуванням специфіки кореспонденції певної історичної доби [1, с. 5].

Виклад основного матеріалу дослідження. Романтичний критичний лист як суб'єкт літературного макротексту мав бінарний підтекст: з одного боку як референт особистісного суб'єктивного (приватний лист), з іншого – як виразник

об'єктивної інформації, що прагнула публічності (відкритий лист), якому була притаманна інтертекстуальна властивість. Погляди письменника постійно еволюціонували, що будь-яку періодизацію кореспонденції робить досить умовною. Як і у творчості М. Грабовського, переломним моментом варто вважати 1843 р., який став межею між раннім європейсько-«лояльним» та пізнім «тенденційним» клерикально-панславістським романтичними періодами.

У перший період (1823 – 1843 рр.) можна простежити наслідування ідей німецького романтизму, їх адаптацію до польської літератури та власне формування романтичної сутності національної критики. Автор дискутував із Б. Залєським, К. Підвисоцьким, Ю. І. Крашевським, доводячи їм свою прихильність до європейських літературних і філософських концепцій, демонструючи особливі симпатії до польських художніх творів, які найбільш наслідували романтичну поетику. Це знайшло свій відбиток у «Літературній кореспонденції М. Грабовського» (1842), яка, крім усього іншого, ілюструє оперативність та діапазон авторських рефлексій, естетичний концепт, експресивну свободу вияву почуттів і смаків. Стиль листів М. Грабовського цього періоду характеризується відносною узуальністю висловлювань, численними літературними паралелями, асоціаціями, алюзіями, алегоріями, потужним підтекстом, значною кількістю невимушених дискусій та поміркованих рецепцій. Це період найвищої популярності М. Грабовського-критика, чиї думки вважались беззаперечними, а ряд письменників (Ю. І. Крашевський, К. Підвисоцький, А. Пшездзєцький) не віддавали до друку свої праці без його схвалення.

Другий період, 1843 – 1863 рр., визначено як тенденційно-дидактичний, коли на зміну романтичному лібералізму чітко виокремилась радикалізація естетичних поглядів, які набували безкомпромісного характеру. Цей період вирізняється вибірковим листуванням і, відповідно, проблематикою. Із контексту епістолярного простору зникають імена І. Головінського, Б. Залєського, Ю. І. Крашевського, А. Тишинського, П. Яновського, у листах відсутні філософська та літературознавча дискусійність, відчувається консервація естетичних принципів та поступовий відхід від романтичних рефлексій тексту. М. Грабовський виступає як апологет клерикальної філософії, обережно адаптуючи надбання реалізму та позитивізму, що почали заявляти про себе. Сталими залишалися його літературознавчі погляди стосовно формування національної літератури на ідеях народності та

фольклористики. У цей час значно менше трапляються товариські поради й побажання щодо творів окремих письменників, але навіть у цих випадках М. Грабовський не добирав слів і не намагався пом'якшити свій «вердикт». Він, на відміну від листування попереднього періоду, не переймався думкою адресата чи почуттями до нього, а також не сприймав жодних виправлень своїх виголошених міркувань.

Міхал Грабовський, як відомо, листувався з такими активними діячами польської культури, як А. Бєльовський, К. Буйніцький, Г. Головінський, І. Головінський, А. Гроза, Г. Жевуський, К. Завадський, Б. Залєський, Ю. І. Крашевський, К. Міцовський, Г. Олізар, К. Підвисоцький, Р. Подберезький, А. Пшездєцький, А. Тишинський, А. Янішевський і т.д. Це були переважно письменники, публіцисти, перекладачі, видавці, що здійснювали вагомий внесок у розвиток національної культури.

У 1842 р. у Вільнюсі побачили світ два томи листів М. Грабовського з літературно-критичної проблематики під назвою «Літературна кореспонденція М. Грабовського». Сюди увійшли епістоли польського критика до знаних тогочасних митців, таких як Г. Жевуський, Ю. І. Крашевський та ін. У виданні листів М. Грабовського 1934 р., окрім матеріалів, наявних у «Літературній кореспонденції», упорядник – А. Бар – навів листи критика написані після 1842 р., а також ті, що не були внесені до першого видання. На жаль, не увійшли ті епістоли, що не мали значення для літературного дослідження, а лише такі, які відображали ставлення і причетність М. Грабовського до літературних подій доби.

Оцінюючи листування М. Грабовського в кількісному складі можна констатувати, що найбільше кореспонденцій М. Грабовського присвячено Б. Залєському. Трохи меншу кількість налічують листи до Ю. І. Крашевського. Як зазначив А. Бар, більшість епістол М. Грабовського мали на звороті останньої сторінки адресу, написану М. Грабовським польською і російською, а часом і французькою мовою. Це означає, що вони не були надіслані поштою, а передавались у інший спосіб (найчастіше, через спільних знайомих) [3, с. 7].

Окрім критичних роздумів про літературознавчі питання, які займали більшу частину кореспонденцій М. Грабовського, тут також містилася інформація про повсякденне життя польського митця – людину зі своїми проблемами, переконаннями, турботами, негараздами й радощами. Саме ця інформація дає змогу

об'єктивно проаналізувати умови, в яких формувались і розвивались його судження, плани, концепції.

Проблематика листів першого періоду позначена адаптацією ідей європейського (німецького) романтизму до національних традицій, групуванням та консолідацією лідерів польської романтичної літератури навколо національної аксіології, протиставленням типу «своїй» – «чужій-шаленій». Ідеї, висловлені в листах до Б. Залєського, Ю. І. Крашевського, Я. Креховецького, містять оптимістично-профетичний характер і спрямовані на поглиблення національного світосприйняття.

Другий період характеризується кореляціями власної теорії романтизму, неоднозначністю комунікативної структури, коли, з одного боку, пошук компромісів був замінений нав'язуванням безваріативної власної візії, не враховуючи соціально-політичних обставин, а з другого – невблаганно змінюваних художніх стилів. Критик переосмислює номенклатуру текстів романтичного канону. Замість ранніх романтиків Б. Залєського, Ю. І. Крашевського, А. Міцкевича все більше уваги приділено зрілим – А. Грозі, Г. Жевуському, А. Пшездзєцькому. Крім того, в епістолярії критика все більше місця займає зміна ідей національної ідентичності на ідею панславізму. Це обумовило прагнення інкорпорації літератур – польської, української та російської і знайшло своє потужне втілення в листуванні з Г. Жевуським. Він був для митця уособленням взірця, який зумів відтворити в художньому творі характер минулої епохи («Звичаєві мішанини» / «Mieszaniny obyczajowe»).

У листуванні з представником «петербурзької котерії» К. Підвисоцьким спостерігаються діалогічна форма епістол, толерантна критика статей адресата, інтерпретація дискусій із І. Головінським та Г. Жевуським. У листуванні з А. Пшездзєцьким, якого М. Грабовський вважав еталоном літературно-критичної думки, відчувається менторське ставлення критика до реципієнта, нав'язування власних думок і лояльна рецепція його творів. Основну масу літературно-критичної кореспонденції М. Грабовського становлять листи до учасників «петербурзької котерії», вплив яких зіграв вирішальну роль у радикалізації світогляду критика. У листах відображені основні ідеї майбутніх статей. Це були колективні розвідки й рефлексії учасників котерії, що дотримувалися літературно-критичних доктрин, заснованих уже не на філософії німецького романтизму, а на католицько-панславістських переконаннях і тенденційних підходах до художніх творів. Загалом усі відомі листи М. Грабовського можна тематично розділити на три блоки: опис

життя в перебігу; літературно-критичні листи; кореспонденції з філософсько-інтелектуальної проблематики. Далі будемо розглядати докладніше.

Перший лист М. Грабовського, що дійшов до нас, адресований Б. Залєському від 17 листопада 1823 р. Він свідчить про їхні тісні відносини, адже тут М. Грабовський з приємністю згадує перебування в гостях у адресата, і навіть просить вислати грошей, не запевняючи при цьому, коли він їх поверне і чи зробить це взагалі. Цей факт зайвий раз підтверджує, наскільки близькими й довірливими були їхні взаємини. У кореспонденції від 9 серпня 1925 р. М. Грабовський писав Б. Залєському, що познайомився з їхньою спільною кузиною А. Проскуріною, і вони багато говорили про Б. Залєського [3, 18]. Ці кілька слів дають нам змогу зробити висновки про те, що, очевидно, обидва літератори мали спільних родичів, але досить далеких, оскільки польський критик познайомився зі згаданою кузиною вже в дорослому віці. Звичайна річ, що польські шляхетські родини, котрі мешкали на Україні, поєднувалися між собою шлюбними зв'язками, проте, ні в цьому, ні в подальших листах немає ані пояснень, ані інших будь-яких згадок про це.

Приїхавши до Варшави після навчання, М. Грабовський, незважаючи на достаток у сім'ї, мав заробляти кошти для існування та розваг, якими він іноді грішив, про що розповідав у своїх листах, а також згадували його друзі-сучасники. Звичайною річчю було те, що М. Грабовський постійно потребував грошей, тому писання рецензій і відгуків було його основним заробітком. Так він формувався як критик. У листі до К. Підвисоцького від 13 січня 1836 р. М. Грабовський зазначав, що не бачить причини не брати у видавця грошей за рецензії, аргументуючи тим, що навіть такі видатні критики, як Ф. Шлегель і С. Джонсон, брали винагороди [3, с. 56]. Подібне обґрунтування «виправдовувало» польського літератора, але навряд чи приховувало його фінансові труднощі. З іншого боку, М. Грабовський завжди багато коштів витрачав на книжки та друковані видання, навіть стародруки, які мали місце в його домашній бібліотеці. Схоже, що саме на це він витрачав більшість свого заробітку. У цьому нас переконує і цитата зі згаданого листа до К. Підвисоцького, де автор епістоли підсумовував прибутки від якогось видання: «Вирахувати кількість екземплярів, вирахувати прибуток від продажу, відняти затрати на друк, а чистий прибуток поділити на двоє. Свою половину, як завжди, заберу книгами» [3, с. 57].

Згадував М. Грабовський і про свої недоліки, зокрема, натякав на неприємний інцидент, який із ним стався під час гри в карти. Дещо докладніше це описував уманський приятель критика С. Гощинський, як М. Грабовський саме через гру в карти був легко поранений у голову, але не маємо точніших свідчень про учасників події чи її місце [4, с. 55]. М. Грабовського притягували подібні розваги, що, враховуючи вибуховий темперамент, не раз втручували його в критичні ситуації. З часом критик став завзятим ворогом гри в карти, оскільки вважав, що окрім програних грошей і неприємних положень нічого від цього не залишається. Найбільше митець жалкував за втраченим часом [3, с. 98].

Як описувалося в першому розділі М. Грабовський був не лише критиком. Він багато написав прозових творів, давав на прочитання й «передвидавничу» оцінку Ю. І. Крашевському, дуже суворо ставився до своїх творінь. Наприклад, в епістолі до згаданого адресата від 19 січня 1840 р. польський літературознавець писав: «Я переконаний у своїй нездатності писати <…> тому зібрані мною матеріали хочу оприлюднити, аби хтось зумів скористатися ними краще за мене.» [3, с. 117]. Так, 28 березня 1840 р., в черговій кореспонденції, він жалівся Ю. І. Крашевському на недобросовісне виконання своєї роботи друкарем Глюксбергом. М. Грабовський повідомляв, що той ошукує з книжками, не надсилаючи їх вчасно, і друкує його праці з грубими помилками. Наприклад, третій том «Літератури і критики» взагалі був підданий поправкам зі сторони видавця, і навіть цілі речення були усунуті, на що М. Грабовський був обурений і шукав інших шляхів для видруку подальших рукописів [3, с. 138]. Це свідчило про те, що Глюксберг, напевно, з погляду на суспільну думку чи цензуру, не наважувався друкувати без коригування праці навіть такого популярного в той час літературного критика як М. Грабовський.

До листів, які свідчили про хід повсякденного життя М. Грабовського, належить і лист до Ю. І. Крашевського від 10 липня 1840 р., де після смерті сина М. Грабовський писав: «Бог обдарував мене міцною і сталою вірою, що немає смерті для тих, у кого Він влив свій дух <…> Усе, що читаю і про що думаю, навертаю до цієї теми. Ти не повіриш, якою втіхою для мене є пізнання праць школи католицької філософії, кореспонденція в релігійних справах із І. Головінським» [3, с. 148]. Напевно, саме в цій трагедії і криється та католицька філософія, прибічником якої згодом став М. Грабовський, і горе підштовхувало митця до роздумів і тих висновків, яких він дотримувався до кінця життя.

Будучи вже відомим критиком і співредактором «Петербурзького Тижневика», в одному з листів до Г. Жевуського від 26 жовтня 1842 р. М. Грабовський просив адресата знайти для нього в Житомирі хорошого художника, який би скопіював портрет С. Холонєвського, коли останній був у Чуднові. Це бажання він пояснював збиранням портретів усіх письменників – його сучасників [3, с. 282]. Звичайно, уже на той час М. Грабовський був досить заможною особою в с. Олександрівка, мав свій цукровий завод і кріпаків, міг собі дозволити замовляти портрети митців. На жаль, доля його колекції залишилась невідомою.

Випадок із невдалою спробою 1843 року видавати в Києві часопис, який би був присвячений ідеї об'єднання слов'ян, на жаль, не міг не відбитись на літературній діяльності М. Грабовського. Він довго не друкував жодних заміток і рецензій, заглибився в господарство та домашні справи. Як будь-яка людина він болісно переживав стосовно зневажливого ставлення до нього польських діячів, які просто не хотіли зрозуміти й підтримати. У листі до Ю. І. Крашевського від 30 червня 1843 р. М. Грабовський писав, що з багатьох причин (у перше чергу – через злощасну кореспонденцію від 21 лютого 1843 р.) не мав охоти до літератури, а бували дні й тижні, коли він навіть звичайної відповіді не міг змусити себе написати [3, с. 316].

Не оминали М. Грабовського і хвороби. Про одну з них довідуємося з його кореспонденції до Г. Жевуського від 4 березня 1844 р., написану рукою дружини М. Грабовського Пауліни. Пояснення цьому знаходимо в самому тексті: очі критика вже були в поганому стані, ні читати ні писати літератор сам не міг, і, прагнучи зберегти ще залишену частину зору, не витрачав її на написання листів [3, с. 338]. Судячи з кількості епістол, що не були написані рукою М. Грабовського, недуга досить довго не покидала його, бо навіть відповідь 6 листопада 1845 р. Г. Головінському ще написана дружиною. Значна кількість переписки в цей період містить певні фрази чи частини, що їх писав сам М. Грабовський. Наприклад, майже всі з них були підписані критиком, деякі (як до А. Пшездзєцького від 24 березня 1844 р.) були частково написані ним особисто. Можна припустити, що хвороба час від часу поверталась чи прогресувала, бо вже 8 січня 1845 р. знову маємо поштове послання до А. Пшездзєцького, де власною рукою М. Грабовського фігурував лише підпис [3, с. 368].

Підтримував спілкування М. Грабовський і з редакторкою «Пілігриму» Е. Земєнцькою. У листі до К. Підвисоцького від 22 січня 1844 р. читаємо: «я пропоную пані Земєнцькій, щоб статті слали до Олександрівки <…> я візьму певний контроль над часописом». Варто зазначити, що така прихильність була частково викликана його непорозумінням у цей час із «Петербурзьким Тижневиком» [3, с. 181].

У листах відображено події, які відбувалися з автором, його сприйняття того, що діялося з ним особисто чи навколо нього. Ворожнеча «Петербурзького Тижневика» і «Гвязди», яка саме мала місце в цей час, безпосередньо торкалася М. Грабовського, принижуючи й заплямовуючи репутацію всіх співредакторів консервативного часопису, вказуючи на хибність їхніх принципів. Звісно, це дратувало М. Грабовського й викликало бажання помсти у вигляді письмових відповідей на шпальтах друкованих видань. Такий настрій і події не могли не відбитися і в приватному листуванні. В епістолі до Г. Жевуського 1850 р. (точна дата невідома) М. Грабовський висловився про часопис «Гвязда»: «Думаю, що ця шайка впаде, а поодинці жоден із них не зможе піднятися вгору. Може, почуємо ще хіба що про А. Грифа, бо той, хоч і не кращий за інших, серед божевільних видається мудрецем.» [3, с. 354]. У цій же депеші вперше він вступив у дискусію з Г. Жевуським: «не приховую, що трохи мені прикро було читати деякі слова з твого листу (не відомий – І. Р.), хоча знаю, що це лише миттєве враження. Ти говориш, що ближче пізнання росіян відсторонює тебе від поляків, робить їх нікчемними і т.д. Мені теж не закриті ані помилки поляків, ані переваги росіян, але і перші не без плюсів, і другі не зовсім святі, а якби навіть був іще гірший стан наших співбратів, це не звільняє нас від обов’язку їх любити, а швидше навпаки. Ти знаєш якнайкраще, яке в мене глибоке почуття до Росії <…> Ти, напевно, не знаєш, що мій батько, хоч і був потомок значної великопольської крові, заслужений російський штабсофіцер, проливав за Росію свою кров у битвах на лінії фронту Требій (червень 1799 р.) та Нові (серпень 1799 р.) проти французів, і за це був нагороджений імператором Павлом І. Осиротілий іще дитиною, я розраховував на протекторат його приятелів і військових товаришів. Генерал Раєвський був моїм опікуном, а надії щодо моєї кар’єри я покладав на Мілорадовича, і, власне, їхав з Варшави до Петербургу, коли він помер. Це вплинуло на все моє майбутнє. Таким чином, Росія мені була така ж вітчизна, як і Польща. Коли 1830 року я був близьким із М. Мохнацьким і з багатьма його колегами, то постійно з ними сперечався щодо

політичних поглядів, і приписую це тому, що я краще за них знав росіян і можливості їх сили й тривалості. Це не могло не вплинути й на подальшу мою письменницьку кар'єру. Я завжди розповідав про приклад співпраці з росіянами, бо бачив у цьому щастя моїх батьків. Я їх до того намовляв, бо кохав, і жаль тепер бачити, що вони опинились на узбіччі.» [3, с. 355-356]. Саме цим уривком М. Грабовський проілюстрував свої почуття до росіян і поляків. Це частково пояснює і зміст листа 1843 р., і життєві постулати, і причини суперечок із приятелями щодо поглядів на Листопадове повстання і т. д. У той же час у кількох цих фразах відчувається біль за втрачені сподівання.

Багато також є епістол М. Грабовського, адресати яких не відомі. В одній із таких – від 5 жовтня 1852 р., – М. Грабовський звертав увагу: «мої очі вже два роки як мені не служать, навіть не пам'ятаю, коли увесь лист, як зараз, був мною написаний. З іншого боку, в мене багато життєвих проблем, які відволікають від літературної діяльності. Сподіваюсь, це скоро мине» [3, с. 361]. Із зазначеного випливає, що припущення про прогресування хвороби очей було правильним. У цій же кореспонденції критик відмовлявся бути дописувачем якогось часопису, назви якого він не вказав. Можливо, це був лист до Л. Кронеберга, який у той час мав намір видавати альманах. Інше запрошення до співпраці він отримав від «Газети варшавскої». Цього разу М. Грабовський висунув вимоги, що йому потрібен регулярний контакт із редакцією, ознайомлення з новітніми творами, бо в Олександрівці літературні новини до нього доходили з певним запізненням [3, с. 367]. Напевно, як один із провідних польських літературно-художніх критиків свого часу, М. Грабовський дозволяв собі ставити подібні умови, і, як ми знаємо, ці умови задовольнялись.

У зрілому віці польський критик знову згадував молоді роки, пишучи листи до своїх уманських приятелів. Дивлячись на свій родинний маєток він писав до С. Гощинського 20 червня 1860 р.: «Ти б сьогодні не впізнав Олександрівку: дерева, що колись ти мені допомагав садити і сам садив, розрослися, у будинку нагромадження пам'яток історії й мистецтва, але сьогодні він уже майже нежила пустеля. Моя кохана мама, яка завжди тебе згадувала, уже десять років не живе. Я сам залишив ті краї, живу вже кілька років у Києві, а деталі про мене можеш дізнатися від того, хто тобі цього листа привезе» [3, с. 395]. Йому було приємно й водночас болісно згадувати молодість і теплоту їхніх взаємин.

Повертаючись до переписки М. Грабовського зі ще одним представником «української школи», Б. Залєським, привертає увагу факт, що після 1828 р. настала пауза в їхньому спілкуванні, яка тривала двадцять шість років. В останній депеші від 19 вересня 1828 р., перед перервою, критик обіцяв не писати більше до Б. Залєського, допоки той не надішле відповіді. Це була остання відома нам епістола перед польським листопадовим повстанням. Можливо, однією з причин стали розбіжності в поглядах на мету заворушення. Навесні 1856 р., М. Грабовський відновив листування з Б. Залєським, а в примітці знаходимо інформацію, що епістола була передана адресатові в Парижі Антонієм Проскурою в жовтні 1856 року, і стала першою спробою відродити старі приятельські стосунки літераторів. У цьому посланні М. Грабовський писав про дружбу з Б. Залєським, про те, що останній був одним із «тих, кого пам'ять береже найбільше. З тобою, мій дорогий, живу незрівнянно більше, ніж із тими, хто мене оточує» [3, с. 391]. Також автор коротко повідомляв про власне життя, викладав на його сторінках свої погляди. Увесь свій життєвий шлях він трактував як низку подій, що відбулися з божої волі. Саме вищим силам польський митець був вдячний за найкращу дружину та коханих діток, за допомогу в господарстві, що його не зламала ані хвороба, ані велике нещастя. Тут же М. Грабовський зізнавався, що у своїх уявленнях він мало чим змінився з того часу, коли востаннє спілкувався зі шкільним приятелем Б. Залєським.

Пізніше син Б. Залєського Д. Залєський писав, що, на жаль, кореспонденції Б. Залєського до М. Грабовського, які, судячи з відповідей останнього, містили багато літературних деталей, були втрачені. Вони знаходились у Я. Козьмяна, але були загублені після його смерті [6, с. 2]. Нам відомий один лист Б. Залєського до М. Грабовського, який навів Д. Залєський, від 30 березня 1825 р. У ньому автор жалівся на брак часу та надлишок натхнення: «Сідаю з твердим рішенням писати до тебе – а пишу думи. Сподіваюся, що цей стан скоро мине і в мене буде більше часу» [6, с. 10]. Тут же знаходимо інформацію, що М. Грабовський у цей час від'їжджав до Петербургу. Напевно, це був той період, коли він мав намір створити дипломатичну кар'єру. Б. Залєський просив критика вислати йому романи Дж. Купера та інші цікаві твори. Особливу увагу привертають кілька останніх рядків епістоли, які вказують на близькі контакти й довіру старих приятелів. Б. Залєський просив М. Грабовського продати йому кілька піджаків – білий і гаптований, гроші мав передати через якусь особу, ім'я якої не назвав [6, с. 11].

Таким чином, цей лист відкидає всі сумніви щодо того, що Б. Залєський писав відповіді М. Грабовському, які були втрачені.

Розмірковуючи про своє життя, в одному з листів до А. Грабянки (від 28.01.1860 р.) М. Грабовський зазначав: «У зрілому віці тісні стосунки поєднували мене з Г. Жевуським, І. Головінським та ще кількома письменниками сумної епохи. Поволі ці відносини віддалялись, я жив у забутті й усамітненні. Лише в останньому періоді мого життя, зустрівши вас, я знову пізнав давні враження інтелектуальної й сердечної симпатії» [5, с. 114]. Так писав критик уже в останні свої роки, осмисливши й проаналізувавши вчинки друзів і колег, які не підтримали його в тяжкий період.

Із листа до К. Підвисоцького від 19 січня 1863 р. дізнаємося, що коли М. Грабовський був у Варшаві, Л. Кронеберг запропонував йому працювати в редакції «Газети польської», але митець відмовився. Тим часом його особисті справи стосовно цукроваріння не приносили вже колишнього прибутку, триразовий від'їзд до Петербургу і відхід від господарства значно погіршив його матеріальне становище [3, с. 398].

Потяг М. Грабовського до мистецтва знайшов свій вираз не лише в літературній критиці чи художніх творах. Принагідно митець зізнався Ю. І. Крашевському в листі від 27 вересня 1840 р., що дуже любив малювати: «Я навіть багато часу своєї молодості, часу, що міг би обернути на зібрання потрібніших мені зараз відомостей, змарнував на водіння олівцем і пензлем. Мені залишились вроджена любов і глибокі почуття не лише до поетичної творчості, а й до малювання» [3, с. 165].

В останні кілька років свого життя М. Грабовський мало писав листів. Майже увесь його час був присвяченій роботі й родинному господарству. Критик вважав, що повинно існувати кілька правил віри, які, на його думку, мусять послужити своєрідним постулатом для кожного християнина. Він висловлював також оптимістичну впевненість у тому, що все може змінюватися, окрім кількох життєвих позицій, яким належить лишитися сталими протягом усього життя [3, с. 392]. Сам же М. Грабовський завжди зоставався вірний своїм принципам.

Висновки. Отже, листи М. Грабовського, які вперше стали предметом самостійного аналізу, суттєво уточнюють уявлення щодо його літературно-естетичної програми, реалізованої в статтях. У кореспонденціях, особливо в тих, що адресовані найближчим друзям – Б. Залєському, Г. Жевуському, Ю. І. Крашевському і т. д., М. Грабовський був відвертий та формулював свої позиції лаконічно і чітко. У листах митця правомірно вбачати продовження критичних статей.

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Interesting and Useful Sport: Using Callanetics Elements During Physical Education Lessons at Higher Educational Institutes

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Abstract: The article analyzes, that using complex of callanetics exercises increases lessons efficiency, evokes interest among students to visit physical education lessons regularly, as for a lot of representative of students' community aesthetic effect from sport is very important. The recreation character of callanetics complex of exercises is investigated on practice and it was defined that there is real expediency to involve this aerobic kind of physical loads during educational process.

Keywords: callanetics, physical exercises, muscles, healthy body, overweight.

Setting the problem. Development of general culture of society is inconceivable without physical culture, that is specially directed into improvement of a person and peculiar nature by herself or himself. This discipline directly influences vital

important qualities, possibilities and capabilities of a human. With the help of physical activity, personality can manage and reduce level of psychological loading that in conditions of modernity gravitates over every person, creating preconditions for physical and mental diseases.

Practice of activity of physical education departments is directed into achievement strictly formal indicators at higher educational institutes of Ukraine, which are based on Soviet methods of training for standards drafting and test controls. Unwarranted marching drill negatively affects students and deprives motivation to uninteresting and unproductive lessons of classroom physical education. Physical education must be interesting and bring benefits to a body, soul and promote harmonic development of personality, as well as another university subjects. That's why, the problem of "physical culture of personality" arises, that will give maximum results for health, but not for "marks in the register", because real beauty of a body, physical excellence, physical and psychological health must become an aim and motivation for active training of physical exercises [1, 45].

Historiography review. Nowadays, researchers are interested in search of new forms of trainings at physical education (R. Veinberh, M. Lynets, M. Radko), where important criterion of improvement effectiveness of practical lessons is students' desire to work for their body, interest in real result. Such scientists as S. Maiboroda, L. Dunaiko, D. Vitriuk propose unconventional methods of lessons conduction. L.Ivanova, M. Ionova insist on harmonic development of students at physical education. Callanetics is classified to personally oriented and desirable form of physical education lessons conduction among students. Nowadays, active search of new forms and methods of physical education is occurring, which would promote increasing training qualities for future specialists at higher educational institutes. However, analysis of special literature shows that methods which are being used in physical education organization are not effective enough for providing appropriate level of physical preparedness for students at higher educational institutions (A.I. Drachuk, 2001; O.V. Drozd, 1999; L.P. Suchshenko, 2005, etc.). Within the last decade, method of conduction educational lessons has not especially changed at higher educational institutions, its efficiency is relatively low, that doesn't reply to modern requirements of higher school (S.M. Kanishevskyi, 2002; T.Yu. Krutsevych, 2003; R.T. Rayevskyi, 2003) [5]. That's why the aim of studio is investigation of peculiarity of this method's

introduction of motor activity in the process of educational practice at higher educational institutes of Ukraine.

Representing main material. At the present stage of educational technologies development, traditional ways and methods are ineffective and deprived personally orientation, they dominate not only at higher educational institutions, which cause reduction of motivation to physical education lessons. Teacher of physical education must work to overcome standardization of motor activity process; not only commanding instructions must be during lesson conduction, but also cursory explanation about impact of different exercises on our organisms and sounding special knowledge about various methods, that must become the basis of encouraging program, that would stimulate to trainings not only at classroom conditions, but individually, outside educational institution.

Having analyzed a lot of modern methods, we come to conclusion, that at present stage, callanetics is the most interesting form of “diluting” uninteresting and monotonous program of physical education for students, the main task of which is to provide formation active involvement to physical education lessons by students, strengthen of their health state, increasing their level of physical competency and motor activity, providing aesthetic and physical results of exercises. While talking about peculiarities of application this type of static sport, elements of callanetics can be introduced to standard traditional trainings and make them more interesting and effective in this way.

Using callanetics is expedient during physical culture lessons at special medical groups, as despite separate contraindications which we will consider next, callanetics can harmonically incorporate with therapeutic physical culture (TPC) exercises as aerobic kind of sport. It is possible to introduce optional subject on request of big amount of students, where they would train only callanetics regularly, working out entire complex of exercises and studying profoundly peculiarities of their implementation. Therefore, callanetics exercises can be applied during physical education lessons as well as at home. Each student can train independently having idea about principles on which callanetics trainings are based and possessing even minor arsenal of exercises, selecting exercises specially for themselves.

American woman Kallan Pinkney (1939-2012) developed callanetics method, that’s why this kind of gymnastic sport is named in her honor. Movements are made with small amplitude, often in uncomfortable position, in full statics or half-statics.

Herewith, the accent is made on so-called “problematic” zones (neck, stomach, buttocks, hips, back) and on inaccessible internal muscles. Callanetics can be described as passive gymnastics, trainings of which don’t have age restrictions and physical preparedness. Also important factor is that it is not necessary to have some special output devices, specialized building or ultramodern equipment for training this king of physical activity [4, 62].

Callanetics proposes big arsenal of exercises, directed into prevention of osteochondrosis and formation of proper posture. Except of this, possibility of clear orientation and dosage of loadings allow developing strength qualities of students, who train in special medical group, taking into account specificity of trainings at different diseases. All exercises which are proposed for strength development are based on using own body weight. Herewith, strength develops not because of size of encumbrance, but because of amount of repetitions.

However, despite of visible simplicity of callanetics, excessive admiration of this system can lead to difficult consequences for health. That’s why a teacher must be well acquainted with this method and explain to students in available and correct way essence and way of exercises execution. It is necessary to remember, first of all, that this complex is directed for those people who are accustomed to at least not difficult, but still physical loadings, that is, if students visit physical education lessons regularly, they can easily do callanetics exercises.

There is entire range of contraindications, which must be necessarily sounded by a teacher as it can cause significant damage to body. Among them it is possible to stand out: cardiovascular diseases (for students of special groups, namely those who enter to this group of risk, training in frugal regime will fit); spine disease (in this case, it is necessary to avoid sharp turnings and exercises with intensified loadings on all spine sections); asthma (active trainings can lead to complications and cause damage with this disease); varicose vein disease (in this case, easier exercises are implemented, which don’t give big loading on legs); recent outlive of surgical intervention (trainings must be stopped for a year after surgeries); hemorrhoidal nodes (prohibition – to squat); recent infectious diseases (after experienced infection, organism must recuperate).

Under conditions of total computerization, a lot of students spend passive way of life – they have lowered libido. Such phenomena reduced level of coordination, small mobility, absence of grace and flexibility in female persons, low index of strength habits

in boys. Callanetics absorbed practice of all mentioned kinds of physical activity. It is very effective for development of flexibility, that is conditioned by mixing various elastic inclines with static fixed maintenances of balance. Precise consequence of exercises execution is also important for development of flexibility, that demands gradual stretching of a certain group of muscles and increasing amplitude of execution with every new exercise – all this gives possibility to develop flexibility [3, 305]. Blood circulation is considerably improving around a body due to stretching and muscles contraction, herewith, complete nutrition of cells of internal organs is proceeding. As a result of training, all systems of organism are adjusted on the right work, metabolism is improved. As a result – wonderful general feelings.

Callanetics program is formed by the principle of “from easy – to difficult” and is divided into complexes intended for development and improvement of state of different body parts. Special group of exercises is referred to composition of callantetics complexes, that activate muscles which are not involved in habitual everyday movements of people. This is extremely important, as those muscles can atrophy with time as well as loose elasticity. Callanetics is created to “wake them up” and activate them. That’s why constant loading on these muscles must improve appearance of students, make their figure slimmer and slenderer, which in its turn, is important reason for trainings [4,62].

Generally, callanetics consists of 56 exercises similar with yoga and gymnastics. All exercises are directed into strengthening of hips, buttocks, hands, forearms, abdominal press, back. Exercises don’t demand moving in space. Specificity consists in tension of a certain groups of muscles during fixation of different stands. In the process of callanetics training all muscles develop equally. All the program is based on static loadings which are directed so that not to arise painful feelings in muscles. Thanks to complex of exercises, the process of metabolism is considerably accelerating in muscular mass that promotes burning of big amount of calories.

Initial position for majority of exercises is legs on width with shoulders, back is straight, stomach is drawn. Standing in the right position, keep it depending on initial level of your physical preparedness for 60-100 seconds, feeling tension in all muscles. Technique of exercises is based on stretching and static exercises which cause activity of muscles groups which are deeply situated. All movements must be executed slowly and gradually without sharp moves and jerks.

It is necessary to note that all exercises are divided into 4 groups: 1) warming-up (6 exercises; 2) exercises for abdomen (4 exercises), complex for legs muscles (4 exercises), exercises for buttock muscles and hips (5 exercises); stretching of muscles (6 exercises); “Belly dancing” (3 exercises); legs strengthening (2 exercises) [2]. If one executes all the exercises regularly, total improvement of metabolism will happen, due to the fact that callanetics exercises have narrow direction on different body parts. Loadings can be increased only in the case of continued period of trainings. Then execution of one exercise and pause (rest) between them can reach maximum time of pose maintenance (30 seconds).

On the basis of studying experience of specialists from different countries and analysis of scientific and methodical literature, we can formulate such methodological recommendations connecting with executions of callanetics exercises: before doing exercises it is necessary to warm up muscles; exercises should be executing in front of mirror – then it is possible to look on yourself and better fix movements; right, calm and natural breathing is very important while doing callanetics; if the rhythm is strayed it is possible to have a rest and renovate it; while staying in the right position it is necessary to fixate it for 60-100 seconds (depending on initial level of your physical preparedness); callanetics demands concentration, constant feeling of your body; peculiarity of callanetics is static loading on body muscles; in the process of training it is necessary to drink water from time to time; trembling of body or limbs is evidence of too much load; it is necessary to breathe economically and rhythmically while doing exercises, breathing retention is not allowed, otherwise organism would not get necessary amount of oxygen; it is not allowed to complicate movements; callanetics exercises can be used at any part of lesson;full complex includes 30 exercises; only systematic execution of exercises will help to achieve the aim [2].

It is necessary to point out that complex of callanetics exercises has comparatively low level of getting traumas while doing them, as absence of sharp movements doesn’t harm joints. Well-known fact that traumas usually happen because of incorrect load on joints. However, it is not worth to execute exercises if they evoke pain (it is necessary to consult with a doctor). Amount of repetitions at the beginning should be only 20 and gradually proceeding to complete program (100).

Conclusions. It was resulted from the experience, that using complex of callanetics exercises increases lessons efficiency, evokes interest among students to visit physical education lessons regularly, as for a lot of representative of students’ community aesthetic effect from sport is very important. However, on the first plan for

a teacher must be benefit for students' organisms, except of aesthetic effect. That's why recreation character of callanetics complex of exercises is investigated on practice and it was defined that there is real expediency to involve this aerobic kind of physical loads during educational process.

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Organization Peculiarities and Content of Physical Education of Students at Pedagogical Faculties

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Abstract: The article analyzes the current state of organization and content of physical education classes at higher educational institutions of Ukraine; problematic issues of educational process organization on the subject are determined. Ways of solving mentioned pedagogical and social problems are formulated, which lead to the aging of Ukrainian nation.

Keywords: physical education, a teacher, professional activity, motivation, a student, pedagogy.

Setting the problem. A sound mind in a sound body and great potential for strong state formation. With every year, the level of atmosphere pollution increases; there is kind of burnout and aging of the nation. Therefore, priority should be given not only to programs for development of educated and economically prosperous nation, but also provision and promotion of healthy and enduring society. The question of improving the process of studying physical education of students has been the subject of interest for specialists for many years. According to recent years, the level of

physical education remains low among the vast majority of applicants; there is tendency towards the decline of physical culture [4]. The analysis of literary sources indicates a significant deterioration in physical development of younger generation [6], lack of motor activity and well-being is noticeable [7], which leads to health decrease of student youth, as well as worsening of work capacity, and in general, a body has resilience to various viral diseases and seasonal ones [3]. So, before physical education as a discipline the task is raised to increase the efficiency of physical education of younger generation as future basis of the nation, which should grow up as healthy and abled-bodied society.

Historiography review. For the first time the strategy of culturology training was defined by V.K. Balsevych, M.Ya. Vilenskyi, A.P. Matveyev. In 1992, L.I. Lybusheva formed the concept of physical education as specific process of forming the physical culture of a person. Investigations conducted in recent years (V.L. Volkov, 2008; V.V. Pruhodko, 2008; Yu.M. Furman, 2004) has proven that for organization of comprehensive process of professional training of specialists at higher educational institutions, technical profile must be linked to an integrative whole and focus on at least six of the following types of training: theoretical, physical, special, real professional activity in different conditions, psychological, psychophysiological. Special importance is still given to professional-applied physical training (PAPT), which being an independent section of physical education course for students, is the connecting link that connects physical, psychological, psycho-physiological training for students at higher institutions with their future professional activities (A.H. Yehorov, 1994; T.Yu. Krytsevych, O.I. Podlesnyi, 2008).

Aim of the article. To analyze the current state of organization and content of physical education classes at higher educational institutions; to identify the problem issue of educational process organization on this subject; to formulate ways of solving problems mentioned in the work, which lead to aging of Ukrainian nation.

Presenting main material. Nationwide, socially determined risk factors that express threat to preservation, development and realization pf Ukrainian population are: trends of recent decades to a decrease in life expectancy and rise in mortality, total population decline; decrease of the level of physical and mental health under influence of social, environmental, economic and pedagogical problems.

There are a few key issues that hinder the solution of motivation tasks to sport activities and increase the level of physical training of the youth. According to many

scholars, it is necessary to abandon the Soviet standards of rigid normativity, compulsory and authoritarianism, adjustment to a given standard from the outside, but on the contrary, motivate the youth by forming an interest to the subject, appeal the standards of athletic body beauty and strengthen their own health for the sake of the future. For a long time, there is marked gap between physical culture and general human culture with its spiritual beginning. Educational institutions and families of young people don't form an emphasis in the harmony of physical and spiritual, which leads to the fact that we have phenomenon of aging of nation.

The main task of physical education at higher education is formation of physical culture and student health. And the formation of physical culture of a student in its turn, should include these basic directions: training of bodily culture, intellectual and socio-psychological training. The legislative base of Ukraine on physical culture and sport at higher educational institutions considers a part of this educational process as a discipline and core component of the holistic development of personality. The program envisages the freedom to choose activity by a student and an independent strategy of general cultural training, because there are two interrelated components: mandatory or basic (designed to provide the foundation of physical culture of a person) and variational (complements basic one and takes into account the individuality of each student, their goals, interests, needs).

The form of practical classes is the basis of physical education at higher education in Ukraine. The practical majority of students have such classes as the only way to get the right knowledge and skills in physical culture. The very person of a teacher pf physical education provides the opportunity to manage the process of physical development of a student and lay a basic knowledge of the proper treatment of their body. Average age of students in Ukraine is 17-30 years, therefore, most of them don't attach importance to physical culture and strength, as this is the time of human motility development, as evidenced by the results that are shown by athletes in various sports. Peculiarities of this age are good health and great deal of people's employment (including education at higher educational institutions). Because of this, many people don't understand and try not to realize the essence of the problem of future health, they don't feel the need for regular physical education to maintain and development of their motor activity. Therefore, the main task of physical education teachers should be an explanation, students' conviction that motor activity is the best way of preventing diseases [9].

Another task of physical education teachers is the creation of a specific education situation that in the process of professional training of future specialists focused their attention on the awareness the factors which influence physical health of a person (optimal motor mode contributes the harmonious development of human body and provides high level of body system functioning); compliance with the rules of personal hygiene; hardening, work on endurance, etc. A teacher should facilitate the creation of mechanism for the formation of self-assessment of physical health of students and adoption of appropriate decisions that promote viability and high working capacity. As V. Lozynskyi indicates, under the influence of physical exercises, functional and adaptive capabilities of cardiovascular and respiratory systems and musculoskeletal system are expanded, the activity of enzymatic reactions increases, the intensity of oxidation-reducing processes increases in tissues, organism's resistance increases to the action of adverse environmental factors, memory improves, irritability decreases, sleep is normal [5].

However, despite problems of students' motivation to active engaging physical education in their lives, there are number of issues that are regulated by the state; they may also contribute to loss of interest to physical culture by students. The Ministry of Education and Science of Ukraine reduced the total weekly students' hours of all subjects of study from 36 hours to 30, defining the part of this load as individual work. This, as well as the introduction into curriculum credit-module system, forces universities to reduce the amount of hours on non-profiling subjects, to which they include physical education [8]. This is resulted in poor conclusion – in most universities, the amount of study load is reduced to two hours per week for physical education at 2nd -3rd courses without additional classes. Students are quickly accustomed to small loads and small amount of training hours. As a result, the effectiveness of physical education classes is sharply reduced in terms of solving the problems of hypo dynamics, health promotion, the development of professionally important physical and psycho-physiological qualities [8]. It is necessary to promote the involvement of students to as many optional and individual exercises as possible in other forms of physical education, which will help to balance the misbalance in reducing academic activities.

Therefore, to unite the processes of physical and spiritual education on the basis of self-determination is one of the ways to solve problems of mentioned in the work pedagogical and social problems: in the healthy lifestyle, in the process of professional

training, which involves the formation the following knowledge and skills of health culture in the future specialists [1]: to understand the organizational structure of professional activity of physical culture, its connection with complex of disciplines of humanitarian, professional and general education units and with the policy of population improving; to be professionally aware of the forms, means, methods of pedagogical activity, be able to analyze educational situations; to respond to necessity of correction and diagnosis of spiritual, physical and mental development and state of a person in time; be able to determine mental and physical capacity, readiness for systematic loads in different age periods and in different situations; adequately estimate physical activity during physical education classes and sport trainings and determine their relevance to the height and physical preparedness of a person; to have enough knowledge and skills to determine contradiction for physical and mental loads in relation to age, physical and mental health; to conduct pedagogical activities, relying on knowledge and disseminating them (structure and functions of an organism, etc.);

It follows from the above, that the main goal of scientific ad pedagogical process and the main task of physical education teachers as an integral part of it is to solve the problem of increasing the efficiency of physical education classes of different layers of population and accordingly, improving health, working capacity and life duration of the country's population.

Conclusions. Teachers should apply a differentiated approach in the process of physical education of students and their professional preparation for future work, to perform professional tasks, strive not only to demonstrate graphically the need to increase physical culture of a body, but convey obligatory self-training and development with the help of words. Physical training should be directed to development of strength and coordination abilities, increasing work capacity and normalization of body weight; for this purpose, it is recommended to use increasing of mood and well-being. Education of student youth has a number of problems that hinder the improvement of students' physical preparedness at higher educational institutions of Ukraine. First of all, it is lack of motivation for students, as well as curiosity of mastering skills of physical culture by them. Secondly, insufficient financing of material and technical support of higher educational institutions of Ukraine, low level of health among student youth, constant reduction of classroom hours, which lead to even lower motivation of students for any kind of physical training.

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Development of Diagnostic Material for Evaluation of the Effectiveness of the Project Organization in the Field of Social Entrepreneurship in Education on the Example of 'Provita OOO' (Limited Liability Company) c. Stavropol

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Abstract: The Assessment criteria for evaluating socio-educational projects, especially goal orientation, positive measurable social outcomes; innovation and research scientific and practical activities; financial sustainability through income generated from our activities; marketing activities of the organization; entrepreneurial ability to have a positive impact on the development of socio-educational sector were determined in this article on the basis of the marked features of the model of the successful organization of social entrepreneurship. These criteria are considered within the assessment of the project targets of social entrepreneurship in education on the example of 'Provita OOO' (Limited Liability Company), in Stavropol.

Keywords: education, social project, diagnostic, diagnostic card, social entrepreneurship in education.

Целью опытно-экспериментального исследования выступала разработка диагностического материала по оценке эффективности социально-образовательного проекта. Постановка цели позволила сформулировать конкретные задачи опытно-экспериментальной части исследования:

- выделить критерии оценки эффективности социально-образовательных проектов в соответствии с особенностями организации социального предпринимательства в области образования;
- подобрать диагностический материал и произвести оценку целевых установок социально-образовательного проекта, соответствующего всем теоретически выделенным особенностям его организации на примере ООО «Провита» г. Ставрополя.

Анализ теоретической литературы и социальной практики за последние 6 лет [1-6] позволяет выделить особенности модели успешной организации социального предпринимательства в образовании:

- наличие социального воздействия - целевая направленность на решение или смягчение существующих социальных проблем в предоставлении образовательных услуг, позитивные измеримые социальные результаты;
- обязательная направленность на инновации - применение новых, уникальных подходов, позволяющих увеличить социальное воздействие предлагаемых образовательных услуг;
- четкий расчет в рамках самоокупаемости и финансовой устойчивости - способность решать социальные проблемы в области образования за счет доходов, получаемых от собственной деятельности;
- ориентированность на тиражируемость - увеличение масштаба деятельности социального предприятия и распространение опыта (модели) с целью увеличения социального воздействия;
- реализация предпринимательского подхода - способность социального предпринимателя видеть провалы рынка образовательных услуг, находить возможности, аккумулировать ресурсы, разрабатывать новые решения, оказывающие долгосрочное позитивное влияние на развитие данного сектора и общество в целом.

На основе этих особенностей можно выделить определенные критерии оценки социально-образовательных проектов, которые включают в себя: целевую направленность, позитивные измеримые социальные результаты; инновации и исследовательскую научно-практическую деятельность; финансовую устойчивость за счет доходов, получаемых от собственной деятельности; маркетинговую деятельность организации; предпринимательскую способность оказывать позитивное влияние на развитие социально-образовательного сектора.

Кратко рассмотрим вышеназванные критерии в рамках оценки целевых установок проекта по социальному предпринимательству в области образования на примере ООО «Провита» г. Ставрополя.

Диагностическая карта №1 «Целевая направленность, позитивные измеримые социальные результаты»

Оценивая проект социально-образовательного предпринимательства в этом направлении, необходимо выявить, насколько его цели и задачи совпадают с целями и стратегией развития общей направленности социальной и образовательной политики и способны решать в режиме своего развития конкретные вопросы с конкретными ожидаемыми, согласно социальному запросу, результатами.

Общая характеристика целевой направленности	Позитивные измеримые социальные результаты
ООО «ПРОВИТА» - уникальный практико-ориентированный проект, носящий по своему содержанию социально-образовательный и культурно-просветительский характер.	• появление ООО «ПРОВИТА» призвано внести заметный вклад в оптимизацию социально-образовательного и куль-турного пространства города и края, а также решения вопросов реализации новых образовательных стандартов; • эта модель новой культурно-образовательной реальности нацелена на обеспечение своевременного развития и самореализации внутреннего потенциала личности взрослых и детей, подлинно гуманистическую воспитательную среду и сохранение ценностей семьи.

Диагностическая карта №2 «Инновации и исследовательская научно-практическая деятельность»

Исследовательская научно-практическая деятельность является начальной стадией инновационного развития проекта социально-образовательного предпринимательства, на которой следует оценить вероятность достижения требуемых показателей проекта и влияние их на результаты деятельности самой организации. Инновационное развитие в предпринимательской деятельности в области образования может быть изолированной разработкой или родоначальником семейства новых образовательных продуктов и услуг, определяющим дальнейшую специализацию организации.

Общая характеристика научно-практической инновационной деятельности	Количественные социальные показатели инновационного развития проекта социального предпринимательства в области образования
Инновационная составляющая проекта (каков механизм решения социальных проблем, в чем заключается новизна)	Новизна данного проекта состоит в феномене комплексного подхода в решении в рамках одной структурной единицы (ООО «ПРОВИТА») таких актуальных вопросов для города и края как: 1. создание альтернативной возможности получения педагогами образовательных учреждений города и края документов государственного образца по программам переподготовки кадров и повышения квалификации в собственном регионе в непосредственном формате общения со специалистами без отрыва от производства; 2. создание альтернативной возможности получения детям раннего возраста присмотра и ухода и образовательных услуг в дневное время; 3. создание альтернативной возможности получения детям дошкольного возраста предшкольного образования по европейским стандартам; 4. создание альтернативной возможности получения детям с ОВЗ дошкольного возраста погружения в массовую социально-образовательную среду с одновременным получением индивидуальной квалифицированной помощи; 5. создание альтернативной возможности получения детям дошкольного и младшего школьного возраста дополнительного образования в системе синтеза искусств; 6. создание альтернативной возможности получения семьям детей раннего, дошкольного и школьного возраста психолого-педагогического сопровождения.

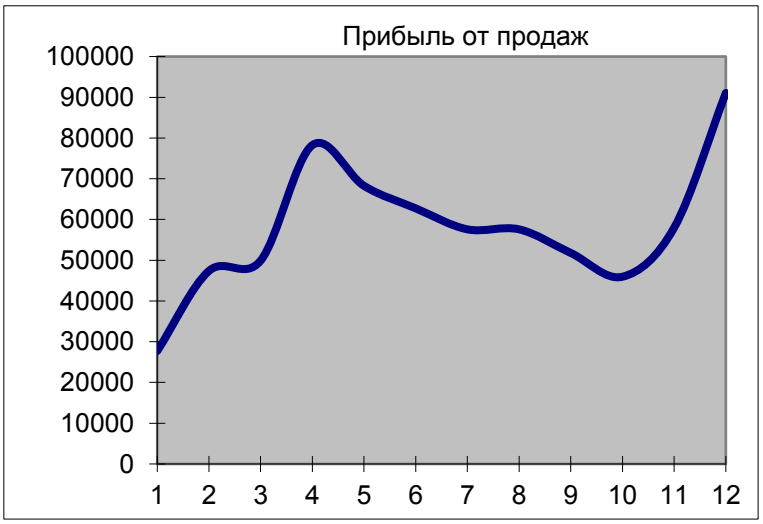
Инновационная составляющая также заключается непосредственно в разработке авторских программ консультативного, развивающего, обучающего, воспитательного, творческого, спортивного и сопроводительно-консультативного характера, организация работы только с титулованными и остепененными специалистами, имеющими педагогическое и психологическое образование, комплексный подход в решении вопросов отдельной семьи и ребенка.

Диагностическая карта №3 «Финансовая устойчивость за счет доходов, получаемых от собственной деятельности»

При выборе проекта социального предпринимательства в области образования большое значение имеет правильный план финансирования. Концентрировать все финансовые ресурсы организации на разработке одного направления проекта не всегда целесообразно. Организация может себе это позволить лишь в том случае, если единственному направлению развития гарантирован 100% -ный успех. В других случаях выгоднее направлять ресурсы па разработку нескольких направлений деятельности проекта. В таком случае появление неудач или объективных обстоятельств остановки при разработке одного из направлений будет компенсировано успехом от реализации другого.

Кроме этого следует оценить количественно все затраты, необходимые для разработки и развития инновационных направлений проекта. Основные затраты, производимые до того, как реализация образовательного продукта или осуществление процесса по реализации образовательных услуг начнут считать отдачу, состоят из затрат на научно-исследовательские работы, капитальных вложений в программу реализации образовательного продукта и первоначальных стартовых затрат, причем уровень этих затрат зависит от инновационной направленности проекта развития социального предпринимательства в области образования. Здесь же возможно оценить необходимость дополнительного спонсорства.

Прогноз прибыли ООО «ПРОВИТА» на первый год реализации проекта



Диагностическая карта №4 «Маркетинговая деятельность организации»

Для реализации проекта социального предпринимательства в области образования необходимо, чтобы маркетинговые исследования рынка подтвердили его потребность, выявили конкретных будущих потребителей. В том случае, если конечный результат проекта социального предпринимательства в образовании - инновационный подход в реализации образовательных услуг, то цель маркетингового исследования - спрогнозировать спрос на новые услуги или условия их предоставления. Сюда же можно отнести и технологические инновации, улучшающие качество образовательного программного продукта или пакета образовательных услуг. При этом целью маркетингового исследования проекта социального предпринимательства в образовании является не только оценка спроса на новые образовательные услуги, но и оценка объема их реализации, который будет обеспечен, причем эта оценка имеет очень важное значение, так как объем и востребованность - это конечный показатель успеха в предпринимательстве.

	Основные этапы расчета востребованности и цены образовательной услуги	Основные характеристики расчета востребованности и цены образовательной услуги
1	Исследование рынка	• основные конкуренты на момент реализации проекта; • общий прогноз развития основных потребляющих сфер; • прогноз состава перспективных образовательных услуг и объема спроса на них.
2	Определение общих целей деятельности организации.	• характеристика типичного потребителя - индивида и предприятия; • требования потребителя к качеству образовательных услуг; 1. методы прямого и косвенного регулирования; • согласование программ.
3	Методика ценообразования на рынке образо-	Логика потребителя по этой методике рассматривается как расчёт верхнего предела цены: Пâ по формуле (3.5): Пâ = У × (Тñ – Тq) –Пî × Тq , где (3.5) У –

	вательных услуг и продуктов, исходя из согласования интересов производителя услуг и их потребителя, предложенная Ю.В. Морозовым	выигрыш от полученных знаний; Tñ – период старения знаний; 87 Tq – длительность обучения; Пî – потери из-за отвлечения на учёбу. Организация, оказывающая образовательные услуги, рассматривает для себя нижний предел цены: Пí, ниже которого заниматься образовательной деятельностью не имеет смысла (3.6): Пí = (1 + К) × (am + bn + F) × Tq , где (3.6) К – максимально допустимый уровень рентабельности; a – средняя ставка заработной платы преподавателей; m – численность преподавателей; b – средняя ставка заработной платы вспомогательного персонала; n – численность вспомогательного персонала; F – условно-постоянные затраты. Соотношение верхнего и нижнего уровня цен позволит определить ориентировочную цену образовательных услуг. Окончательный размер цены связан с факторами рыночной конъюнктуры.

Диагностическая карта № 5

«Предпринимательская способность оказывать позитивное влияние на развитие социально-образовательного сектора».

Стадия непосредственной реализации является главной и основной стадией проекта социального предпринимательства в образовании. Обстоятельно анализируется сам процесс: как должна быть организована система выпуска образовательного продукта или пакета образовательных услуг и каким образом должен осуществляться контроль за соблюдением технологических процессов их реализации.

	Рыночная стратегия проекта социального предпринимательства в образовании	Основные характеристики стратегии
1	Формирование рыночной стратегии организации для оказания позитивного	• анализ и прогнозирование конъюнктуры рынка образовательных услуг;

	влияния на развитие социально-образовательного сектора	• анализ и прогнозирование факторов конкурентного преимущества; • анализ связей с внешней средой; • прогнозирование и воспроизведение циклов пакета образовательных услуг.

Образовательная деятельность в большей степени, чем другие направления социальной предпринимательской деятельности, сопряжена с риском, так как стабильная гарантия благополучного результата практически отсутствует. Об уровне риска образовательной деятельности свидетельствует тот факт, что в среднем из каждых десяти коммерческих организаций, предоставляющих образовательные услуги, успеха добиваются лишь одно-два. Риск, возникающий в социальном предпринимательстве в области образования, включает в себя следующие основные виды: риски ошибочного выбора инновационного социального проекта; риски не обеспечения социально-образовательного проекта достаточным уровнем финансирования; маркетинговые риски реализации результатов проекта социального предпринимательства в области образования; риски возникновения непредвиденных затрат и снижения доходов; риски усиления конкуренции; риски, связанные с недостаточным уровнем кадрового обеспечения и др.

Одной из причин возникновения риска ошибочного выбора социального проекта является необоснованное определение приоритетов экономической и рыночной стратегии, а также соответствующих приоритетов различных видов инноваций, способных внести вклад в достижение целей организации. Специалисты также могут ошибиться в оценке современного финансового состояния коммерческой организации и ее перспектив на рынке образовательных услуг.

При выборе источника финансирования инновационного социально-образовательного проекта существует три возможных варианта. Первый метод – самофинансирование проекта, второй – опора делается на внешние источники финансирования, третий представляет собой комбинацию вышеназванных. Соответственно возникает риск неполучения финансовых средств в результате неправильно выбранного метода финансирования.

На рынке инноваций, как правило, действуют десятки негосударственных образовательных организаций, что является причиной возникновения рисков из-за усиления конкуренции. Маркетинговые риски в первую очередь обусловлены

особенностями инновационного проекта. Сюда же отнесен риск ошибочного выбора целевого сегмента рынка образовательных услуг, возникающий в следующих ситуациях: а) когда спрос на новшество на выбранном сегменте рынка оказывается нестабильным; б) когда на данном сегменте рынка потребность в новшестве недостаточно сформировалась; в) если выбран сегмент рынка, в котором потребность в новшестве оценена неверно; г) если для продаж выбран сегмент рынка, в котором потребность в новшестве ограничена, и т. п.

Избежать полностью риска в проекте социального предпринимательства в области образования в целом невозможно, поскольку инновации и риск – две взаимосвязанные категории, но его показатели возможно существенно снизить.

Таким образом, в соответствии с особенностями организации социального предпринимательства в области образования и критериями их оценки может быть осуществлен подбор диагностического материала по оценке эффективности социально-образовательного проекта.

Предметный количественный и качественный анализ данных может быть представлен после описания и реализации самой модели эффективной организации проекта социального предпринимательства в области образования.

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Strategy of Nationally Oriented Study of Ukrainian Language as Foreign: Applied Aspect

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Abstract: Specificity of Ukrainian studies component of studying Ukrainian language as foreign is characterized in the article. Main peculiarities of communicative method of learning Ukrainian language as foreign are analyzed on B1, B2/B2+ levels. Peculiar plan of nationally oriented Ukrainian future manual is formulated, which will provide holistic and comprehensive preparation of foreign student for confident communication in Ukrainian language.

Keywords: Ukrainian language as foreign, nationally oriented education, listening, reading, writing, speaking, text, interaction, manual.

Setting the problem. Modern stage of development of Ukrainian society is characterized by interference Ukrainian education into transitive level – stage of creation properly Ukrainian educational space. Provision the proper level of preparedness of foreign citizens needs to improve some educational methods of Ukrainian language at non-lingual higher educational institute of Ukraine, demand searches of complex approaches for realization of two leading tasks of the course: on one hand, studying base Ukrainian language with assimilation of free acquirement “everyday dictionary”, high communication skills, on the other hand, preparing of language for future specialist, that is reposition in the language for professional orientation. Combination of two mentioned ways often evokes “incompleteness” at the level of one of subsystems or has probability to master only lexical minimum without ability to correctly and properly introduce it into oral or writing language, apply during professional activity in the future. That’s why, on our opinion, Ukrainian language for professional orientation must be separate subject at 3rd or 4th year of language studying (accordingly, at 3rd or 4th courses), as assimilation of professional language and learning of documentation conducting need completely another tools and methods.

However, there must be indissoluble connection and penetrating communicative links between subjects. By virtue of this, represented investigation is essentially the first part of two-blocks research that covers problems of teaching Ukrainian language as foreign and ways of its solution at non-philological institutions of Ukraine. In particular, experience of teaching the discipline at higher state institution of Ukraine “Bukovynian state medical university” is analyzed and priory models of subject development are outlined at the institution.

Methodology of teaching Ukrainian language as foreign is comparatively young science. Today, teacher of Ukrainian language faces the problem of searching the ways of increasing cognitive interest of students to learn language, consolidation of their positive motivation to learning, because cognitive activity itself is one of main criteria of quality of specialists’ preparedness and its effective formation is possible only in conditions of optimal organization of learning process.

Historiography review. V. Kostomarov, A. Shchukin, A. Frolkina investigate specificity of creation educational manuals with texts of different styles and tasks for them. Researchers L. Vasylieva, B. Sokil, N. Stankevych, N. Tsisar and others study general problems of selection and use of educational text. O.Kachala, Z.Kunch, and others study definition of lexical material and peculiarities of its applying (scientific); H. Onkovych, M. Shevchenko, O. Tseniuh and others (publicist); L. Antonov, A. Budnik, L. Vasylieva, Z. Matsiuk, I. Protsyk, V.Fedchyk, H. Shvets’ and others (fiction). Individual manuals with selection of texts and tasks for listening and writing are developed by V.M. Vinnytska (“Sluhayemo, hovorymo, pyshemo” [Listen, speak, write] Ukrainian language as foreign), S.I.Diachenko (“Ukrayinska literatura dlia inozemnyh studentiv” [Ukrainian literature for foreign students]), L.M. Palamar (“Chytayemo ukrayinskoyu” [Read in Ukrainian]), B.M.Sokil (“Knyha dlia chytannia z ukrayinskoyi movy dlia studentiv-inozemtsiv” [The book for reading in Ukrainian language for foreign students]). However, it is necessary to create manual taking into account the most advanced methods and technologies, with involvement of topical material and representation of the newest information that conditions the relevance of this investigation, that is peculiar plan for future educational book.

Aim of the investigation – to characterize specificity of Ukrainian studies’ component of learning Ukrainian language as foreign; analyze main peculiarities of communicative method of assimilation Ukrainian language as foreign at B1, B2/B2+ levels; formulate peculiar plan of nationally oriented future manual, that will provide

holistic comprehensive preparation of foreign student for free communication in Ukrainian language.

Representing main material. Experience of teaching at HSEI (Higher state educational institution) “Bukovynian state medical university” where studying is conducted in English language for students-foreign citizens (that is one of contract’s condition), made us think about the problem that has strategic character and is principled for all institutions, where foreign students are studying – it is not important in what language special subjects are conducted, foreign citizens must pass and master course of Ukrainian language as foreign at high level, as Ukrainian language is the only state one of independent Ukraine (as well as representatives of national minorities, who have department, where studying is conducted in language of their title nation – *Sic!*). In addition, the course of Ukrainian language as foreign must be finished with state exam. In fact, we need to start respecting our language, speak this language and teach Ukrainian those people who visit our country – represent our culture in the world through its prism. Only in this way we will come to “lifting from the knees” of nation’s central image – our language. Only in this way students would not ask a teacher during the lesson why people on the streets speak the other language, not this one that is taught at the university.

Having analyzed entire conglomerate of proposed manuals and educational resources of the department of social sciences and Ukrainian studies at BSMU, it was made a conclusion, that elementary level of learning Ukrainian language as foreign one (A1, A2) is the most developed and methodically provided. As long as basic dictionary, topics of propaedeutic character, main grammatical and morphological categories (“Acquaintance”, “Family”, “Education”, “Pharmacy”, “Shop”, “Transport”, “Noun”, “Pronoun”, Adjective”, Verb”, “Case paradigm”, “Syntax”, etc.) vary with tiny difference, all scientists and methodologists come together on expediency of using this tool. There are considerably less manuals and educational material for those students who improve language, that is for B1, B2/B2+ levels. There is lack of manuals which would gradually and methodologically introduce material, considering requirements for levels and Pan-European recommendations of lingual education [2]; would have wide informative spectrum, but would be based on principles of nationally oriented content of education.

Nationally oriented learning of Ukrainian language as foreign is not only an attempt to “dress” language on vyshyvanka [embroidery], but desire to represent our

country for foreigners as for representative of world association (together with all civilized counties, which would not let foreign citizens to study in their state for 5 and more years and not have studied their language, not have been acquainted with their culture). This is cultural advertisement of country and part of formation process of humanitarian space of nation, that must be absorbed by foreign citizens and they must share this received information in their countries. Therefore, national component of education content is considered as system of knowledge about country's language, history of nation, its traditions, customs, ideals, authentic sources of culture, etc. Learning foreign language means attraction to cultural acquisition of its nation, as formation of communicational competence as integral ability "successfully solve tasks of mutual understanding and interaction with bearers of language, that is studied" [3, 91].

Learning language is not possible without immersion into culture. Germs of national essential direction of educational process have already been at BSMU in frames of subject "Ukrainian language as foreign", however only 10 classroom lessons are dedicated for learning these topics, that is simply miserable and students don't have possibility to properly work out these topics, that's why they lose motivation to learn them. The fact of absence of specially designed manual on the basis of institution is an important moment, that would be standardly used by teachers. Separate abstracts of regional geographic profile are represented only by informative texts for reading, without the number of developed questions for discussion, tasks for listening, etc. In prospect, we desire to create a manual oriented into national concepts, that is aimed not only to teach language, profound speech, ability to conduct monologue (for example, speech at conference), dialogue and polylogue, but to receive qualitative knowledge about the country, where student lives at the moment. The principle of regional geography (Ukrainian studies) is laid in the basis of nationally content-informational component, where factor of knowledge about Ukrainian mentality, ethno-psychology, ethno-culture, geography, history, prominent people is dominated.

In our opinion, it is necessary to expand the program and increase amount of hours of teaching Ukrainian language as foreign of this level to 80 classroom hours and 10 hours outside institution – at museum of architecture, theater, Organ hall, etc. (totally 90 hours together with module control). Communicational topics must become starting point, which will be able to open regional geography aspect of Ukrainian language as foreign, formulate high communicational skills of students, give

comprehensive information about Ukraine as ancient nation with rich history and prominent figures from different branches: **geography** (arrangement of the country, climate, the biggest cities, rivers, the capital of Ukraine, etc.), **culture and history** (Trypillya, “Scythia”, prince period, period of enslavement, liberating struggle of the beginning of XX century, independence), **music** (S. Krushelnytska, M.Solovyanenko, N. Yaremchuk, S. Rotaru, Kvitka Tsisyk, Nina Matviyenko, T.Petrynenko, Ruslana, “Okean Elzy”), **literature** (H. Skovoroda, T. Shevchenko, I.Franko, Lesia Ukrayinka, V. Stus, L. Kostenko, S. Zhadan), **theater** (coryphaeus of Ukrainian theatre, “Berezil”, M. Zankovetska, B. Stupka), **painting** (T.Shevchenko, Nykyfor Drovnyak, M. Pry-imachenko, K. Malevych, O. Murashko, O. Arhypenko, Ye. Hapchynska; art critic Borys Voznytskyi), **cinema** (O.Dovzhenko, S.Paradzhanov, I. Mykolaichuk, Yu. Ilyenko, K. Muratova), **sport** (B. Klychko, A.Shevchenko, O. Harlan), **space** (L. Kadeniuk, Yu. Kondratiuk), **inventors** (Y.Tymchenko, I. Sikorskyi, S.Korolov, P. Bo-bonych, Ye. and B. Paton, M.Amosov, A. Malyhin, V. Petrov, M. Vyazovska), **composers** (M. Lysenko, M.Skoryk, S. Stankovych, V. Ivasiuk), **the most prominent buildings of Ukraine** (holistic architectural atlas of Ukraine). Topic of **regional studies** must be separately covered in the manual (in our case – Western Ukraine, Bukovyna; culture of the region; prominent people; Chernivtsi).

In relation to classroom topics, they must be organized mostly relying to communicative methodology and method of lingual immersion. That is, **reading, writing, speaking, listening, interaction** is important at this stage, their direction must be concentrated around mentioned above topics-discussions. Texts for reading – adapted biography of authors, extracts of their writings. Since a text is one of main component of meaning of learning language and appears as a product, means and object of communication (according to Generally European Recommendations of lingual education, “text is a center of any action of lingual communication; it is external objective connecting link, “joint” between those who products and those who receives – whether they communicate directly or distantly” [2, 98]).

It would be necessary to take extracts of popular science articles about writers, prominent cultural and social activists for listening. For example, it is important to concentrate the topic “History” on such figures as Anna-Yaroslavna, Bohdan Khmelnytskyi, Ivan Mazepa, Pylyp Orlyk, Stepan Bandera, except “synchronous” texts about crucial periods in entire history of Ukraine; on certain prominent dates (Holodomor [starvation], Ukrainization, “West” operation, dissidentness, etc.). Topic of

recent revolutionary events must be appeared as separate problem, with clear explanation and discussion of preconditions and results of those dismal days. It is necessary to implicate various materials to the topics (interviews with extracts of urbanistic everyday communication, cuttings from newspapers, magazines, dialogical communication, adapted extracts of literary writings), that will give possibility to move away from stamped lingual samples and situations and let to stay in frames of live lingual process for foreign students.

Essential stage of preparation for listening is to use dictionaries of unknown words that must be formed for each topic or even for subtopic. It is necessary to use not only teachers' speech for listening, but also actively implicate audio and video records, fragments from programs of "Kultura" TV-channel, or artistic programs of national radio, records of songs or interviews, fragments from films, etc. For example, talking about "Cinema" topic, sounding of speech of I. Mykoliachuk, fragments from such films as "Ukrayina v ohni" [Ukraine on fire], "Propala hramota [Lost charter], "Tini zabutyh predkiv" [Shadows of forgotten ancestors], "Bohdan-Zinoviy Khmelnytskyi", "Pomarancheve nebo" [Orange sky], etc., will become a good example to recollect "History" topic, to make interesting semantic associations. Exercises for listening are oriented into development and formation of lingual activity; their main task is to get information, evaluation of heard material, discussion between students, that must be "inflamed" by a teacher.

Stage of writing, as well as previous elements of general communicative line, must harmonize with already studied and mastered material, it is best to apply it after reading and listening. That's why, for continuing the topic of cinema of Ukraine, it would be efficiently to conduct writing control, such as: tests "To whom do these words/statements belong?" (to give the whole range of quotes or translated replicas), "Describe emotions of main female character of "Pomarancheve nebo" [Orange sky] (to write mini-text about events of that time through the prism of character of "heroine-patriot"), "Write yes or no" (questions based on reviewed abstract and read texts), "Correct grammatical mistakes in the text" and so on. In the "Writing" unit, it is necessary to apply various genres of this kind of practice: mini-composition-reflection, leaflet (for example, characteristics of works of art at imaginary exhibition of M. Pryimachenko), advertisement of a concert (for example, after listening to songs of "Okean Elzy"and reading a text about the group – to write advertisement about concert of Ukrainian part of group's world tour in Chernivtsi), dialogue, debate, description, letter, application, etc. A teacher should necessarily give examples of how to write mentioned genres of writing, discuss problematics, give instructions, etc. Previously

learned grammatical and morphological rules must be actively applied and necessarily repeated.

While studying “literature” topic, extracts from writings of T. Shevchenko or literary adapted analysis of his poetry can be given as illustration for repetition of grammatical rules, which were studied during previous lessons, where students need to put words in the brackets in the right grammatical form: “text about poem “Kateryna” written by T. Shevchenko. It is necessary to put words in brackets in the right case and verbs in the right time: *Romantychna poema (Taras Shevchenko) «Kateryna» rozpovidaye pro (trahediya) (silska divchyna). Kateryna (pokohaty) (soldat). Vony (zustritysia). Kateryna ne (sluhaty) (batky), (podruhy), yaki (hovoryty), shcho yomu ne mozhna (viryty). Vona (viryty), shcho vin (liubyty) (vona) i skoro (odruzhytysia) z (vona). Soldat (pity) z (viysko) dali, a Kateryna (zalyshytysia) vdoma (vahitna). De (vona (narodytysia)hlopchyk. Usi liudy v (selo) dumaly pro (Kateryna) pohano: vona nechesna, neskromna divchyna, vona (narodyty) (dytyna) bez (cholovik). Batko I maty ne (mohty) (vytrymaty) (sorom) i (skazaty) (dochka), shcho (vona) krashche (pity) z (dim). Kateryna z (malenkyi syn) na (ruky) (pity) (shukaty) (sviy kohanyi). Vona (dumaty), shcho (znaity) (vin) i vony (odrushytysia). (Divchyna)bulo duzhe vazhko. Shchob dytyna ne (pomerty) z holody, vona navit’ (prosyty) u (liudy) hroshi. Odna, bez (hata, teplyi odiah, hroshi), z (dytyna) na (ruky), vona (shykaty) svoho (Ivan). (Odyn raz), v holodnyi zymovyi den', Kateryna (zustrity) (sviy kohanyi). Vona bula shchaslyva. Ale Ivan ne (zahotity) navit’ (hovoryty) z (vona), (skazaty), shcho vin (vona) ne (znaty). Kateryna ne (mohty) (poviryty) v tse. Vona (plakaty), (prosyty) yoho (vziaty) syna, shchob vin ne ris syrotoyu. Ale Ivan hrubo (vidshtovhnuv) (vona) i (poyihaty). Vid horia Kateryna (zbozhevolity). Vona (zalyshyty) (dytyna), a sama (naklasty na sebe ruky) – (vtopytysia). Hlopchyk ne (pomery): (vin) (znaity) dobri liudy. Koly vin (pidrosty), to (staty) (povodur): vin hodyv po selah zi(staryi slipyi kobzar), (vodyty) (vin), dopomahatyu (vin)* [6]. The given fragment will be able to reveal the plot of Shevchenko’s poem and will enable to recollect grammatical rules and their application.

In general, while making accent on the content of Ukrainian studies for “Ukrainian language as foreign” discipline, it is necessary to take into account following important components: examples of folk wisdom (proverbs, sayings, bywords, well-aimed expressions, ethical edifications); examples of verbal information (non-equivalent vocabulary, phraseologisms, metaphors, aphorisms); examples of non-verbal information (mimicry, kinesetyka [pantomime, gests], procksemics [spatial and temporary sign system of communication] [5], etc.

The stage of interaction is also important, which must be implemented at the end of studying the topic or subtopic. From methodical point of view, situational and role games can be used here, because this form of getting information develops cognitive interest, activates mental activity. During the game, foreign students adorably assimilate material, learn how to apply acquired knowledge in new situations. Thanks to this way, reality is modeled, imitation of real actions is happening, that promotes easy learning of educational material and later permits to recreate it on the subconscious level. At the lesson of Ukrainian language, example of interaction can be situation “In the museum” formulated and directed by a teacher (for example, national gallery, where works of artists are exhibited, with which students were acquainted before; museum of history, where wax figures of prominent people are situated, national symbols: museum of Trypillian culture near Kyiv, etc.), where one student gets the role of guide, and the other ones are visitors who ask questions. The best way of giving examples of interaction is with slide show, video presentation, etc.

Therefore, rich content of a cabinet with illustrative material is important moment for productive learning of language. It is necessary to use cassette tapes, CD-disks, electronic books, illustrative books about Ukraine, its history, culture (for example, “Buildings of Ukraine included to UNESCO heritage”, “Bukovyna”), guidebooks, booklets, albums of painters.

Introduction of lingual club on the base of department has individual significance for holistic communicative strategy of language development of foreign students, where not only foreign students would participate, but also Ukrainian ones. It will give possibility to have discussions in Ukrainian speaking audience, to have real lingual practice.

Conclusions. Main peculiarities of communicative method of learning Ukrainian language as foreign at B1 and B2/B2+ levels are analyzed in the article. Peculiar plan of future nationally oriented manual is formulated, that would provide holistic, comprehensive preparation of foreign student to free communication in Ukrainian language. Basic components of content line of the manual are enlightened: reading, writing, speaking, listening, interaction, studying of which will give possibility to form ideal conditions for learning mentioned levels of Ukrainian language as foreign, to get more visual and acoustic impulses in order to develop not only reading or listening, but also speaking and writing, which will help to confidently operate active content of our language, to find the most important information about Ukraine, its culture and achievements.

Perspectives of further investigation. As was mentioned at the beginning of the work, study is the first part of two-blocks investigation with “Ukrainian language as foreign” problem of “independent user” level. Henceforth, we intend to consider the problem of teaching and learning of medical theme, basics of anamnesis and conducing of professional documentation within special course of “Ukrainian language as foreign for professional direction”.

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Anatolij Moiseyenko's Shahpoetics in the System of Saturatic Genres

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Abstract: The article is devoted to the analysis of poetic creativity of contemporary Ukrainian artist Anatoly Moiseyenko. Shahpoetics writing by him was synthesized synthesis of poetry and chess composition in the system of satirical genres.

On the basis of the conducted analysis was concluded that A. Moiseyenko with his works tried to seeks to democratize the language of Ukrainian literature, expand its subject matter and diversify the figurative and stylistic palette, contributing to a change in the image of the Ukrainian writer.

Keywords: poetry, shahpoetics, shahov composition, verlibre, satire, epigram, cartoon.

Formulation of the problem. The poetic work of Anatoliy Moiseyenko had a Doctor of Philology degree, professor, the chairman of the department of modern Ukrainian language of Kyiv National University named after Taras Shevchenko, a member of the National Union of Writers of Ukraine (1988). His works are one of the most striking phenomena in the development of the literary process in Ukraine at the end of the 20th and the beginning of the 21st century. He is the author of two dozen collections of poems, numerous translations from German and Slavic languages, poetical works for children. There were still no publications devoted to the conception of the mosaic of A. Moiseyenko through the prism of satirical measurements in the literature on literature.

An analysis of recent research and publications launched the solution to this problem. The creative and creative way of A. Moiseyenko has been repeatedly in the field of scientists' eyes. In particular, the appearance of his first poetic collection congratulated a well-known reviewer in Literary Ukraine on the famous writer E. Gutsalo [1]. Critic P. Serdyuk revealed the specifics of the genre of the wreath of

sonnets in the creative work of the poet [8]. Academician M. Zhulinskiy wrote a preface to the book of selected poems written by A. Moiseyenko [2]. Literary critic V. Kuzmenko had analyzed the sources of poetry of the artist [3]. On the occasion of the 60-th anniversary of the birth of A. Moiseyenko a scientific collection was published on his honor [7]. There were no special works in which the experimental mosaic of A. Moiseyenko was covered through the prism of satirical measurements until now in the science of literature.

Consequently, the relevance of the article is caused by the acute need to fill the gap in the scientific research of experimental poetry. The shahpoetics is one of the brightest contemporary Ukrainian poets written by A. Moiseyenko as well as the lack of literary works on this subject in particular.

The aim of the research is to analyze Anatoliy Moiseyenko's poetic in the system of satirical genres.

Presentation of the main research material. There was a rather paradoxical situation In the Ukrainian poetry of the late twentieth and early twenty-first century. In quantitative terms poetry is capable of affecting the imagination of any researcher but quite a bit in the modern poetry of people who need a thorough and analytical attention. "Anatoliy Moiseyenko's versioning level and the embodiment of significant artistic and poetic tendencies belongs to the category of figures that are worthy of detailed observation" [7, p. 197]. This words belongs to Yaroslav Goloborodko. The reflections on the poetry and on literature in general made by Anatoliy Moysienko. The "poet in essence and not in the gates" (P. Movchan) each time with new collection, tends to subordinate to the once formulated universal principle. "The peculiarity of true creativity is that to give the reader the pleasure of discovering the cognition "of life («Baroque discourse of Ukrainian poetry of the XVIII century» written by Ivan Velichkovsky), understanding" life». There were the first and foremost of his oracle subjects and realities. That is why the artist denies "book fairness" and enjoys the turmoil of the «grasshopper» was surprised by the flowering of the «golden dandelion «which is not too soon «the silver will become like a wind» [6, p. 307].

The most unnatural thing for the poet may be the habit, the stamp, the loss of freshness of the reception of the surrounding reality, because genuine poetry is a free and dissociated thinking deprived of literary stamps and book of unreality, a modern language and a modern view of the world. Just in this, in our opinion, one of the most important traditions of Ukrainian classical poetry, including satirical. There is

condensed as the naphtha on inspired jokes, detached from a particular situation and from a particular character, as well as anecdotes «with a beard», nothing, besides disappointment and boredom do not cause.

Fresh colors and their own images and not «borrowed from the ink cartridges predecessors» [11, p. 426] wrote by I. Velichkovsky and G. Skovoroda, T. Shevchenko and I. Franko, M. Vorony and O. Oles, Ostap Vyshnya and P. Glazovy and others. This is the tradition of pan-European. It is noteworthy that V. Hugo in the preface to the collection of poems "Odes and Ballads" showed the reasonably of classical critics toward to French poetry into a kind of royal Versailles park. There were aligned, trimmed, smoothed, refined, sprinkled with sand. Contrary to the classical attitude, the artist introduces new forms and dimensions to French poetry, initiates a new system of versification, and emphasizes the sound organization of poetic text rhythm melodicism.

One of the poetic books of A. Moiseyenko also has an eclectic name "Sonnets". In the headline the author has identified the allusion of tradition and innovation, because, on the one hand, the sonnet form of poetry implies observance of strict discipline, clear canons and regulations at all levels content, compositional, lexical, acoustic, etc.

On the other hand, the verlibr pulsation of figurative thought, evident in modern rhythmic intentional means of living Ukrainian language, provokes a shakeup of the canon [7, p. 236]. Obviously the question is not about the unity of traditions and innovation but rather the coexistence of the traditions of modernist or modernist traditions in the context of the modern text of the modern poet. "Before the epilog the ink cartridge of the predecessor before the innovator life with its small and great changes" [11, p. 673]. That was the remark of M. Ushakov.

So in the creative work of A. Moiseyenko was found a fairly wide genre of palette from the canonical poetry forms of the sonnets, gazelles, triolets, octaves, rubai, hawks and even the crown of sonnets to the loose verlilbrus and already totally unheard of in poetry, so called shahpoetry. According to the modest estimate of the author himself, "shahpoetry did not remain unnoticed in both literary and chess circles". There allows us to hope for a sincere development of this kind of creativity, for a future perspective [6, p. 412]. Acceptably appreciated the collection of "Shahpoetry" and international grosmaster Victor Korchno write "Rare book, such, apparently, there is no more in the world" [Ibid. p. 430].

In "Literary Encyclopedia", shahpoetry qualifies as "a kind of creativity, a synthesis of poetry and chess composition, which was begun in the 90's of the twentieth century. A. Moiseyenko" [4, p. 582]. The shahpoetry versed lines identify certain ideological and thematic conflicts of the solution of the chess problem and the poetic text directly "intertwines" in itself the solution of the author's problem. A. Moiseyenko noted skillfully compiled such tasks and was even the prize winner of Ukraine's championship in chess composition. Academician M. Zhulinsky in the foreground entitled "The Spirit that Unites the World of Others" to the book "The Selected" by A. Moiseyenko (2006) explains the specifics of his shahpoetry: "The poet was lured to revive chess figures, the course of each of which gives birth to an association, something a new, unusual sheds light in the imagination ... In the poetic text "embedded" chess moves peculiar codes, through which the figures come alive and begin to act. And immediately before us there is a rapid dynamics of the battle: *attack - defense - retreat - offensive.*

The battlefield is won, the loser on the guillotine ... There is a collision of two languages the game of visual associations from contemplating the movement of figures on a chessboard and directly the game of chess a chess party, which in itself is a virtuoso game of imagination, a prediction analysis [6, p. 6]. It is noteworthy that one of the visual poems of another modern author, M. Soroka, "The board is our life" identifies the chessboard as a metaphor for human life with white and black fields that are constantly alternating. In this work the metaphor, beginning with the title itself, unfolds in the inner plot of the visual verse: "The board is our life, next to luck and sorrow, black and white fields cannot pass anyone" [9, p. 151].

Just as on the chess board was a dynamics of battle with all its unpredictable consequences for each of the rivals, the arrangement of figures on it an unbridled temptation to play a poetic imagination. The chess pieces for the poet is the same unique personality as the living people with all their suffering and joy. Therefore it is quite natural that A. Moiseyenko 's chauvinism is also a witty word in which echoes the broadest semantic comic gamma.

The artist's haunting satirical proves that his experiments with poetic language "should be considered not only as verbal freedom of versification, the choice of verse forms and rhythms; here is an important model of artistic thinking, that is, a trick to creativity" [7, p. 434]. A. Moiseyenko is mostly innovative. Each of his initiations

somehow multiplies the arsenal of Ukrainian modern poetry with new moves, images and motives. Including the humorous satirical ones.

For example, in the "Cycle to the first" shahpoetry, the verse "From overclocking // In the lion's mouth" // Fall // Tenderness ... is depicted in a chess etude, in which the white tour is offered as a sacrifice to the black king and "Time," and again, // And the third time ... "with the sole purpose -" To win [5, p. 7]. The comic of the situation is achieved by the absence of a black king who has nothing left to do, how to accept a victim and ... lose. He cannot abandon the "victim", because the tour is "crazy" (every time he declares the king to "shah").

Consequently, the given shahpoetry is contains parochial didactic of sweet death in "gentle arms".

The parable character are also other poetry of the cycle "Do not hurry // Remove the boulder, // What happened to you // In the middle of the path. // He can become // Tramplin // In overcoming // Further path ... "[Ibid. 9] and "Going, // Do not stumble about a stone, // Lying // On the Road" [Ibid. 10], or "The gate, // That is always open // Friend // And the enemy, // We should remember // What's the one and the second // Once upon a time // In their narrow // Outline // And not will erode ... [Ibid. 11], or "And the Trojan horse // In the teeth // Do not look ... // For only later on // Find out, // What is he // Trojan" [Ibid. 13] et al. All of them are also depicted by diorama with the fixation of the real chess parties of prominent international masters who have been racing over the past decades at the Chess World Championships. The book "Shahpoetry" also contains the cycle of poems "Variations on chess themes". Among the various genre palette of the cycle we encounter a parachute-parable (according to the typology of P. Soroka: [10, p. 5]):

There is an eternal shah
But there is no eternal mate.
And that one
Who is always ready
Keep us In eternal fear
Or eternal obedience,
It must be weighed against this [5, p. 38].

The inventive maxim of the work is quite transparent as it does not exist in the chess of the eternal mother (losing in the game), so does not exist for a man and eternal death (we die only once). Laughter frees man from fear even during his lifetime.

Moreover, laughter actually prolongs life, because humor is an effective means of such continuation. Optimists acquire, pessimists lose. "Although successful and daring, however, he chooses who can in a life laugh at himself," says the proverb.

But there are some interesting examples of the pointing-pointers

The expediency of accepting a victim

I

Almost a Hamlet question:

Be

Or

Beat [Same. 42].

II

And the king died in the arms of the victim [Ibid. 43].

As you can see A. Moiseyenko quite consciously fills his text with comic elements and, of course, not only to simply entertain the recipient. The writer of the modern textbook tends to present himself as a domestic observer, as clear as possible for the Ukrainian national character, who cannot afford his reader to be bored. Therefore, it is self-identified with laugh discourse, because its aesthetic code remains close to folk laughing culture.

It is worth recalling that the well-known Renaissance Polish poet Yana Kokhanovsky has a poem "The chess" given by M. Zhulinsky a reason to speak about the hereditary spiritual connections of Anatoly Moiseyenko 's shahopoetry with Baroque Ukrainian poets, in particular, Ivan Velichkovsky, whose creativity has been repeatedly addressed by the author of "Shahpoetry". This allows us to speak about the neo-Baroque tradition in contemporary Ukrainian poetry, which A. Moiseyenko continues to prolong. Shahnologiya is one of the favorite lyric sub motives of the poet, "where the image of the grosmasters acquires an associative and social orientation, which is to the author himself, he certainly belongs to a small cohort of grosmasters of versification and connoisseurs-analysts of the poetic culture in modern Ukrainian literature" [7, 200]. Launched in the work of A. Moiseyenko, shahpoetry is being developed by other contemporary artists. Thus, the collection "Carthage of the Continent" (2003) by V. Kapusty is entirely devoted to shahpoetry.

Conclusions. The Unusual phenomenon of Ukrainian literature of the late XX early XXI century. A. Moiseyenko 's poetry, in particular his shahpoetry is a synthesis of poetry and chess composition. These are postmodern poetic works, for which features such as cannibalization of reality, neo-baroque discourse, enriched by the

eagerness of neo-avant-gardism techniques, are characteristic; "Ironic linguistic behavior" of the author, up to the destruction of the versified form; parody, etc.

Shahpoetry is also became a full-fledged genre of satirical creation along the line an epigram, a parable, a cartoon. A. Moiseyenko with his humorous satirical quizzes, seeks to democratize the language of Ukrainian literature, expand her themes and diversify the figurative style palette, helping to change the image of the Ukrainian writer.

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The Genre of Comedy in Ukrainian Literary Discourse of 20-30s of XX century

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Abstract: The article is dedicated to the coverage of the artistic features of the comedy genre in literary discourse of 20–30s of XX century. Under review is the update of repertoire and innovative forms of theatrical interpretation of "Molodyi Teatr" headed by Les Kurbas and "Berezil" theater.

Through the prism of specifics of the genre the sideshow of "Viy" play, "Ukrainisation" by Ostap Vyshnia, "Mina Mazaylo" and “The People`s Malakhiy” play by M. Kulish and "In the steppes of Ukraine" comedy by O. Korniychuk, and also works of other Ukrainian playwrights are analyzed.

Keywords: genre, dramatic art, sideshow, comedy, tragicomedy, vaudeville, performance, kitsch, plot, comedy dramatist.

Statement of the problem. The dramatic art in general and the comedy genre in particular occupy the significant place in the Ukrainian humor and satire of the 20–30s of XX century. By the weapons of laughter playwrights fought against the remnants of bourgeois psychology, against everything old that in their opinion interfered with the construction of a new society.

However modern literary criticism does not have specific works on Ukrainian comediography of "Executed Renaissance" period in its arsenal.

Analysis of recent researches and publications which contain solutions of the designated problem. The dramatic art activities of such comedy playwrights as Ivan Kocherga, Mykola Kulish, Olexander Korniychuk and some others have repeatedly been within the field of scientific researches. Thus, N. Kuzyakina initiated the conception of Soviet realities satirical description in dramas by M. Kulish [4; 5]. The researchers G. Kostiuk [3] and M. Kodak [2] dedicated their studies to understanding tragic and comic features in M. Kulish's play "Pathetical Sonata" [2]. O. Gudzenko investigated romantic elements of Ukrainian drama of 20s of XX century. T. Sverbilova

examined dramatic works by I. Mikitenko and O. Korniychuk in terms of mass culture of 30s of XXth century [6; 7]. Though up till now in literature studies, there have been no special works, which would have covered the specifics of the comedy genre in Ukrainian literary process of the 20–30-ies of XX century.

Thus, the actuality of the article is caused by acute need to fill in the gaps in the study of Ukrainian comediography`s art features of "Executed Renaissance" period and also by the absence of literary critical works on the problem.

The aim of study is to analyze the specific genre of comedy in Ukrainian literary discourse of 20–30-ies of XX century.

The main material of the research. In the first two decades after the October Revolution in Petrograd (1917) in Ukrainian comediography a few age categories of writers were represented. The older generation writers – E. Krotevych, Y. Mamontov V. Tal` (Tovstonis) – mostly directed satire against bourgeois life and its remnants in their contemporary time, but ridiculing bourgeois ladies "marriageable daughters", etc. ("Sentimental devil" by E. Krotevych, "Pink web" by Y. Mammoth) did not go beyond everyday life satire.

Being in exile, Olexander Oles` also wrote "Inspector of Kamenetz" theatrical comedy for four acts, "People's Court" tragic comedy, "Bourgeois" farce – that was the reaction of the individual author's consciousness and collective perception of the characters, unreal "bourgeois" of October revolution in Russia and the coming of new most advanced party – the "cannibals" to power. Also a series of vaudevilles and grotesques ("For Muller", "The Patriot", "The next concert" and others).

Of course, not all of plays written by Oles` are perfect, not all survived, such as the "The Last patience" play on the Zaporizhs`ka Sich destruction (amateur artist, author played one of the secondary parts in it). Nevertheless poetic theater of O. Oles, highly spiced with Ukrainian humor and satire – is substantially groundbreaking phenomenon of not only Ukrainian drama.

Many comic plays of 20s were dedicated to antireligious issues. Ostap Vyshnia, the representative of the younger generation of writers severely ridiculed religious prejudices in his "grotesques" ("God's Work`s Got Confused" 1924, "Heaven`s Issues" 1924 etc.). This issue takes the significant place in the works of D. Bedzyk ("In my grandmother's arms", "Behind the scenes of the church" and so on).

Some works were dedicated to the Ukrainianization topic. Thus, in a sideshow for "Viy", "Ukrainization" play Ostap Vyshnia depicts Underyud or "Soviet madam", a

female city dweller who does not know what "villagers" are ("Though, it's not so important" – notes the head of Commission). The logic way of thinking of the madam is extremely limited. In her opinion, the Ukrainization "is held to keep all in their positions, because if the Ukrainization didn`t take place, they would have to drive everything out". The history of Ukraine and its people for that person is associated only with borshch (beetroot soup) and galushky (Ukrainian dumplings).

In the late 20-ies of XX century in Ukraine there were 74 professional theaters. The rapid development of theatrical art led to the search for unique art forms and the variety of genres.

"Molodyi Teatr" was a conspicuous phenomenon in the Ukrainian drama of the 1920s. Headed by Les Kurbas, it became the theater, which began fighting traditionalism in several directions at once; first, it was a complete upgrade of the stage repertoire, secondly, a completely new form of theatrical interpretation.

In January 1922 "Berezil" theater was established – being the only living "organism" of Kurbas` supporters and associates. There was a training studio for directors, stage-painting studio that trained Anatolyi Petrytskyi and Vadym Meller, a dramaturgic group, also the first in Ukraine theater museum was arranged, its own magazine was published.

The real "Berezil" climax was associated with the Kurbas – Kulish – Meller (director – playwright – artist) triumvirate. Performances staged by them such as "The People`s Malakhiy", "Myna Mazaylo" by Mykhola Kulish, confirmed the fact of birth the philosophical theater in Ukrainian stage, the fact of the final overcoming of the crisis, Ukrainian theatrical art`s provinciality. Kurbas` dream – to bring Ukrainian Theatre on the European level was carried out.

Kurbas was entranced by directing ideas of Craig G., G. Fucs and M. Reinkhardt, was interested in the T. Pavlikovskyi`s practice and work of the Viennese theaters of 1907-1911ss. Yet G. Craig`s thoughts appeared to be the most consonant to Kurbas` ideas. The director finds in his ideas the same primitive everyday life objection in the theater, which, in his view, distorts the essence of performing arts.

This postulate also calls denial of literary work literal adherence. G. Craig concludes that the interpretation of the play should be the director`s own achievement. This is how a cult of a new director`s vision on stage is formed – a part instead of the whole. The form in the theater is created by movement, its first principle is flexibility and mobility of design. That is what innovation of "Molodyi Theatr" consisted of –

L. Kurbas involves talented young artists – Petrytsyi A. and B. Meller to work in the theater.

L. Kurbas finds like-minded person in the figure of Mykola Kulish (1892-1937) the playwright, and theater greets him as its founder. Each satirical play by Kulish – "The People`s Malakhiy", "Myna Mazaylo" – instantly became the epicenter of literary and artistic debate, which fell into the view field of not only the author but also critics, theater. Those passionate discussions immediately gained political nature.

Extremely complex innovative play by Mykola Kulish – "The People`s Malakhiy" tragicomedy (1927) was carefully concealed over sixty years.

Every part of it, every phrase of the work was very difficult to create for the playwright. After all, everything had been revealed for the first time, starting with problematics – ruthless criticism of totalitarianism – ending with unusual compositional organization and creation of unique characters-images. Having translated from the Hebrew Malakhiy in Ukrainian means "My Herald"; in other words "Messenger of God".

Biblical Malakhiy not only mercilessly exposes those priests who went wrong, declined from faith, in fact, betrayed it, but, speaking contemporarily, predicts, foresees the glory of the second temple – the coming of the Messiah; predicts persistent and just Judgment for all faith and goodness apostates.

The author of tragicomedy claimed that he had intended to depict Malakhiy as a person who perceives form not a content of revolution, and to his mind he had succeeded to do it. What does a newly-brought to light "messiah" proposes "for a higher purpose"? Which implementation methods of his "reforms" he applies? Malakhiy promises the patients of Saburovka to fulfill all their whims. It was at this very moment when the "Ukrainian delegate" comes up with a brilliant "idea" of the “second decree"; "Attention, attention, attention... to remove immediately all portfolios and folders. And when officials will ask where they put statements and complaints, please answer: from now on all singular people`s complaints, applications and request to carry: 1) in a head; 2) in heart sacs-neither in portfolios nor in folders. "Malakhiy Smallglass sincerely believes that his “reforms”" immediately improve the man` s inner world ("the Urgence of man`s reform...").

The nature of the "reformer" is ambiguous. Complex and contradictory. Deeply philosophical. "Rooted" in ancient times (this name the thirteen of the Old Testament low prophets had). Malakhiy is eternal and at the same time clearly individualized. M. Kulish hyperbolically generalize his image using metaphors, elements of symbolism,

and above all – language`s plasticity, scintillating replicas of the characters, the organic unity of word and gesture.

In April of 1929 the world saw a new masterpiece by M. Kulish – language-masterly comedy "Myna Mazaylo". Based on skillful selecting of words, folk humor vividness play was a great success. Incomparable vision of space by Vadym Meller theatre artist organized the space in such a way that the scenery emphasized but not occupied it; the furniture served only as conventional lines on the stage. Actor in "Mina Mazaylo" play got the complete freedom of speech, procreating the actorish masterpiece (Yoseph Hirnyak as the main lead).

The plot arises very popular in the 20 years issue in Ukraine – change of surname by denationalized commoners like the protagonist of the play. Ukrainian-born Mina Mazaylo strongly opposed Ukrainianization as he hated his belonging to the “second-class” people enslaved for centuries, so that he could not get a promotion at work.

Y. Sherekh was the first who drew attention to the typological similarity of the "Myna Mazaylo" play by M. Kulish with "Le Bourgeois Gentilhomme" by Moliere. Similarly to Mr. Jourdain, Myna Mazaylo strongly seeks to enter the "higher society", hires a teacher of "correct pronunciations". All the characters of the comedy without exceptions are concerned only in mode of life that is characteristic for the philistine.

The tragedy of the epochue became its comedy. Ukrainianization, Russification, philological aspect comprised a certain helplessness of the authorities in resolving of urgent social problems, attempts of simply not noticing it. Even nowadays the "Myna Mazaylo" play by M. Kulish remains topical on this point.

Branded as nationalistic "mixed with counterrevolutionary Trotskyism", "Mina Mazaylo" and "The People`s Malachiy" plays were banned in Ukraine up to 90 years of XX century.

M. Kulish still remains unsurpassed Ukrainian comedy dramatist 20-30-ies of XX c., which, together with L. Kurbas made a revolution in the practice and theory of drama. Attaching dynamism to the plays` composition, comedy dramatist tried to reform the form, fill it with still not fully used musics, rhythm, color, associations, overtones.

The satirical comedy named "Katia`s Love or Construction Propaganda" (1928) was written by Mychailo Yalovyi (alias – Yulian Shpol, 1895–1937).

O. Ushkalov believes that the only dramatic work by Yulian Shpol thematically and stylistically reminds the language-virtuosal comedy by Mykhola Kulish called "Myna Mazaylo", published also in 1928. Firstly, in both works the primary topic is

"Ukrainization" and secondly, both authors display the issues in the absurd-comic light. The play by M. Yalovyi was weak in artistic terms, especially in comparison with the comedy by Kulish, thus it was not shown on the stage, and after collapse of "Ukrainization" there was no chance left for its stage production.

The dramatic works by Olexandr Korniychuk (1905–1972), one of the apologists of socialist realism in Ukrainian literature, need new revisions and significant correlations now. Life and creative career of the odious playwright-nominee, same as Ivan Mykytenko`s and Leonid Pervomaiskyi's, emerged from the ranks of the "Molodnyak" and VUSSP Komsomol workers` literary groups represents great interest in terms of scientific understanding of the Ukrainian Soviet-style culture – a phenomenon still being objectively studied in mass culture discourse. This Ukrainian author with his impeccable sense of theatre managed to create a reference type of socialist realism dramaturgy. It will be remembered that that plays by O. Korniychuk were not only on the main stages of Kyiv and Moscow, but also in almost all theaters of the former Soviet Union. Each play of the playwright became all-Union "hit". Korniychuk entered literature with clearly defined principles of publicness of art, which gained chimerical meaning of "partisanship"in the culture of socialist realism. There is no wonder that his first artwork was a story about Lenin "He was great" (1925).

However, the substitution of artistic and aesthetic factors by imperial demagoguery adversely affected the value of art works.

The real "professionally made kitsch" [7, p. 46] about the "Happy Ukrainian village was a comedy by O. Korniychuk named "At the steppes of Ukraine" (1940). One of the fundamental characteristics of kitsch, as known, is intertextuality, focus on the areas of plastic models, styles, genres, creating later versions, targeted at undemanding tastes of people without sufficient cultural education. Comedy and vaudeville, including comedy by O. Korniychuk called "At the steppes of Ukraine" often became such genres in the 1930s.

By bitter irony of fate the article named "A Work of Great Truth of Life" on the play by O. Korniychuk "At the steppes of Ukraine" was published in the main Moscow newspaper "Pravda" in June 22, 1941, the day of the beginning of the most tragic war for Ukraine.

Conclusions. So, under the conditions of thematic and also stylistic literary practice unification the choice of life-based material for artistic implementation for writers was small. However, in literary discourse of 20–30s of XX century humorous-satirical work of Ukrainian writers was a unique phenomenon, which expanded the theme and genre range of national literature. In general, the genre modifications

palette of comedy of 20-30-ies of XX century was quite varied: language and virtuoso comedy ("Myna Mazaylo" by M. Kulish), tragicomedy ("The People`s Malachiy" by M. Kulish), satirical comedy ("Katya`s Love or Construction Propaganda" by Y. Shpol, "Republic on Wheels" by I. Mamontov, "Flute Solo", "Days of Youth", "Girls of Our Country" by I. Mikitenko) kitsch ("At the steppes of Ukraine" by O. Korniychuk) and others.

The Modern epochue comprehend time and space in the genre of comedy in a special way. Deformed reality mythologized consciousness, the idea of the world as crazy house, thinking by categories of absurd, theatricality of life, violation of ethical and aesthetic principles that seemed inviolable, and carnivalization as one of the action-creating means – are the main features of the genre of modern Ukrainian comedy of 20–30-ies of XX century.

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The Concept 'Sadness' and Its Metaphorical Models in the 21st Century American Fiction

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Abstract: The article identifies metaphorical expressions underlying conceptualization of the negative emotive concept "sadness" in modern American English. The verbal means of metaphoric realization of the concept "sadness" are viewed from the metaphor theory proposed by G. Lakoff and M. Johnson, in terms of which thematically related schemes of metaphorical projection form the so-called "metaphor models". The analysis revealed twelve metaphorical images, which are associated with the concept "sadness" in American prose literature. In this research they are considered as figurative constituents within the structure of the negative emotive concept "sadness" in modern American language.

Keywords: negative basic emotive concept, conceptual metaphor, metaphor model.

Introduction

Emotions express our attitude towards the environment and they are our reactions to different events or situations in the real world. Therefore, negative or positive character of an emotion depends on our capability to meet our demands and reach our goals. For instance, negative emotions (e.g. sadness, anger, fear) give impetus to some action referring to avoid harmful influence; they are associated with frustration of human wants [25, 197; 8, 10].

In contemporary science sadness is usually classified in psychology and linguistics as follows: 1) a basic emotion [18, 146; 10, 105] and a negative emotion [25, 197; 2, 114]; 2) a basic emotive concept [21, 186].

In psychology the phrase "basic characteristics of an emotion" is used to talk about the universal communication signals of a certain emotion (for instance frown, which stands for the emotion of sadness or tremor indicating fear) [2, 103; 19, 77; 1, 26]. While on the subject, sadness has a low level of intensity and is considered to be a long-lasting feeling [2, 84; 9, 507].

Cognitive linguistics points out two fundamental criteria when specifying basic emotive concepts: 1) they are intuitively correlated to the notions of emotions; 2) key verbal representations of the basic emotions are morphologically primitive words [13, 140]. Although mimic and pantomimic signs of all basic emotions are universal, some languages have few words which denote sadness (e.g. the word “song” in the language of Ifalik means “sadness” or “anger” depending on the context of its use) [27, 211]. Moreover, there are languages with no naming unit for “sadness” (specifically, Tahitian language has various types of anger verbalized by 46 words, but there exists no specific word for “sadness” or “anger” in this language) [12, 219].

Basic emotive concepts denote abstract notions and that’s why they are not always easily identified in a language. The conceptual domain “human emotions” involves plenty of concepts from different domains and, thus, draws in lots of conceptual metaphors (and metonymies) in multi languages [7, 94-104]. These metaphors can be considered as guides of outgoing notions, which lead us through the domain of emotive concepts [13, 139-140].

Cognitive linguistics defines metaphor as “the phenomenon where one conceptual domain is systematically structured in terms of another” [3, 38]. Thus, metaphorization is based on the interplay between two cognitive structures – a source domain or “significative descriptor” (more concrete, easily defined knowledge of the world, gained by experience; metaphorical expression is drawn from this concept area) and a target domain or “denotative descriptor” (the concept area with specified abstract notion, to which the metaphor is applied) [23, 9-12; 5, 26]. Thematic fields of significative descriptors form the so-called “metaphor models” [23, 12]. For example, the metaphor model *Emotion is a Substance* has such lexical realizations in English as: *be filled with love/pride/rage*, *react to things with astonishment/anger/enthusiasm*, *fall in love* [5, 29].

The aim of this research is (1) to define the metaphoric images, which underlie the conceptualization of the negative basic emotive concept “sadness” in the 21st century American prose literature, and, consequently, (2) to figure out the metaphoric models of “sadness” representation in contemporary American discourse.

Means and methods

The data are retrieved from the novels by the New York Times bestselling authors at the beginning of the 21st century (D. Brown, J. Gregory, J. T. Hawks, S. King, J. Patterson).

Methods of investigation are specified by text-centric approach to linguistic analysis of language units and include, in particular, *contextual analysis*, used (a) to reveal the semantics of emotive lexicon meaning “sadness”, (b) to classify these emotive words and expressions into subgroups according to deferential characteristics, (c) to single out sub-concepts of the macro-concept “sadness”; *analysis of lexical co-occurrence*, applied to single out metaphoric collocations verbalizing the concept “sadness”; *descriptive method* implemented to summarize the main points of the thesis. With the help of the *field methods* the figurative constituent of the concept “sadness” in modern American prose literature was introduced.

The text-centric approach is relevant to linguo-cultural analysis of the emotive concept “sadness” hence it enables the essence specification of a concept reconciling figurative perceptions of a certain phenomenon by fiction writers [15, 32].

The metaphoric approach to emotion description aims at drawing parallel between the emotion and other concepts with similar characteristics. And due to the above mentioned emotions should be described in terms of conceptual metaphors. According to Z. Kövesces, *Emotion* is among the most common target domains [6, 46]. It is considered to be a basic domain [3, 233-234]. The source domains in the process of metaphorization of emotions usually include orientational or spatial concepts, such as: *Up/Down* and *In/Out* [5, 31; 23, 35], *Container* [11, 337; 4, 110], *Journey* [3, 280; 11, 338], etc.

Results and discussion

In this thesis “sadness” is defined as a negative basic emotive concept (further acronym NBEC) in view of the most common concept definitions in linguistics [20, 76; 26, 50] and emotive concept definitions in emotiology (linguistics of emotions) [17, 14; 21, 49]. Being a culturally induced formation the NBEC “sadness” keeps the record of all individual negative experiences of this emotion (separation from a significant other, blow to hopes, non-fulfillment of expectations) and also universal, socio-cultural perceptions of sadness, which are realized by nominative units of American English. In these terms nominative units (lexical and phraseological) represent notions of the objects relative to their names in a language as the result of verbal and cognitive activity of a human being [22, 7]. Hence, nomination of sadness by the language unit means that there exists a specific verbal naming unit, which is always on your mind and is used cut and dried in the process of language expression.

The classification of the emotive lexicon denoting “sadness”, featured in the thesis, is based on two fundamental principles of linguistics of emotions. First, the means of verbalization of emotive concepts include three major: nomination, description and expression [21, 90; 29, 18]. Second, due to “explicit and implicit characteristics” of a literary text they divide the emotive lexicon into two groups: (a) lexical and phraseological units with direct nomination of emotions, and (b) language units, which just refer to the emotions meant without naming them directly, thus, dealing with interpretation of these emotions in terms of background knowledge of a reader and context of a literary text [29, 6]. So then, we suggest categorizing the emotive lexicon used to realize the NBEC “sadness” in American prose literature into four groups: 1) nominations of the emotional state of sadness; 2) nominations of reasons of sadness; 3) nominations of non-verbal reactions and 4) nominations of verbal reactions in the emotional state of sadness. The last ones fulfill communicative functions in speech and express the emotion of sadness experienced by a character in the moment of speaking. These verbal realizations might include the interjection *Oh* and other exclamations as: *Oh, God! Oh, no! It cannot be!* etc. For example: *‘Oh, Scott.’ I shook my head as I slapped the file closed and opened another* [36, 129]; *‘Oh, God. His poor mom and sister… they were so close. They’re going to be… I don’t think I could tell them. No, I... Could you?’* [36, 96].

Regarding the structures or scene-frames of semantic knowledge relating to emotive concepts having been introduced so far in emotiology (see [21, 60; 16, 16-17; 14, 343; 13, 142]), we take as a basis the field organization of a concept modeled by Z. Popova and I. A. Sternin [28, 106-115]. Thus, in this research the field-model of the concept “sadness” comprises three constituents: image component (including perceptual and metaphoric images), informative zone (essential features of a notion) and interpretative layer (socio-cultural evaluations). So then, the verbal reactions in the emotional state of sadness form the interpretative conceptual layer within the structure of the NBEC “sadness”. On the one hand, these language units verbalize spontaneous emotional reaction of a human being to some kind of loss (real or unreal, physical or psychological), on the other, they may express condolences for some tragic events.

The nominations of the emotional state of sadness and the nominations of the reasons of sadness are realized by lexical units with explicit expression of this emotion. They assert directly either the relevant feeling of the emotion (the nominations of the emotional state of sadness) or the reasons for its experience (the nominations of the

reasons of sadness). The above-noted groups of units form the informative zone in the structure of the concept of "sadness". Among the most commonly used nominations of the emotional state of sadness in the 21st century American fiction are: nouns *pain* (31), *grief* (16), *sadness* (10), the adjective *sad* (30) and its derivative – the adverb *sadly* (19). For example: *I turned away from the pain in Trahan's bloodshot eyes. He looked as if he'd lost a best friend more than a co-worker* [36, 102]; *Rabbi Tzvi Goldstein's widow was a delicate, fawnlike woman who'd collapsed into herself in grief* [33, 137]; *"What is it? You look sad."* [33, 212]; *"I can't, Maggie. You know that," he said sadly* [37, 199]. The most frequent nominations of the reasons of sadness in prose literature include the adjective *painful* (26), the verb *to hurt* (11) and the adjective *sad* (9). The reasons that cause the feeling of sadness, expressed by the above mentioned words, rely on the context and may vary as follows: (a) the corruption of somebody's dear creation, e.g. *Almost equally painful was that her father's creation had been corrupted – now a tool of terrorists* [36, 278]; (b) separation from a beloved one, e.g. *He had told Maggie to use the Molly B as often as she wanted, and she thanked him, but said it would make her sad to be on board without him, which touched him* [37, 175]; (c) emotionless voice tone about the death of a closed one, e.g. *Your father has been murdered… Kohler's emotionless tone hurting as much as the news* [30, 82], etc. Unlike other nominations, the word *sadness* was determined as the keyword representing the concept "sadness" in American English according to such characteristics as: dominant frequency use of the direct meaning of the word, minimal dependence on the context, and precise part of speech identification (hence the name of every concept is the noun, expressing general notion [24, 258-259]). For example: *Her voice took on a tone of sadness* [32, 424]; *He felt an inexplicable pain in his soul… an aching sadness he could not explain* [31, 568] *…Vicki felt a deep sadness…* [34, 266].

The process of naming the emotional state of sadness and the reasons of sadness at the lexical level is carried out usually in modern American novels by means of adjectives (43,18% of the total number of lexemes denoting "sadness"), referring to predominance of qualitative characteristics of sadness.

The analysis of the data under investigation showed that the process of metaphoric verbalization of the NBEC "sadness" in modern American fiction is realized by means of twelve metaphor models (further M-models). Each M-model has the following integrated structure "SADNESS IS SMB/SMTH", where the target concept

area SADNESS comprises interrelated subconcepts GRIEF (including PAIN, HURT, SORROW) and DESPAIR (including DISAPPOINTMENT, APATHY). The basis for the acquisition of the latter ones made relevant criteria in psychology (intensity of feeling, duration of the emotion, causes of its manifestation, and etc.), according to which several gradations or types of the emotion sadness are singled out [12, 397].

In our research metaphorical realizations of the NBEC "sadness" form the part of its periphery in the so-called "core-periphery model of a concept" [28, 165].

M-model 1 SADNESS/APATHY IS LIQUID SUBSTANCE (15% of the total number of metaphoric expressions under investigation) denotes the feeling of being sad because of hopelessness, which fills a person like a vessel. This conceptual model has the following lexical realizations in the novels by S. King and D. Brown: *to fill smb with sadness* [35, 399]; *the apathy evaporated* [30, 583].

M-Model 2 SADNESS IS BURDEN (7%) refers to emotion of sadness as a kind of longtime load for a human being, e.g. *the sadness had burdened smb for long* [33, 118].

M-model 3 DESPAIR/and HURT IS AGENT (15%) indicates the ability of extreme sadness, when there is no hope (despair) or feeling of pain because of missing someone (hurt) to act all alone (to overtake, to etch). For example, in the language of J. Patterson we come across such word-groups as: *the despair overtook smb* [36, 349]; *raw hurt etched smb's face* [36, 122].

M-model 4 GRIEF IS SWAMP (7%) means that the deep emotion sadness will absorb you if you let it. This model can be represented by the following expression from the novel "The Book of Names" by J. Gregory: *grief swamped smb* [33, 339].

Another M-model 5 GRIEF IS AURA (7%) symbolizes radiant energy that comes from a person, who experiences very great sadness in the novel by J.T. Hawks "The Dark River", e.g. *to feel the aura of grief* [34, 64].

M-model 6 GRIEF IS BLACK PIT (7%) shows that the strong emotion of sadness seems to have no limits, and anyone can get sucked into it for several times. For example: *to get sucked into the black pit of grief again* [33, 18].

M-model 7 GRIEF IS STRAFE (7%) signifies that intense sadness can attack someone with gunfire. See the example from D. Brown's novel "Angels and Demons": *the grief strafed smb's heart* [30, 112].

M-model 8 PAIN IS FLASH (7%) represents sadness as an emotional suffering. Pain appears suddenly on person's face and is expressed briefly. It is verbalized by the word combination *a flash of pain passed across smb's face* [34, 220].

M-model 9 PAIN IS POOL (7%) defines sadness as unpleasant emotional experience. It is accumulated like standing clear water in someone's eyes, e.g. *smb's eyes are clear pools of pain* [33, 122].

M-model 10 PAIN IS GRINDER (7%) denotes the acute sadness moving slowly through your heart with great discomfort. For example: *the pain grinding through smb's chest* [33, 213].

M-model 11 SORROW IS WAVE (7%) symbolizes almost unbearable sadness moving rapidly up and down a human body. This metaphoric meaning is expressed by the word combination *to feel a wave of sorrow* [33, 140].

M-model 12 DISSAPOINTMENT IS STAB (7%) indicates the feeling of sadness injuring someone like a pointed weapon when things are going wrong, e.g. *disappointment stabbed through smb* [33, 212].

Percentage ration of the above mentioned M-models showed that M-models SADNESS/APATHY IS LIQUID SUBSTANCE and DESPAIR/HURT IS AGENT are more often applied to the concept "sadness" in contemporary American fiction.

Conclusions

The carried out analysis leads to the conclusion that the modern American authors associate the NBEC "sadness" with twelve metaphoric images (liquid substance, burden, agent, swamp, aura, black pit, strafe, flash, pool, grinder, wave, stab). These figurative constituents form the source domain SMTH/SMB (mainly SMTH) in the structure of the integrated metaphor model SADNESS (specifically GRIEF) IS SMTH/SMB. The most frequent metaphoric images associated with the concept "sadness" in the 21st century American fiction are LIQUID SUBSTANCE and AGENT when the emotion of sadness is interpreted in terms of both nonliving and living matter.

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Ecological Audit – a Method of Training of Students-Ecologists

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Abstract: The article devotes to training of students the ecological audite. The modern practice conducting of audite on enter prices: some aspects of history and perspectives of ecological audite development are considered. Also, in the article the ecological problems of nature use, control by ecological audite are considered. By that the problem spheres of ecological audite are separated the aim, task and essence of ecological audite are described.

Keywords: nature management, environmental problems, environmental audit, the impact on the environment.

Статья посвящена актуальному для студентов экологических и экономических специальностей вопросу — обучению экологическому аудиту. Экологический аудит в мировом сообществе появился в 1970-80-х годах. Директива об экологическом аудите была принята в ЕЭС в 1982 году, а в 1984 году национальное агентство по охране окружающей среды США разработало концепцию экологического аудита федеральных агентств. В 1994 году в Азербайджанской Республике был принят закон «Об аудиторских услугах». Определение экологического аудита дано в законе Азербайджанской Республики в 1996 г «Об охране окружающей среды». Экологический аудит — независимая оценка соблюдения субъектом хозяйственной и иной деятельности нормативно-правовых требований в области охраны окружающей среды и подготовка рекомендаций в области экологической деятельности [1]. Экологический аудит относится к числу относительно новых областей науки об окружающей среде. Предмет «Экологический аудит» является одним из прикладных в науке экологии и природопользования. Экологический аудит, был использован в 70-е годы в экономически развитых государствах для защиты интересов бизнеса, а также был направлен на снижение уровня риска для окружающей среды и здоровья населения. Уже в середине

80-х годов 20-го века Международная торговая палата начала считать экологический аудит как метод внутреннего организационного управления с целью повышения контроля за работой производства и выполнением норм экологического права. Быстрое внедрение экологического аудита обусловлено следующими двумя причинами:

1) разработка мер, способных улучшить экологические показатели и повысить конкурентную способность продукции;

2) повышение штрафов за нарушение соблюдений норм и законов в области охраны окружающей среды.

Цели и задачи экологического аудита [2]:

- На основании известных экологических факторов правильно распределить материальные затраты предприятия.

- Предпринять меры по уменьшению расходов связанных нецелесообразным расходованием природных ресурсов и загрязнением окружающей среды.
- Связь и полное взаимопонимание с местным населением и представителями экологического надзора.

- Приоритет при получении скидок, дотаций для организаций инвестирующих в охрану природы.

- Получение международных стандартов управления по вопросам экологии, экономики и экологической безопасности.

Экологический аудит подразделяется на обязательный и инициативный.

Выделяют четыре вида аудита [3]**:**

- внутренний аудит;
- внешний аудит;
- комбинированный;
- совместный.

Обязательный экологический аудит осуществляется:

- При установления соответствия деятельности хозяйственного общества природоохранным предписаниям.
- Анализ эффективности системы экологического менеджмента.
- Результат оценки экологической безопасности сырья, оборудования, технологий.
- Вывод размеров экономического ущерба от загрязнения.
- Оценка опасности отходов.

- Определение рациональности природопользования на конкретной территории.
- Анализ энергопотребления и мер по его снижению.
- Заключение анализа объема выбросов вредных газов и возможные мероприятия для их снижения.
- Анализ экологического риска в результате техногенных аварий и стихийных природных явлений.
- Выявление экологических проблем и разработка мероприятий по их решению.
- Аргументация принимаемых нормативных актов по экологической безопасности.

Целью экологического аудита является: помощь хозяйственным обществам в выборе направления экологической политики, усовершенствование предупредительных мер для экологических требований, а также формирование механизма рационального использования природных ресурсов и обеспечения устойчивого развития. Курс «Экологический аудит» изучает закономерности развития экологического аудита в сфере охраны окружающей среды. Специальный курс «Экологический аудит» углубляет знания о процедурах экологического аудита; изучает степень воздействия на окружающую среду, дает понятия о экологической экспертизе на производственные проекты; раскрывает сущность экологического менеджмента в сфере охраны окружающей среды, одним из основных элементов которого является экологический аудит. Также спецкурс «Экологический аудит» дает практические навыки при изучении уменьшения негативного воздействия производства на окружающую среду и рационального использования природных ресурсов, при разработке экологической политики предприятия. Приобретение студентами теоретических знаний и практических навыков, необходимы будущим специалистам -экологам для принятия экологически и экономически обоснованных решений: при проведении исследований, связанных с разработкой и внедрением ресурсосберегающих мероприятий, специфики воздействия предприятий на состояние окружающей среды. Экологический аудит начинать надо, прежде всего на проблемных с точки зрения экологии предприятиях. Для выхода продукции предприятия на международный рынок с необходимо соблюдение экологических норм, сформулированные Международной организацией стандартов (International Standart Organisation) в серии ISO-14000.

Следование стандартам является добровольным, а соблюдение природоохранного законодательства – обязательным. В соответствии с таким пониманием назначения спецкурса его задачи можно сформулировать следующим образом:

1. Формирование у студентов теоретических знаний и практических навыков в области экологического аудита.

2. Для применения экологического аудита в управлении природопользованием и обеспечении устойчивого развития необходимо изучение закономерностей, методов, приемов, порядка и процедуры.

3. Методические основы воздействия на окружающую среду, выявление особенностей и видов взаимодействия в системе «отраслевые хозяйственные общества – окружающая среда».

4. Развитие и изучение основных направлений государственной экологической политики.

5. Хозяйственная или иная деятельность должна отвечать экологическим требованиям.

6. Анализ причин возникновения и путей решения экологических проблем образующихся при функционирования различных отраслей промышленности.

7. Экологический менеджмент и аудит, основные этапы проведения программ экологического аудита, основные функции и задачи.

8. Приобретение студентами навыков работы с практическим материалом, статистическими данными, умение их анализировать с точки зрения экологических последствий деятельности предприятий.

9. Применение методов экологического аудита с соблюдением нормативно-правовой базы для принятия экологически и экономически обоснованных решений.

Учебный курс «Экологический аудит» опирается на следующие дисциплины:

- Экологическое право
- Экономика природопользования
- Общая экология

Чтобы понять и освоить методы аудита, необходимо владеть знанием по следующим вопросам:

− Экологические аспекты деятельности предприятия.

− Управление экологическими аспектами на предприятии.

− Экологические требования по всем экологическим аспектам.

Для того чтобы студенты могли посмотреть на деятельность предприятия глазами аудитора, необходимо было вооружить их знаниями по управлению экологическими аспектами деятельности предприятия.

Весь учебный курс состоит из трёх разделов. Первый – теоретический материал о содержании, сущности и нормативно-правовой базе этого инструмента; третий – практические действия при планировании и проведении экологического аудита на предприятии. Именно эти два раздела обычно преподаётся специалистам. Для студентов второй раздел полностью посвящен характеристике важнейших факторов воздействия предприятия на окружающую среду (выбросы, сбросы и загрязнение вод, обращение с отходами производства и потребления) и организация на предприятии системы контроля и регулирования этих факторов.

Только после детального разбора всех факторов воздействия предприятия на окружающую среду, установления всех нормативных требований для этих факторов, знакомства с методами производственного экологического контроля можно приступать к обучению методам получения свидетельств аудита. Важно обратить внимание студентов не только на декларируемое предприятием воздействие на окружающую среду, а также на воздействие неорганизованное, залповое, аварийное, несанкционированное.

Виды воздействий на окружающую среду деятельности промышленности - эту задачу решают сведением в систему разрозненные представления студентов о факторах воздействия предприятия на среду обитания. Необходимо как следует понять смысл «экологический аспект», поскольку он является ключевым в стандарте ИСО 14001 [4].

Экологический аспект **-** это элемент деятельности предприятия, его продукции и услуг, который может взаимодействовать с окружающей средой.

Учебный материал подводит к тому, что при подготовке и проведении аудита необходимо рассмотреть все категории экологических аспектов:

1. Сырьевые материалы
2. Вспомогательные материалы
3. Продукция (количество по каждому типу полученной продукции)
4. Топливо (все виды топлива и масел)

5. Электричество (общий объём, количество электроэнергии)

6. Вода (потребление, наличие)

7. Выбросы в атмосферу (состав и объёмы выбросов, количество выводящих труб, оборудование для очистки выбросов)

8. Сточные воды (все точки отведения сточных вод, их состав и объём, наличие и состав очистных сооружений)

9. Отходы (регистрируются отдельно все существующие отходы производства и потребления, указываются имеющиеся на предприятии места хранения отходов, описание методов утилизации и процедур отбора проб)

10. Запахи (регистрируются все запахи, образующиеся в результате работы предприятия)

11. Шум (наиболее значительные источники шума с указанием оборудования, от которого исходит шум)

12. Вибрация

13. Риски (все основные риски нанесения ущерба окружающей среде в результате аварий)

14. Сбои в работе предприятия (возможные сбои в работе предприятия, вид загрязняющих веществ и их объём).

При проведении аудита необходимо проследить весь процесс от склада сырья до тех точек, где готовая продукция, отходы, сбросы, выбросы покидают производственную зону. Важно собрать информацию о количествах используемых ресурсов, образующихся отходах, сбросах и выбросах. Эти данные должны быть соотнесены с объёмами производства, например, потребление электроэнергии на единицу производимой продукции. Материальный баланс масс даёт картину источников и причин образования отходов, выбросов, сбросов, которая необходима для выработки альтернатив малоотходного производства.

В настоящее время контроль и управление природопользованием осуществляется главным образом на основании декларируемого предприятиями и организациями воздействия на окружающую среду (сбросы, выбросы, размещение отходов, использование ресурсов и готовой продукции). Вместе с тем, доля предполагаемого воздействия на окружающую среду в его общем фактическом объеме не превышает 15-20%, что является одной из основных причин чрезвычайно низкой эффективности экологического контроля и управления в стране. В

общем объеме практически не учитывается неорганизованное воздействие, залповое, аварийное и так называемое "ночное" (осуществляемое с сознательным нарушением законодательства) воздействие, несанкционированное размещение и захоронение отходов и др. Следовательно, при проведении аудита необходимо обращать внимание на указанные экологические аспекты не только при работе предприятия в оптимальном режиме, но учитывать прочие ситуации отклонения от нормы, которые характеризуются наибольшими размерами воздействия. Происходит закрепление теоретического материала, знакомство с предприятием, используемыми технологиями, анализ взаимодействия промышленного объекта с окружающей средой. В процессе докладов студенты фиксируют свои упущения, замечают ошибки и неточности у докладчиков отряда, разбиравшего аналогичную ситуацию. Это очень важно для усвоения учебного материала. Результаты освоения дисциплины «Экологический аудит» используются при подготовке дипломных работ и при обучении для получения дополнительной квалификации «Аудитор в области экологии».

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Experience of Non-Traditional Training Method by Lessons, Devoted to Problem of Nuclear Wastes

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Abstract: In given article the experience by conducting lessons for students with use of self-study method of brain assault, devoted to problem of nuclear wastes. The recommended questions for independent study of students and questions asked by teacher by given theme, also the rules conducting of brain assault are offered. The lacks and positive sides of the brain assault lesson by problem of nuclear wastes are revealed.

***Keywords*:** method of brain assault, nuclear wastes, discussion, students of high school, uranium, plutonium.

Для преподавателя выбор метода проведения каждого учебного занятия - вопрос актуальный, а порой и сложный. Главное чтобы занятие было интересным, эффективным. Однако, как это сделать? Лекция - традиционный метод обучения (а их специалисты насчитывают до 50) - до сих пор считается необходимым и эффективным методом обучения [1], но она же может быть скучной. Впрочем, у каждого метода обучения есть свои плюсы и минусы.

В данной статье представлен опыт проведения занятия со студентами в Азербайджанском Государственном Университете Нефти и Промышленности, с использованием метода «мозговой шторм» по дисциплине «Современные проблемы инженерной экологии». Данный метод был использован в теме «Экологические проблемы ядерной энергетики» на групповом занятии, посвященном проблеме радиоактивных отходов.

Радиоактивные отходы – это ядерные материалы и радиоактивные вещества, для которых не найдено применения и есть необходимость от них избавиться. Однако, если на сегодняшний день им не найдено применения – это не значит, что будущее поколение захотят от них избавиться. Эта проблема остаётся на сегодняшний день одной из нерешённых проблем человечества. И многие страны просто ожидают каких-то прорывных идей и технологий. Ежегодно во

всём мире в результате производства образуется примерно 200000 кубометров малоактивных и промежуточных радиоактивных отходов и 10000 кубометров высокоактивных отходов.

На сегодняшний день идёт процесс естественного торможения, т.е. пока, например, не найдено эффективного применения плутонию – ценнейший продукт, который человечество получило. В настоящее время вся энергетика работает по принципу – защита глубиной иными словами барьерная защита. Однако уже сегодня надо задуматься и найти ему применение. Хранение плутония предусматривает аспекты повышения безопасности потому что при хранении плутоний распадается. Учитывая, что плутоний можно назвать «золотым запасом» - это с экономической точки зрения неэффективно.

Радиоактивные отходы образуются при эксплуатации и снятии с эксплуатации предприятий ядерного топливного цикла, в процессе реализации военных программ по созданию или ликвидации ядерного оружия, при эксплуатации и снятии с эксплуатации кораблей военно-морского и гражданского флотов с ядерными энергетическими установками, при использовании изотопной продукции в народном хозяйстве и медицинских учреждениях, в результате проведения ядерных взрывов в интересах народного хозяйства, при выполнении космических программ, а также при авариях на атомных объектах. Особенно острой проблема утилизации и захоронения атомных отходов становится в настоящее время, когда демонтируются большинство атомных электростанций в мире. По данным МАГАТЭ это более 65 реакторов атомных электростанций и 250 реакторов, использующихся в научных целях. По официальной оценке воздействия на окружающую среду сегодня прокладываются траншеи в земле, выложенные глиной и геотекстилём и туда закладываются радиоактивные отходы. Однако, такой подход опасен – есть вероятность попадания радионуклидов в окружающую среду.

Для нашей страны эта проблема также актуальная. Нефтяные предприятия служат главными источниками радиоактивных отходов на Апшероне. Наибольший радиоактивный фон наблюдается в зонах «Бибиэйбатнефть» и «Сураханынефть», а также вблизи йодового завода в посёлке Рамана и Ени Сураханы [2]. В мае 2014 года президент Азербайджана Ильхам Алиев подписал распоряжение о создании закрытого акционерного общества «Национальный центр ядерных исследований» при министерстве связи и высоких технологий [3].

В рамках проекта предусматривается строительство ядерных реакторов. Из всего вышеизложенного выявляется актуальность обсуждения данного вопроса.

Мозговой штурм – это обсуждение самых актуальных вопросов, где во главе смыслы, в приоритетах – умные головы, а в перспективах - реально работающие стратегии, где объединяются для того чтобы двинуться по пути модернизации.

Рекомендуемая схема «мозгового штурма» следующая: создание групп (модератор, секретарь, генераторы и аналитики), ознакомление с проблемой, генерирование идей (вариантов решения проблемы), анализ идей, рефлексия (анализ деятельности группы). Проблему может сформулировать преподаватель – он же ведущий или модератор. Очень важно обсуждение проблемы проводить в комфортной и непринужденной обстановке. На время обсуждения следует отключать сотовые телефоны. Оптимальный состав группы для мозгового штурма – 5–8 человек. Предпочтительно включить в группу людей с разными интересами и качествами (активисты и неактивные студенты). Секретарь записывает идеи участников, генераторы идей (подающие иными словами выдвигающие идеи по поставленной проблеме идеи) и критики-аналитики, которые должны уметь донести критику идеи, не обидев при этом ее автора.

Правила проведения «мозгового штурма»:

- максимальное число идей (предпочтение количеству, а не качеству идей),
- во время генерации идей запрещена критика, замечания, реплики, спор,
- анализ идей (критиковать надо идею, а не человека).
- оказывать предпочтение безграничной фантазии в самых разных направлениях.

Самое важное в мозговом штурме – поиск нового, а не конкретное решение. При выборе оптимального решения следует руководствоваться следующими критериями: экономичность и экологичность.

Перед каждой командой экспертов ставилась одна цель – необходимо было по учебной литературе самостоятельно изучить следующие вопросы [4]:

- Понятие радиоактивных отходов
- Источники появления отходов
- Классификация отходов

- Обращение с радиоактивными отходами (средне- и высокоактивными)
- Основные стадии обращения с радиоактивными отходами
- Хранение отходов
- Геологическое захоронение
- Трансмутация

Вопросы, задаваемые модератором, по заданной теме:

- Какими методами проводится экологический мониторинг в этой области?
- Как часто проводится такой мониторинг?
- Что можно сказать о радиоактивной обстановке в Азербайджане?
- Можно ли плутоний, считаемый радиоактивным отходом, назвать золотым запасом и найдется ли ему применение?
- Каковы могут быть технологии по хранению высокоактивных отходов, которые составляют 5% от всего количества получаемых отходов?
- Каковы тенденции развития атомных станций во всем мире?
- Конструируются ли сегодня ректоры для безопасной эксплуатации в рамках инновационного прорыва?

По мнению студентов, которые заранее изучили рекомендуемую литературу, ознакомились с патентами в этой области - избавиться от ядерных «могильников» можно только если замкнуть топливный цикл и ускорить нейтроны, которые специально замедляют с помощью воды. Инновацией в этой области может быть отказ от уран-графитовых реакторов или реакторов на тяжёлой воде, которые работают на уране - 235 (его запасы истощены) и создание реактора на быстрых нейтронах, который будет работать на уране 238 (его запасы рассчитаны на 3000 лет). Уран и плутоний «будут крутиться» десятилетиями, а остатки деления – цезий, йод, стронций, технеций можно не хранить, а хоронить, распадаются они быстро и контроля требуют не на сотни, а лишь на десятки лет. Эта перспектива дорогая, но выгодная как с экологической, так и с экономической точки зрения.

Что понравилось?

- учащиеся были активны весь урок,
- участники были замотивированы на защиту своей позиции, поэтому подготовка аргументации была неформальна,

- во время дискуссии при защитах ресурсов активность проявляли даже те студенты, которые на обычных занятиях молчат,
- активная дискуссия вызывала у большинства студентов интерес.

Какие выявились недостатки?

- работа коллективная, поэтому не каждый студент проявляет желаемую активность,
- слабый учащийся просто может «закомплексовать».

Несмотря на указанные недостатки, «мозговой штурм» по проблеме радиоактивных отходов оказался вполне приемлемым методом экологического обучения.

Внедряя новейшие технологии, которые существуют в мире и которые смогут решить уже существующие проблемы, при хорошем финансировании, с помощью коллективного обсуждения студентов (будущих в этом направлении специалистов) решение этого вопроса будет лучшим. Но для этого надо вначале определиться: что мы храним – опасные для планеты вещества или золотой плутониевый запас, что перевешивает – риск загрязнения или надежда на будущие технологии. Правильным будет тот ответ, который поддерживает наше будущее – студенты.

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A Philosophical View on Borders of Personality

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Abstract: This paper is concerned with assessing the problem of borders of a personality. Along with the physical and spiritual borders of a personality the authors suggest to consider the social ones. To substantiate this issue attention has been focused on the mechanisms of intruding into the privacy of a personality. The authors suggest that the forms of intrusion depend largely on a personality's space intruded – physical, spiritual, or social. In this connection, the authors suggest that it is absolutely indispensable to take into account the borders of a personality while building up the relations with it.

Keywords*:* personality, philosophy of personality, borders of personality, space, intrusion into personality's space.

Introduction

Today much attention is being paid to problems of personality in scholarly literature. The problem of "borders of a personality" has been particularly often examined lately [1, p. 140]. Indeed, a human does not merely exist in the world. He occupies a space of his own. And it is important to determine what kind of space it is, what exactly it looks like, and what should be done to avoid intrusion into the realm of a personality breaking its borders. These issues do not only update the problem but also stress its practical significance.

At the same time, the aforesaid permits us to clarify the aims and objectives of this paper – to regard the problem of the borders of a personality from the standpoint of philosophy. To achieve these aims, the following tasks are to be performed – to consider the peculiarity of the problem, to uncover the mechanism of intrusion into the borders of a personality, to demonstrate the practical significance of the problem.

Territories of a personality

In today's Russian literature the problem of the borders of a personality has been mostly researched by V. Moskalenko [1, p.140-147]. She distinguishes two variable territories of personality – "physical territory" and "spiritual territory" [1, p. 140]. Physical territory, in its turn, consists of two things – the place the human body itself occupies in an amount of space as well as "some additional amount of space surrounding it"[1, p. 140], where a human feels comfortable. "The spiritual territory… is not as strictly bordered as the physical one but nevertheless it does exist. The borders of the soul territory are invisible; however, if someone trespasses them without our permission we experience a sort of discomfort as if someone has stepped on our foot" [1, p. 140].

Such an approach seems quite agreeable – evidently, a body of every human occupies a certain amount of space. And in the process of a human's growing up this space is also increasing. Sometimes the size of the body is so large that it can even provoke a scandal. Thus, in March 2017 some Russian TV channels commented shortly on a conflict situation on board an airliner with a volleyball player who was over seven feet (216 cm) tall. Since there was not enough room for his legs between the seats he had to remove them to the aisle; but a female flight attendant did not like that. As a result, a conflict arose which could have certainly been avoided if people had paid immediate attention to the different territory the player occupied as a personality.

A human may be characterized, further, not only by his own physical territory but also by a spiritual one. Although it is not perceptible by eyesight, it undoubtedly exists. It is the spiritual world of a human that includes values, ideals, concepts, etc.

Interesting judgments about the issue have been made by John of Kronstadt canonized by the Russian Church for his holy life: "The clearer is the heart, the vaster it is, and the more beloved creatures it encompasses" [2, p. 60]. It is well known that the heart is considered to be the center of a human's spiritual world (interesting enough, in some cultures and languages this "role" of the heart is linked with other organs e.g. liver (in some African tribes), abdomen (in some Indian tribes in Latin America). The "vaster" it is, the broader a human's spiritual territory is, and the more saturated his spiritual life is. It is no accident, therefore, that John of Kronstadt made an emotional appeal: "Keep on clearing your hearts during your lifetime" [2, p. 335]. Only in this way can one create conditions for a really spiritual life filled with good

thoughts, words, and actions. Obviously, in this case a human's "opportunities or chances" [3, p. 1150] for a virtuous life increase greatly.

Philosophers researching the issue of personality agree with these views, although they are convinced that some notions should be made more explicit. Particularly, it is to be stressed that both physical and spiritual territories are not completely independent of one another. Thus, when we embrace a friend we intrude into his physical territory but at the same time we enlarge our – and, consequently, his own – spiritual territory since we demonstrate our sympathetic and emphatic attitude which is much more valuable than just common ordinary links between two people.

At the same time, it should be kept in mind that a human is a threefold unit: a bio-, socio-, and spiritual creature [4]. Hence, the social territory of a human should also be carefully dealt with. It is closely connected with the social position of a human, and with his status. The higher is the status of a human, the wider is his social territory. It can be illustrated, best of all, by a visit to the office of one's old business acquaintance who has been promoted to CEO. There he, like most humans, demonstrates his social territory through his behavior, connections, and relations.

Hopefully, the analysis of interrelations of the aforementioned territories can help understand the complexity and importance of this issue for both private and professional life of a human.

The mechanism of intrusion into a personality's space

Deprived of the possibility to consider the whole bundle of problems connected with interrelations of a personality's territories, we shall now focus upon the mechanism of intrusion into a personality's space. Such an intrusion is predetermined by the variety of borders of a personality.

Intrusion into the physical territory is the most typical kind of invading a personality's life – a human approaches another one violating his comfortable distance of communication and, probably, even attempting manipulations with his body (embracing, pushing, etc). In other words, in this case the mechanism of intrusion means performing some physical actions.

As for intrusion into the social space, it does not presuppose any bodily contact – although this may also be the case – but, primarily, the demonstration of his attitude to the other's social position. Obviously, there may be variants – both positive and negative [5]. The positive variant means playing up to a person occupying a high social

position (a super-loyal attitude toward him), stressing his status (e.g. bowing down to him, or even kissing his hand), and praising him (e.g. delivering complimentary speeches). The negative variant may occur when a human is dissatisfied with the other person's implementation of his social functions despite his very high position in the social hierarchy. Such a disruptive behavior may occur on the level of actions (e.g. bombarding somebody with rotten eggs), interrelations (e.g. totally ignoring somebody), or words (e.g. appeals for somebody's withdrawal or firing).

As for intrusion into the spiritual territory, it can also be performed by words, actions, and attitudes. Thus, when a person's hat is taken off and thrown to a muddy puddle he gets morally offended. Declaring uncomplimentary things about one's behavior deals a devastating blow to his reputation. When a human is offended verbally it is primarily his dignity that is humiliated. Thus, the spiritual territory is also exposed to intrusion.

To block outside intrusion one should carefully border his territory. Moreover, according to V. Moskalenko, it must be a duty of a human himself [1, p. 143]. And indeed, another human cannot know where our, e.g. spiritual, border lies. Therefore, to prevent intrusion "we should open ourselves for others as widely as we find it suitable" [1, p. 144]. A human should learn to mark his borders. A mere phrase "Please don't touch on this" can prevent intrusion of others, and, consequently, preserve good relations between people. It is especially important for inter-gender relations that "determine modern social life to a large extent" [6, p. 57]. Observing the peculiarities of physical, social, and spiritual borders of man and woman helps create really heartfelt relations which is especially vital for family life. It is well known that "service to family" [7, p. 48] is vitally important for family life. And this service, in its turn, presupposes genuine concern over the members of the family and, consequently, knowing and observing physical, social, and spiritual borders of a personality.

Conclusion

We conclude that the issue of borders of a personality is not only of theoretical but also of practical value. Knowledge of borders – physical, social, and spiritual territories – of a personality enriches the understanding of a human, discloses the specificity of his existence. At the same time, a human should mark his "borders" to avoid outside intrusion. It is especially essential while defining one's spiritual territory which is not as strictly bordered as physical and social ones but which is immeasurably vital for a human's life. Only on the basis of the borders of a personality can we interact

constructively with a person creating genuine positive relations which are a pledge of a happy private life [8, p. 1353] and successful professional career.

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Being of a Modern Human – Shoots of the Future in Realities of the Present

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Abstract: Specificity of the modern human's being through the prism of A. Toffler's ideas is dealt with. The findings confirm that the transition of industrial society to post-industrial one witnesses the growing role of individual features; the razing of sexual and age characteristics in the professional sphere. The authors put forward an idea that a human has to realize himself/herself in new realities thus enriching the existing diversity of being with one more, his/her own, individually colored scenario of life.

***Keywords**:* individual being, diversity of being, modern human, future, post-industrial society.

Introduction

The being of a modern human containing shoots of the future which is being formed right before our eyes arouses considerable interest. Generally speaking, the present makes us cast a drastically new glance at a human's life during the period of transition from industrial society to post-industrial one. Probably, the peculiarities of this transition are best of all described by Alvin Toffler. He represents the immediate future as follows: "The stringent age isolation will disappear; the young and seniors will communicate with each other. Education, more variably and closely connected with work, will last a lifetime. And work itself – be it manufacturing for the marketplace or for the household – will probably begin earlier than it used to begin during the period of one or two previous generations. Due to these causes, the civilization of the 'third wave' may prefer quite the contrary character traits of the young such as maintaining

complete independence from opinions of the peers, lesser orientation toward consuming and lesser hedonistic self-circularity" [1].

Analyzing the transition to the 'third wave' society A. Toffler marks out six principles of industrialism which provided the progress of public development but began disappearing during the modern epoch of the post-industrial society: standardization, specialization, synchronization, concentration maximization, centralization [2]. We will analyze peculiarities of the modern human's being through the prism of these principles.

Peculiarities of the modern human's being

Evidently, there is now evidence that standardization is being changed to de-standardization. Moreover, culture itself is becoming more and more de-standardized. People start using not only piece goods but also different symbols to make their being individual. Commenting on this aspect of the problem A. Toffler gives an example: "*Bell telephone and Co.* which once planned to provide each American house with identical black telephones – and almost succeeded in it – nowadays produces about a thousand combinations or types of telephone equipment from pink, green, or white phones to the ones for the blind or people who have lost voice or even larynx; or special phones to create sites (modems)" [3]. Variable is becoming a sort of motto in business life. The world is multi-colored. The human world is multi-dimensional since every human is unique. The wider is the assortment of goods the more the demands of humans are satisfied. This tendency can be seen everywhere. In particular, mobile communication operators try to satisfy the most exigent and unusual demands of their customers – identifying a phone number or concealing it, air temperature, dating agencies, a melody while waiting for the answer, etc.

In the modern world specialization is being replaced by de-specialization. Thus, potentialities inherent in computers allowed any office to operate on a qualitatively new level. It has turned into an electronic one. At the same time, the real communication space is being supplemented with the virtual one. Not far off is the time when a human will spend his vacation in the real space but work in the virtual one, money, business relations, and career growth being connected mostly with the virtual space. For example, there appeared a *Bitcoin*, a monetary unit and a payment system used in purchasing via the Internet which is becoming more and more popular. This and plenty of other things will undoubtedly add its own coloring to the specificity of the communication space and the social life of the modern human. The communication

space has already widened up to the planetary level. A human is able to communicate with humans all over the world. Social life is accelerating significantly due to information technologies. At a time a human can perform much more volume of work, even very complicated one. Obviously, this may lead to "blunders". And this is already the case in social reality. Human communication is becoming multi-channeled. In this situation the choice of priorities is inescapable. As a result, it is not a company, but a human himself who determines his working hours. In this respect, a human becomes a manager of himself – knowing well his own abilities, and having a clear idea of those of the society he chooses his line of behavior and vital activity.

Not only business life but also social one have both become exposed to synchronization. Transportation systems were "trembling" during rush hours. All telephones were "buzzing" everywhere at the same time. Today, situation is changing drastically. Synchronization is being replaced by de-synchronization. For example, an employee gets entitled to choose not only his working hours but also the place of work. Hours may be "flexible" but the place of work may be located "far off", i.e. not necessarily closely "tied up" with the office. Having a mobile phone at hand a human can communicate with partners, colleagues, and friends at any time.

The mass synchronization of processes is being replaced by a "pointed, targeted" aim at a certain person or a group of persons. Social life is acquiring its own address. Although being bound to spend more time to do the job a human is nevertheless able to achieve much more [4]. Labor productivity is becoming more and more intensive [5].

Today, concentration is being replaced by de-concentration. De-concentration of money, energy, resources, and manpower is becoming socially profitable, corresponding to today's pattern of social life. This is especially of great importance for Russia. Taking into account vast, boundless spaces of this country, the specificity of its regions the idea of de-concentration should be ranked first in business life. It may help create new "business places". Society tends more and more to become a sort of "network" or poly-centric in its business life, and therefore a social one. Trade business, e.g., turned out to be the most responsive to this trend. Spacious malls with impressive parking lots are being replaced by small shops "located just near your house" where you can walk in a matter of minutes.

In social life, the principle of maximization is also being replaced by that of de-maximization. Other measures and scales, more suitable for today's reality, are

appearing in our life. Evidently, moving along the way of gigantism is but a useless waste of resources. Moreover, it is incompatible with a human. Therefore, the personification of the communication space leads to its de-maximization. A human creates such a space around himself that he is able to master. It is no accident that Russian government has been recently promoting the idea of building small-storey houses. They are much closer to a human. They are more profitable economically. Life itself demands the idea of de-maximization to be implemented.

And, last not least, we will consider the issue of centralization. It reached its peak in the mid-1900s. Enterprises summarized great volumes of information – monthly, quarterly, and yearly reports. Nowadays, centralization is being replaced by de-centralization. The very term 'centralization' is used in management much too often. Today, we can speak of coming back to the home production on a higher, electronic basis and with a new evaluating of home as a center of business and social life – creation of a virtual office at your own premises. Researchers note that "from the technological point of view it is quite possible and from the economic one this step is expedient. An employee is given a task, and then he himself competently searches for the means to perform it collecting all the necessary information, sharing it with his colleagues, and, in the long run, presents the product of his labor. And to do all this he needn't even leave home" [6].

Conclusion

We conclude that the transition from industrial society toward post-industrial one creates conditions for changing the modern human's being. The traditional pattern of human life with its unambiguous character, strict age and sex differentiation is being replaced with new life scenarios which suggest a human new "opportunities" [7]. It can be ascertained that a modern human's being is changing to greater individualization which is accompanied by leveling of the age and sex gradation, first of all in the professional sphere. These aspects to a large degree uncover the peculiarities of the modern human's being and determine the trend of his development, "patterns of his existence" [8]. And it still lies in store for humans to find themselves in new realities, thus realizing the already existing variable of being [9] with one more, their own, individually colored life scenario.

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The Integrated Processes of Change the Judiciary in Ukraine That the Implementing Provisions of the Law on Judiciary of the Republic of Poland

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Abstract: In the article a comparative analysis is carried out of the judicial system of Ukraine, which is on the path of European integration, and is actively reforming the judicial case, and the law on judicial proceedings of the Republic of Poland, which in a short time managed to become a full member of the European Union, for further use of the experience of an effective restructuring of the justice system.

Considered and analyzed the positions of scientists on the problems of formation and activity of the judiciary corps, and new ways of improving the functioning of the judicial system of Ukraine are proposed.

Keywords: legal proceedings, judge, justice, judicial case.

Інтеграційні процеси перетворення судоустрою в Україні та імплементація положень законодавства про судочинство Республіки Польща

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Анотація: У статті проводиться порівняльний аналіз системи судочинства України, яка знаходиться на шляху Євроінтеграції, і проводить активне реформування суддівського корпусу, та законодавства про судочинство Республіки Польща, яка за короткий час спромоглась стати повноправним членом Європейського союзу, для подальшого використання досвіду ефективної перебудови системи правосуддя.

Розглянуті та проаналізовані позиції науковців на проблеми формування та діяльності суддівського корпусу, та запропоновані нові засоби вдосконалення діяльності системи судочинства України.

Ключові слова: судочинство, суддя, правосуддя, суддівський корпус.

Постановка проблеми. Правосуддя у світі з'явилось разом із виникненням перших держав, оскільки має безпосередній еволюційний зв'язок із державою як соціальним явищем суспільного життя. Із давніх часів суддівська влада та судді мали нерозривний зв'язок із самодержцями, які намагались підкорити суд власній волі, а на початку цивілізації і взагалі брали на себе не тільки законодавчу функцію, але і функцію правосуддя.

Натомість при розвитку цивілізації, суспільство зобов'язало владу відділити судочинство від інших гілок влади з наданням йому особливої ролі в державі. Німецький правознавець Рудольф фон Иеринг свого часу зазначав: «Встановлення судової посади є принциповим самообмеженням державної влади» [9; с. 23].

Метою дослідження є здійснення порівняльного аналізу діяльності суддівського корпусу України та Республіки Польща для розробки пропозицій з удосконалення системи судочинства України.

Аналіз останніх досліджень і публікацій. Дослідженням міжнародного та вітчизняного досвіду формування та діяльності суддівського корпусу займалися такі дослідники як: І. Аксаков, Г. Борковскі, Є.В. Васьковський, Р. Иеринг, J.J. Litauer, J. Łętowski, Л.К. Савюк, та інші.

Виклад основного матеріалу. Дійсно, суддівська діяльність відіграє основну роль у розв'язанні спорів, які виникають у суспільстві. Основним завданням держави є надання громадянам суддів не тільки високої професійної якості, але

й професійних діячів, які за своїми рисами характеру здатні виконувати функції без будь-якої можливості впливу на їх рішення з боку інших осіб.

Останні роки Україна знаходиться на шляху повного реформування законодавства щодо багатьох аспектів життя. Основними напрямками вдосконалення існуючого правового режиму є забезпечення незалежності законодавчої, виконавчої та судової влади і формування національної правової моделі оновленої держави, завданням якої є зміцнення демократичних цінностей, які визнані в усьому демократичному світі.

За думкою багатьох вчених, незалежність судової влади, її незаангажованість та непідконтрольність є базою нормального розвитку держави.

Наприклад, І.С. Аксаков вважає, що залежний суд – це нісенітниця або ж жахлива аномалія, залежний суд не є суд [6, с. 652].

На думку Є. Васьковського при формуванні суддівського корпусу особливою метою держави є забезпечення якості підготовки суддів та порядку заміщення суддями своїх посад. На його думку, підготовка професійних суддів має велике значення, але порядок заміщення посад є складнішим, оскільки існують наступні типові системи: виборні; обрані самими суддями серед суддів; призначені урядом за його розсудом та призначені урядом за конкурсом [8, с. 21-22].

Необхідно погодитись, що підконтрольне судочинство у нашій державі існує близько століття. Звісно, якщо враховувати радянський період, коли суди підпорядковувались спочатку Народному комісаріату юстиції СРСР, який повинен був здійснювати спостереження за застосуванням судами кримінального, цивільного і процесуального кодексів, узагальнювати судову практику та в разі необхідності розробляти зміни і доповнення до законів [14].

Потім Комуністичній партії до середини 1950-х років в умовах реформування політичного та державного курсу в СРСР проголошеного на відомому XX з'їзді КПРС.

В рамках реформи відбуваються зміни і в галузі управління судовою діяльністю, основами законодавства про судоустрій СРСР, союзних і автономних республік 1958 р. значно розширюється організаційно-наглядова самостійність судових органів, функції судового управління (організаційного, кадрового, фінансового та матеріально-технічного забезпечення народних судів) зосереджуються у

верховних, крайових (обласних) і прирівняних до них судах, а місцеві органи юстиції у зв'язку з такими перетвореннями – ліквідуються. При цьому діяльність Міністерства юстиції Української РСР у сфері управління судами якийсь період змін не зазнала, воно продовжувало керувати судовою системою країни. Така подвійність у судовому управлінні розглядалася суддівським співтовариством не інакше, як втручання в судову діяльність і порушення права на незалежність суддів і самостійність судів.

Закон «Про судоустрій Української РСР» 1960 р. передбачив право судових органів самостійно вирішувати питання організаційно-управлінського характеру з виконання директивних вказівок радянсько-партійних органів.

Але безпосередньо в судовій системі спеціальних органів із забезпечення діяльності судів (фінансування, матеріально-технічного забезпечення) створено не було. Це завантажувало суди невластивою їм управлінською діяльністю, вимагало координації роботи з радянсько-партійними органами і продовжувало ставити суди в залежність від партійних і радянських органів різного рівня. Безумовно, такий нагляд з боку органів влади не був таким жорстким, як в сталінський період, але все ж повної незалежності від впливу партійних органів не було. Проте надання вищим судам права судового управління суттєво змінило модель судового управління, яка отримала визначення «судово-адміністративної моделі».

З 1970 р. Міністерство юстиції СРСР практично відновило колишні функції судового управління, і з цього часу воно ставило завдання з організації діяльності судів усіх рівнів, транслювало і проводило в життя партійні рішення з питань судової діяльності [5].

Керівна роль органів юстиції була скрізь. Наприклад, наказом начальника відділу юстиції Курганського облвиконкому № 128 від 13.11.1981 р. за спотворення, допущені при складанні державної статистичної звітності з розгляду кримінальних і цивільних справ в Щучанському районному суді Курганської області, було поставлено питання про звільнення голови районного суду з посади [4].

Після розпаду Радянського Союзу та проголошення незалежності Україна вступила на новий шлях формування держави за прикладом сучасних європейських держав, з поділом державної влади на законодавчу, виконавчу та судову гілки, кожна з яких стала самостійною та незалежною.

На виконання цих принципів була задекларована необхідність підвищення ролі й авторитету суду та було прийнято рішення про початок судової реформи, а потім цілої низки законів, спрямованих на забезпечення незалежності та самостійності судів і суддів.

Таким чином, суддівський корпус був наділений певною свободою, але на протязі всієї незалежності постійно знаходився під «м'яким» контролем з боку посадових осіб високого рівня.

Якщо звернути увагу на історію формування судочинства Республіки Польща, у наших країн є багато спільних рис.

Континентальне розташування, соціальна близькість та політичні процеси більше двох віків певним чином впливали на законодавство наших країн.

Сьогодні багато вітчизняних та зарубіжних науковців відзначають фантастичні успіхи у минулому соціалістичної держави Республіки Польща у формуванні суддівського корпусу та забезпечення дійсно ефективного, дієвого та справедливого судочинства. За короткий час держава спромоглась стати повноправним членом Європейського союзу з повною перебудовою системи законодавства та свідомості.

Якщо провести аналіз системи законодавства України та Республіки Польща, то на перший погляд вона не має суттєвих відмінностей, але якщо проаналізувати певні відмінності, стає зрозумілим завдяки чому суддівський корпус Республіки Польща діє більш ефективно, ніж в Україні.

Історично на сучасне судочинство Польщі вплинули правові системи Росії, Франції та Германії.

Структура судової системи Польщі регулюється Конституцією та спеціальними законами.

Польське правосуддя за останні декілька століть суттєво розвинуло вдалу модель організації судової системи. Вона адаптована до європейської моделі позитивного права і на основі французької процедури оскарження у дві інстанції, та Верховний суд [22, с. 67-68].

Відповідно до ст. 175 Конституції [11] правосуддя в Польській Республіці здійснює Верховний суд, загальні суди, адміністративні суди і військові суди.

Відповідно до Конституції Верховний суд став наглядачем з питань юрисдикції над діяльністю загальних і військових судів і важливо те, що Верховний суд став органом, що не залежить від будь-яких державних органів [23, с. 15-16].

Варто відзначити той факт, що судді Верховного суду так само, як і в інших судах, є незалежними і підкоряються тільки Конституції і законам. Щодо відносин Верховного суду із законодавчою і виконавчою владою законодавством передбачений принцип збалансованості та незалежності.

Як вказує польський дослідник Дж. Етовскій, Верховний суд Республіки Польща – основний інтерпретатор всієї правової системи і центр формування єдиних правил для інтерпретації цієї системи [21, с. 24]. Таким чином, можна зробити висновок про те, що Верховний суд грає в сучасній демократичній правовій державі особливо важливу роль серед різних судів і трибуналів з різними компетенціями.

Цікавою видається реалізація концепції, яка закріплена у п. 2 ст. 176 Конституції, що структура та юрисдикція судів і порядок розгляду визначаються законами. А за ст. 177 Конституції загальні суди здійснюють правосуддя за будь-якими справами, за винятком справ, віднесених законами до компетенції інших судів. Таким чином, впроваджено презумпцію компетентності. Тобто у випадку неврегульованості у законодавстві правил підсудності будь-якої нової категорії справ суд здатен прийняти її до провадження без посилання на певну норму в якості універсальної компетенції.

Таким чином юрисдикція загальних судів включає в себе врегулювання всіх питань в сфері кримінального, цивільного, сімейного, трудового права та права соціального забезпечення, якщо вони не належать до компетенції Верховного суду або спеціальних судів.

Загальні суди, в свою чергу, поділяються на окружні суди, районні суди, апеляційні суди [24]. Структура поділу судової системи за районами та округами дає більш високі результати та мобільність розгляду за місцезнаходженням спору.

За ст. 184 Конституції діє також Вищий адміністративний суд та інші адміністративні суди. Абстрактне формулювання надає законодавцю можливість створення безлічі адміністративних судів без внесення змін до основного закону держави.

Адміністративні суди здійснюють контроль за діяльністю публічної адміністрації. Цей контроль охоплює також винесення судових рішень (правил) щодо відповідності законам постанов органів місцевого самоврядування та нормативних актів місцевих органів урядової адміністрації.

Військові суди здійснюють правосуддя у кримінальних справах у Збройних силах [2].

Особливе значення для польського правосуддя має суддя. Під «суддями» слід розуміти посадову особу судової системи, яка має право виносити вирок від імені Республіки Польща. Таким чином, суддя «в кабінеті» є органом державної влади (судової), який здійснює правосуддя та інші доручені завдання, наділений владою компетентного вирішення спорів та правових конфліктів [20, с. 77].

Якщо звернути увагу на положення Конституції Республіки Польща щодо правового статусу суддів, вони є єдиними персоніфікованими посадовцями, які захищаються державою поряд із всіма іншими державними органами.

Вищезгадане твердження випливає з того, що судову владу здійснюють судді. Законодавець сформулював норму таким чином, щоб забезпечити високий соціальний статус, а також конституційні привілеї та гарантії незалежності всіх суддів у зв'язку із виконанням ними професійних завдань.

Підготовка суддів здійснюється схожим з Україною шляхом проходження навчання у Державній академії судочинства та прокуратури Республіки Польща, але є важливі відмінності: наприклад, загальна підготовка триває 12 місяців і включає відвідування лекцій та практичних занять. Після закінчення кожної секції занять кандидат проходить практику у судах та інших органах, пов'язаних із судочинством. Після проходження практики кандидат на посаду судді проходить професійну підготовку, яка триває 48 місяців. І лише після завершення всіх етапів підготовки суддя має право подавати заявку на заміщення вакантної посади судді в районному суді [7, с. 2].

На жаль, в Україні до якості підготовки фахівців-судочинців ставляться з неналежною відповідальністю. Процес підготовки значно спрощений, оскільки кандидати на заміщення посади судді проходять лише 12-місячну підготовку за рахунок державного бюджету. Теоретична програма підготовки не відрізняється від порівняльної, але практичних навичок, дослідження майбутніх обов'язків у рамках професійної практичної підготовки не відбувається.

Замість цього майбутні судді направляються до Вищої кваліфікаційної комісії суддів України для подальшого складання кваліфікаційного іспиту, що включає в себе перевірку рівня теоретичної та практичної кваліфікації, а також особистих та моральних якостей з метою виявити професійну здатність до здійснення правосуддя.

Кваліфікаційний іспит складається шляхом письмового анонімного тестування якості застосування закону та вирішення практичного завдання, після перевірки якого визначається рейтинг кандидатів на посаду судді. Кандидати, які набрали не менше 75 відсотків балів, направляються у резерв на заміщення вакантних посад судді [1].

Цікавим видається дослідження А.В.Пулика, який проводить аналіз позицій науковців щодо суті судової влади та задається питанням, які установи до неї належать або які мають певний вплив чи здійснюють допомогу їй.

Говорячи про органи судової влади, спочатку необхідно встановити, які саме об’єкти повинні бути розглянуті в межах даного питання. Ґрунтуючись на широкій класифікації, прийнятій серед вчених, які досліджують правоохоронні органи, де в якості критерію використовуються функції охорони та підтримання правопорядку, система державних органів представлена всіма гілками влади, оскільки, по-перше, в процесі своєї діяльності правоохоронні органи, використовуючи владні повноваження, мають право застосовувати державний примус, а по-друге, законні і обґрунтовані рішення правоохоронних органів підлягають обов’язковому виконанню; одночасно їх невиконання тягне додаткову юридичну відповідальність [15, с. 26].

Інші вчені (наприклад, К.Ф. Гуценко) виділяє в системі правоохоронних органів наступні категорії: суди; органи, що здійснюють організаційне забезпечення діяльності судів; прокуратуру; деякі з органів, покликаних виявляти і розслідувати злочини; адвокатуру та інші організації, які надають юридичну допомогу [12, с. 14]. Слідуючи цьому підходу, лише ті органи, які, на думку дослідника, входять в поняття «суди», були б об’єктом розгляду, що не до кінця видається правильним щодо всіх органів, які внаслідок застосування концепції публічної адміністрації належать не тільки до органів виконавчої влади, але й до більш широкого кола суб’єктів, що займаються адміністративними функціями в громадських інтересах [3, с.19].

Польські дослідники дотримуються дещо іншої класифікації, виділяючи юрисдикційні органи (судові, квазісудові і позасудові [10, с. 19]), примирні органи, органи контролю і дотримання правопорядку, а також органи, які надають правову допомогу [19, с. 24-25]. До судових органів автори зараховують суди (загальної юрисдикції, спеціалізовані і Верховний Суд), а також трибунали, до яких зараховують Державний Трибунал (Trybunal Stanu), Конституційний Суд (Trybunal Konstytu-cyjny) і міжнародні органи юстиції [13][1].

Класифікація польських дослідників видається більш вдалою, але її не можна підтримати щодо квазісудових органів (третейських судів).

Слід зауважити, що на даний час спостерігається тенденція до зближення правових систем держав усього світу, що необхідно для успішного торгового обігу, який все більше набуває наднаціональний характер.

Відповідно до законодавства Республіки Польща та України третейським судам відведена особлива роль.

До речі, відповідно до Конституції України у якості судової влади передбачені лише державні суди. При цьому згідно з положеннями Закону України «Про судоустрій і статус суддів» рішення недержавних (третейських) судів обов'язкові для виконання.

Чинне законодавство України відповідно до світових стандартів обмежує національні суди у переоцінці доказів по справі, правильності висновків арбітражу при дослідженні обставин справи, що відповідає міжнародному принципу невтручання у діяльність третейських судів.

Рішення третейського суду може бути скасовано, якщо:

1) справа, у якій прийнято рішення третейського суду, не підвідомча третейському суду відповідно до закону;

2) рішення третейського суду прийнято у спорі, не передбаченому третейською угодою, або цим рішенням вирішені питання, які виходять за межі третейської угоди. Якщо рішенням третейського суду вирішені питання, які виходять за межі третейської угоди, то скасовано може бути лише ту частину рішення, що стосується питань, які виходять за межі третейської угоди;

[1] Історично звані в Польщі в своїй більшості трибуналами, в тому числі Європейський суд з прав людини, Міжнародний суд ООН, Трибунал першої інстанції ЄС, Європейський суд, Міжнародний кримінальний суд, а також Суд з питань публічної служби ЄС.

3) третейську угоду визнано судом недійсною;

4) склад третейського суду, яким прийнято рішення, не відповідав вимогам закону;

5) третейський суд вирішив питання про права і обов'язки осіб, які не брали участь у справі.

Доцільність неможливості оскарження рішення підвищує авторитет вказаного судового інституту, а сторони по справі, які передбачили третейське застереження в договорі, повинні самостійно оцінювати всі переваги та ризики третейського процесу.

Таким чином третейські суди, зберігаючи певні властивості своєї діяльності, мають повноправні судові повноваження здійснювати судочинство.

Сьогодні третейські суди набирають актуальність завдяки очевидним перевагам перед державними судами у специфічних сферах (наприклад, у морських правовідносинах або у спорах за участю іноземного елементу). Особливість третейського розгляду полягає у його універсальності, тобто можливості вирішити спір за законодавством інших країн.

Ст. 11 Закону України «Про третейські суди» визначає наступні джерела права, якими може керуватися третейський суд: Конституція, закони та інші нормативно-правові акти України і міжнародні договори України; законодавство інших країн; аналогія закону, аналогія права, торгові та інші звичаї.

Третейська форма розгляду справ приваблює спрощеною процедурою розгляду спору, відсутністю жорсткої стадійності процесу, можливістю за домовленістю сторін обирати арбітрів, мову процесу, дату, час, місце проведення засідання, відсутністю апеляції (рішення є остаточним без можливості оскарження) та інше, але перегляд потребує істотних матеріальних затрат.

Незважаючи на це, суспільство вимагає створення нових недержавних інституцій, які б допомагали сторонам вирішити конфлікт. Однією з них можна назвати медіацію, яка кожен день набирає популярність.

В Польщі досить цікаво врегульовано питання відповідальності суддів за неправомірні судові рішення. Так, в цій країні суддя володіє матеріальним імунітетом, який має на увазі неможливість його притягнення до кримінальної відпові-

дальності і позбавлення волі без санкції дисциплінарного суду. Якщо суддя підозрюється у злочині, прокуратура звертається до дисциплінарного суду з проханням відхилити матеріальний імунітет.

При цьому польська система відповідальності має одну особливість: відповідальність судді настає не з моменту вступу в силу відповідного незаконного рішення, а фактично з моменту надходження скарги на нього. Дійсно, внаслідок надходження скарги на суддю останній відсторонюється від виконання своїх посадових функцій на весь період проведення внутрішнього службового розслідування. На цей період судді зменшується зарплата. Відшкодовується така «упущена вигода» тільки в тому випадку, якщо передбачувані звинувачення не отримають свого підтвердження.

Крім того одним з найбільш небажаних і найбільш суворих дисциплінарних покарань для суддів місцевих судів є переведення на роботу в інші регіони держави (в Польщі 16 воєводств) [16].

На наш погляд, зниження доходів судді та переведення на роботу у інший суд на іншу місцевість дисциплінує служителя Феміди від здійснення проступку, тому в Україні необхідно запровадити таку саму систему покарань для суддів.

Особливо варто підкреслити, що в Польщі також до виконання функцій судді досить широко залучаються професори або доценти юриспруденції [18, с. 684].

В Україні, як і в Республіці Польща, суди за законодавством також є спеціалізованими, тому необхідно для підвищення якості судочинства запровадити можливість залучення в якості консультантів науковців із вченими ступенями відповідної спеціалізації, які б були закріплені за судом і мали згоду проводити семінари та консультування суддів з теоретичних питань судочинства.

Однак вважаємо недоліком судової системи Республіки Польща порядок обчислення строків відповідальності судді з дати надходження скарги, а не з моменту вступу в силу незаконного рішення. З цим не можна погодитись, оскільки порушується принцип розумності строків. При такому підході необхідно встановити граничний строк з моменту скоєння правопорушення, в протилежному випадку вказана норма порушує права судді та може використовуватись як важіль шантажування судді скаргою у будь-який час.

До того ж на думку багатьох польських суддів міністр юстиції має занадто широкі повноваження щодо ліквідації і створення судів, а також здійснення нагляду за легітимністю судочинства. «Правосуддя – це вимір справедливості, а на вимір справедливості не можуть впливати інші гілки влади», – резюмує суддя Конституційного суду Польщі Анджей Врубель на питання щодо можливості впливу органів державної влади на діяльність суддів, представники Державної Ради судочинства з подивом відповіли: «Якби з'ясувалося, що політики вимагають від судді винесення якогось рішення, – був би великий скандал» [16].

Цікаво, що в Конституційному трибуналі навіть розглядалася справа щодо того, чи має міністр юстиції згідно з Конституцією Польщі право на такі широкі повноваження. В кінцевому підсумку судді Конституційного трибуналу не побачили в цьому порушення Основного Закону Польщі [16].

В Україні у ході останньої судової реформи та внесених змін до ст. 16-1 Конституції була створена та сформована Вища рада правосуддя, замість реорганізованої Вищої ради юстиції, завданням якої є формування та контроль за діяльністю суддівського корпусу, порядку обрання та звільнення суддів.

Тобто зміни повністю виключають Президента із процесу добору суддів, що зміцнить незалежність суддівського корпусу. Це положення відповідає європейським стандартам та встановленому конституцією порядку добору суддів Республіки Польща, де судді призначаються Президентом за поданням Державної ради судочинства [11]. Однак в Україні до початку 2018 р. повноваження Президента зі створення, реорганізації та ліквідації судів, призначення суддів; а Верховної ради України щодо обрання суддів та Вищої ради правосуддя - будуть незмінні.

На жаль, нещодавно у Республіці Польща парламентом були прийняті резонансні пакетні закони, які можуть серйозно підкосити всю судову систему країни. Один з них надає парламенту, більшість в якому належить правлячій партії, повноваження вибирати 15 з 25 членів Національної судової ради. Це орган, який відповідає за призначення суддів і забезпечує незалежність правосуддя. Другий законопроект наділяє міністра юстиції правом призначати керівників судів і в будь-який час знімати їх з посади [17].

Президент під тиском мітингів в містах та активної критики Європейського Союзу із можливістю навіть застосування санкцій поки заблокував вказані закони,

але у разі їх прийняття судова система Республіки Польща перетвориться у інструмент політичної волі правлячої партії країни та ліквідує справедливе законне судочинство.

Висновки. Підсумовуючи вищевказане, зрозуміло, що тільки після всебічного аналізу інститутів правосуддя України та Республіки Польща можна зробити висновок про те, що у останній поряд із законодавчою і виконавчою владою, судова виділяється як основна найбільш важлива гілка держави.

В свій час у зв'язку з повною перебудовою системи законодавства Республіки Польщі, високі успіхи щодо якості та швидкості реформування держави до високого загальноєвропейського рівня, відбулися завдяки застосуванню унікальних механізмів формування та діяльності суддівського корпусу.

Влада дуже ретельно підійшла до реформування саме судової реформи, цим самим забезпечивши не тільки виконання вимог ЄС, але і реальне надання власним громадянам права на справедливість.

В Україні, незважаючи на 25 річне малоефективне реформування суддівського корпусу, нарешті почались процеси налагодження самостійності системи судочинства, оскільки безперечно, однією з найважливіших функцій держави є надання громадянам права на неупереджене правосуддя, яке можливе за умови всебічної реалізації суддівської незалежності.

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Research Values in Future Physical Rehabilitologist Professional Training

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Abstract: The article covers the research values, methodological analysis of the basics for the physical rehabilitologists training, generalization of philosophical ideas, regularities, principles and general scientific theoretical positions that contribute not only to the clarification of the essence and the definition of the specifics of professional activity, but also to the substantiation and implementation of the formation system of future physical rehabilitologists professional identity in higher educational institutions.

***Keywords**:* epistemology, researcher ontology, concept of discourse, education paradigm, professional identity.

Дослідницькі цінності у професійній підготовці майбутнього фахівця з фізичної реабілітації

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Анотація: У статті розкрито дослідницькі цінності, методологічний аналіз основ професійної підготовки майбутніх фахівців з фізичної реабілітації, узагальнення філософських ідей, закономірностей, принципів і загальнонаукових теоретичних положень, які сприяють не лише уточненню сутності та визначенню

специфіки професійної діяльності, а й обґрунтуванню та реалізації системи формування професійної ідентичності майбутніх фахівців з фізичної реабілітації у вищих навчальних закладах.

Ключові слова: гносеологія, онтологія дослідника, концепція дискурса, парадигма освіти, професійна ідентичність.

Постановка проблеми. Прагнення нашого дослідження психологічно спрямовано до дослідницьких цінностей конструктивістських і інтепритуючих парадигм і прийняття якісної дослідницької позиції, що є типовим для традиційних досліджень у сфері професійної підготовки особистості. Ми обрали шість дослідницьких цінностей з цих парадигм щоб підтвердити прийняття конструктивістського і інтерпретуючого підходів.

1. Спирання на рефлективність – як дослідник, я буду досліджувати власну гносеологію, об’єктом є мої власні передбачення з дослідження з метою виявити перспективи і невідповідності.

2. Гносеологічні питання пізнання – як я знаю, тещо я знаю і як я сприймаю і приймаю те чого я не знаю? Мої знання або інформація, що отримана від респондентів і з інших джерел не є повністю авторськими, тому що парадигми існують у соціальній і науковій сфері за допомогою мови, яка соціально вбудована всередину нашої культури.

3. Інтегрована онтологія дослідника – як автор/дослідник я впливаю на процес дослідження. Я привношу власне онтологічне «я» у процес дослідження, і конструкції, і реконструкції, реалізовані учасниками шляхом обробки (are processed through): суб’єктивне розуміння, втілений індивідуальний досвід. Це накопичений культурний і соціальний капітал, «розвиваючий зв'язок (персональний і професійний), що утворює життя і концентрується у загдкі самого себе».

4. Субєктивний взаємозв’язок між дослідником і учасниками. Я співставлю теорію, що розвивається з поглядами інших дослідників і учасників експерименту, які як індивідуальності роблять внесок в процес дослідження. Іноді ці конструкції реальності повинні розділятися між різними позиціями дослідження, але не обов’язково.

5. Існування множини реальностей- я переконаний, як дослідник, що знайдена істина в процесі дослідження умовна і що існує множина істин, кожна з

яких обумовлена « позиціонуванням кожного в контексті дослідження». Це підкреслює постмодерністський і постструктуралістський погляд. «Це стверджує множину шляхів пізнання що залучає нас до реального світу крізь ідеї всередині нас».

6. Немає фіксованої правди, тільки часткові розрахунки- знання умовні, інтерпольовані часом, соціумом, культурою, гносеологією. Це вимагає чіткої онтологічної позиції, що буде зосереджена на поточні знання і істини, що можуть змінюватися під час дослідження. «Відсутня фіксована незмінна правда у соціальній науці».

Сенс дотримання цих шести принципів, впродовж конструктивного процесу доведено, в підтексті конструктивно обгрунтованої теорії. «Наші концептуальні категорії виникли внаслідок нашого тлумачення даних швидше, ніж з нашої методологічної практики.Таким чином, наш теоретичний аналіз є інтерпретацією реальності, а не обєктивнми звітами про неї (реальність)».

За аналогією Russell, зафіксував проблеми суб'єктивного тлумачення, де герменевтична навичка робить неявне явним, акцентуючи увагу на екстраполяції і тлумаченні, а не на казуальному визначенні. Зідно з позицією, чотири головних інструмента дослідника в межах інтепритуючої парадигми є: концепція дискурса, інтерес до впливу, цінність повідомлення і можливість відтворення. Концепція дискурса і інтерес до впливу є необхідними і достатніми інструментами у дослідженні професійної діяльності фахівця з фізичної реабілітації, щодо професійної культури і цінностей на індивідуальному рівні в локальному підтексті. «Фіксація значення ніколи не є нейтральною дією, але завжди надає переваги певним зацікавленим особам. Дискурс відповідає за реальність і не відверте віддзеркалення її. Таким чином питання переважаючих дискурсів і інтересів є найбільш важливим».

Аналіз останніх досліджень з проблеми. Аналіз наукової літератури засвідчує, що з метою узагальнення та поглибленого вивчення процесів методологування науковці досліджують різні аспекти методології як науки (А. Новіков, Д. Новіков [8], Г. Щедровицький [9], та ін.). Розкриваючи функції, сутність і становлення методології, О. Анісімов характеризує динаміку та зв'язок розуміння цього феномену в різні історичні періоди [1]. Для наукового уточнення змісту поняття «методологія» С. Мочерний обґрунтовує його структуру [7].

У наукових розвідках Г. Копилова простежується продовження дослідження цієї проблеми, позаяк автор розглядає «методологію та методологізацію в контексті часу» [5]. Висуває ідею професійного методологування А.Фурман, визначаючи методологію не лише як учення про способи організації та побудови теоретичної і практичної діяльності людини, що має загальний характер, а і як науку й «мистецтво уможливлення досконалого мислення та ефективної діяльності в усіх сферах суспільного життя» [11].

Мета статті. Розробка системи формування та узагальнення філософських ідей, закономірностей, принципів і загальнонаукових теоретичних положень, обґрунтуванню та реалізації системи формування професійної ідентичності майбутніх фахівців з фізичної реабілітації у вищих навчальних закладах.

Виклад основного матеріалу дослідження. Перш ніж приступити до аналізу явища професіоналізму фахівця з фізичної реабілітації, треба визначитися з його природою і світоглядним поглядом на онтологію, морфологію і функціонування цієї цілісності, існування якої для нас є аксіомою. Це вихідна теза організації будь-якої подальшої аналітичної роботи.

Залежно від того, яким буде цей погляд на походження формуються наступні інструменти для формування ідеології, тобто головних семантичних фільтрів для відбору інструменту і визначення загального алгоритму і окремих технологій аналізу проблеми.

І якщо ідея в теорії має значення об’єднувального моменту, на що у свій час вказував І. Кант, висловлюючи тезу про систему науки, то цілком слушним є твердження, що ідея професіоналізму містить в собі програму побудови теорії професійних зв’язків, шляхи його формування, схему за термінологією І. Канта [3].

Філософія освіти – сфера, яка разом з еволюцією передбачає певні стабільні основи, що зберігають своє значення на будь-яких етапах розвитку людства. На думку В. Кременя, під впливом певних процесів окремі з цих ідей набувають особливого значення [4]. З’являються нові ідеї, які обов’язково потрібно враховувати, особливо у фаховій підготовці майбутніх фахівців з фізичної реабілітації.

Методологічний аналіз основ професійної підготовки майбутніх фахівців з фізичної реабілітації передбачає узагальнення філософських ідей, закономірностей, принципів і загальнонаукових теоретичних положень, які сприяють не лише

уточненню сутності та визначенню специфіки професійної діяльності, а й обґрунтуванню та реалізації системи формування професійної ідентичності майбутніх фахівців з фізичної реабілітації у вищих навчальних закладах.

За останні роки ми бачимо збільшення інтересу науковців і практиків до проблеми професіоналізму і професійної компетентності фахівців – державних службовців; економістів; політологів; соціальних працівників; працівників системи освіти Горбатюк Р., Гузій Н., Доброскок А.С., Романишина О.Я. та ін.

Ці роботи об'єднує позиція, що новітня парадигма освіти передбачає формування професіонала, і цей процес охоплює два напрями: розвиток складових професіоналізму, як системного утворення; особистісне становлення – формування внутрішньої готовності до особистісної реалізації у професії.

Особливої значущості в контексті наукового аналізу філософсько-методологічних основ професійної підготовки майбутнього фахівця з фізичної реабілітації набувають праці, у яких розкривається специфіка методології наукової діяльності та методології наукового дослідження [5]. Зокрема, В.Загвязинський і Р.Атаханов інтегрують методологію та методи психолого-педагогічного дослідження [2], що використовувалося у науковому обґрунтуванні процесу формування професійної ідентичності майбутніх фахівців з фізичної реабілітації.

У контексті дослідження різних аспектів підготовки у вищих навчальних закладах майбутніх фахівців з фізичної реабілітації зосереджено увагу на обґрунтуванні В.Стьопіним філософського та методологічного аспектів розвитку соціально-гуманітарних наук [10], методологічного змісту педагогічного процесу, який визначався шляхом системного аналізу, вивчення методології педагогічного дослідження.

Визначаючи філософсько-методологічні основи професійної підготовки майбутнього фахівця з фізичної реабілітації, які є відображенням фундаментальних істин, теорій і принципів, наукових основ процесу пізнання професійної діяльності, ураховували, що в наукових колах використовують кілька рівнів методології. Шляхом теоретичного аналізу встановлено, що серед науковців немає спільної думки про кількість їх характерні ознаки цих рівнів. Так, А.Фурман виокремлює філософський, загальнонауковий, конкретно-науковий (спеціальний) та конкретно-тематичний (спеціалізований) рівні методологування [12]. Визначаючи сутність підготовки майбутніх фахівців з основ реабілітації людей з обмеженими

фізичними можливостями, Ю. Долинний видокремлює такі методологічні рівні: загальнофілософський, загальнонауковий, конкретно-науковий, рівні методик і технік дослідження, а також методологічної рефлексії (застосування дослідником способів наукового пізнання, де інтегруються всі джерела методологічного забезпечення).

Інтегруючи наукові підходи до структурування методологічного аналізу діяльності фахівців з реабілітації, вважаємо, що його доцільно проводити за такими чотирма рівнями:

1) *філософський,* який дає змогу враховувати вчення про науковий метод пізнання парадигм і філософських принципів для розуміння сутності професійної діяльності реабілітолога;

2) *загальнонауковий,* що відображає систему використання загальнонаукових методологічних підходів у дослідженні процесу формування професійної ідентичності майбутніх фахівців з реабілітації;

3) *конкретно-науковий* – для уточнення сутності психолого-педагогічних аспектів формування професійної ідентичності майбутніх реабілітологів;

4) *практично-технологічний* – з метою обґрунтування оптимальних та ефективних педагогічних технологій для реалізації окреслених завдань дослідження.

Філософська методологія в контексті формування професійної ідентичності майбутніх фахівців з реабілітації базується на розумінні діалектичних процесів як складної форми становлення майбутнього фахівця з реабілітації, якісних змін у його формуванні та розвитку в напрямі підготовки до професійної діяльності, спрямованої на підтримку здоров’я і відновлення втрачених фізичних можливостей та забезпечення оптимального самопочуття людей з обмеженими фізичними можливостями.

З метою філософського забезпечення дослідження В. Кохановським акцентувалася увага на узагальнених положеннях про розвиток: рух від простого до складного, від нижчого до вищого, переходу від абстрактного до конкретного; на єдності логічного та історичного; на діалектиці загального, особливого й одиничного, необхідного й випадкового – як детермінант формування процесів і явищ, що досліджуються. Ураховувалося, що знання має йти від часткового, дослідного (експериментального) до узагальнень і висування теорій.

Висновки і перспективи подальших розвідок. Філософсько-методологічний аналіз основ підготовки студентів до професійної діяльності реабілітолога з урахуванням специфіки формування в них професійної ідентичності базувався на врахуванні «теоретичного ядра філософії – логіки, діалектики, методології пізнання», багатьох філософських дисциплін (філософії історії, філософської антропології, філософських питань акмеології, синергетики та ін.), загальнотеоретичних концептів філософії, універсальних категорій «культури і сфери мислення» [12].

Для створення логічно впорядкованої системи формування професійної ідентичності майбутніх фахівців з реабілітації структуровано категоріально-понятійний апарат, який складається із сукупності понять (відображення в узагальненій формі явищ і подій дійсності, зв'язків між ними шляхом фіксації їх загальних і специфічних ознак та якостей), термінів (слів, які виражають певне поняття спеціального наукового знання), категорій («вершини» наукового пояснення, коли термін стає загальновизнаним, є найважливішим поняттям будь-якої науки, що становить основу її понятійного апарату), дефініцій – короткого, точного та логічного визначення певного поняття, що містить найсуттєвіші його ознаки й зафіксоване в наукових текстах і спеціальних словниках.

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Competitive Strategies of Railway Transport of Ukraine as an Essential Part of the European Integration

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Abstract: The article is devoted to creation of the model of Eurointegration development of railway transport of Ukraine. The analysis of strategies for determining the level of competitiveness of passenger transportation by railway transport has been carried out. It is proved that the formation of the strategy involves obtaining a certain view of the future state of the industry and ways of solving existing problems. It is scientifically proved that the solution of this issue is possible through the creation of competitive and functional strategies for the development of a passenger business entity based on the use of modern management methods.

Keywords: strategy, transport, railway industry, passenger business entity, competitive position.

Relevance of the problem. The Ukrainian railway network is one of the most developed among European countries, it occupies a leading place in the volume of transportation and plays an important transit role on the Eurasian continent. Eurointegration is the main and unchanged foreign policy priority of Ukraine, and further development and deepening of relations between Ukraine and the EU are carried out on the principles of political association and economic integration..

The development of any industry is impossible without defining the main goals and areas of operation, i.e. a strategy. Formation of the strategy involves, first, obtaining a certain idea about the future development of the enterprise or industry; and secondly, the active use of modern methods of management by the enterprise, providing a certain balance and future directions of its development. The strategy for the development of the railway industry is aimed, first of all, at obtaining additional income from all spheres of its activity and increasing the competitiveness of the transport industry [1]. The passenger transport industry performs a huge amount of social work, as well as promotes the freedom of movement of Ukrainian citizens, one of the most important of their constitutional rights.

Unresolved issues in the research problem. No passenger transport operator can achieve an advantage over competitors in all commercial traffic (main services) and means of their promotion in the transportation market. Therefore, the choice of priorities and the development of a strategy that would be most suitable in line with the European tendencies in the development of a market situation; which provides the best way to use the strengths of business entities (see fig. 1).

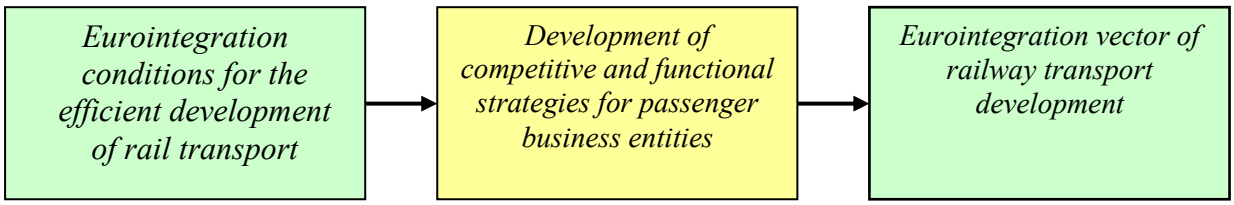

Fig. 1. Model of Eurointegration development of the Ukrainian railways *[ownresearch]*

The purpose of this article is creation of competitive strategies for rail transport development in the context of the European integration.

The main material. Any general strategy to improve the efficiency of passenger transport of economic entities is based on selected common competitive strategies. The link between general and general competitive strategies is straightforward: when choosing a general competitive strategy, the entity determines the way to achieve its strategic targets. The combination of general and general competitive strategies depends on the characteristics of the industry, the overall competitive position of business entities in the environment and their performance. In addition to the basic strategy, which includes a combination of different strategic business areas, competitive strategies define the approaches by which they should operate in each of these areas.

In order to improve the efficiency of the operation of passenger transport, the main general strategy, in our opinion, is a marketing competitive strategy, which, by our definition, as a kind of marketing strategies of economic entities, is one of the means of realizing their marketing goals and is aimed at identifying those strong the parties through which they can successfully compete in the target segment of the market of transport services and which can create a competitive advantage for them [2]. Types of competitive strategies according to the most common classifications that can be used to improve the efficiency of passenger transportation are shown in fig. 2.

Using the provisions of the classical works of M. Porter and the world experience in the organization of transportation, it may be stated that it is advisable to apply such provisions of the system approach to ensure their competitiveness [3, 4]:

1. Converting a passenger entity to a producer with the lowest cost of transportation. Such an approach is the cost-benefit strategy, or price leadership based on reducing its own costs, compared with the costs of a competitor, by obliging control over the places of their formation and regulating the volume of transportation or the proposed additional services, thereby achieving higher results compared to them. The low costs allow to have a price advantage and serve as a kind of barrier to penetrating newcomers to the target segment of the transport services market.

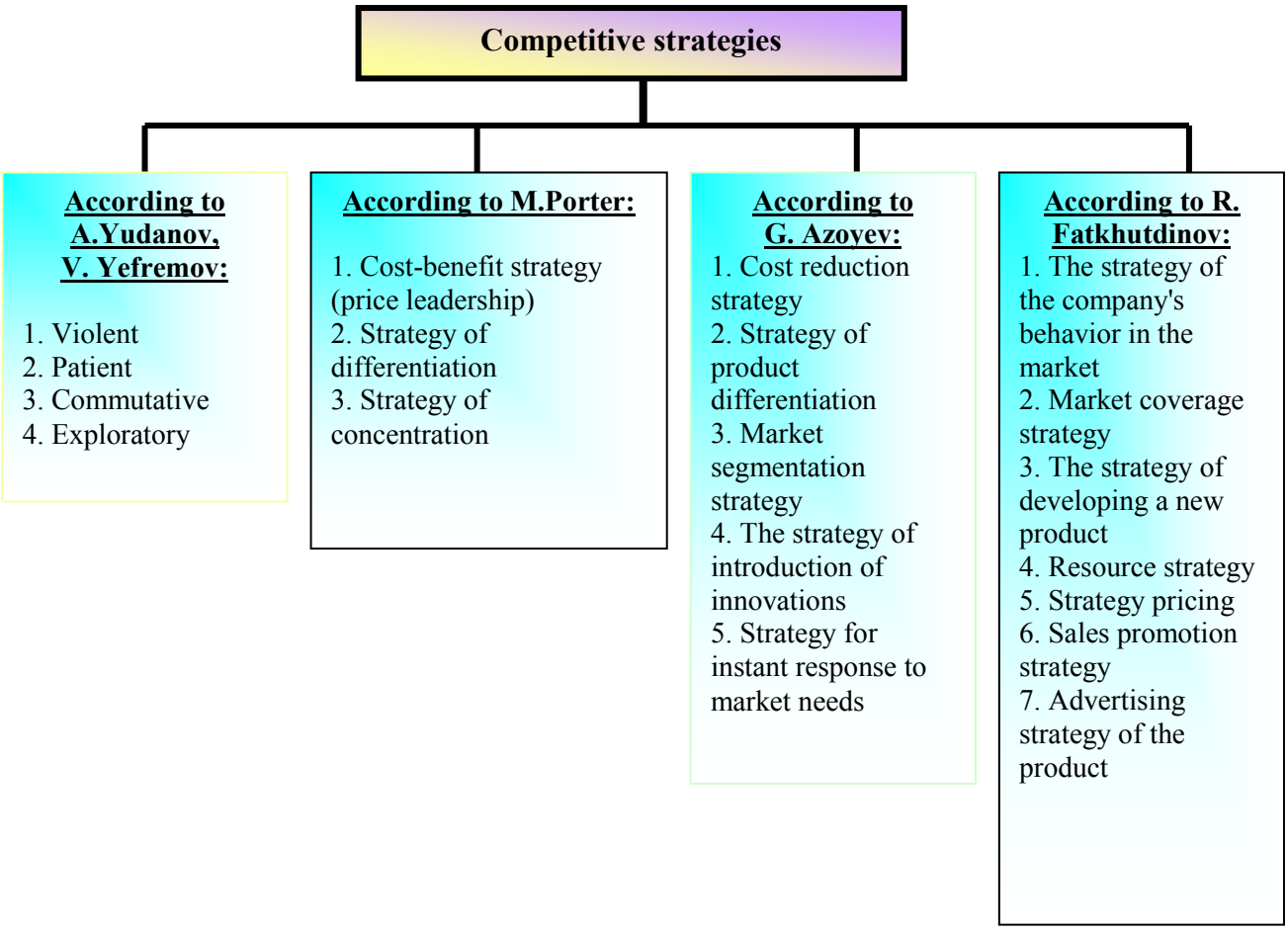

Fig. 2. Types of competitive strategies *[ownresearch]*

2. Differentiation of transportations, aimed at creating the recognition of consumers about their significant differences in standards from the transportation of competitors. These special differences can be based on such elements of the marketing complex as: image, flexible pricing policy, service, an extensive network of service points (sales of transport services), increased advertising, etc. The basis of this approach lies in the strategy of differentiation, which is long-term and reliable to achieve a level of profit above the average in the industry, since consumers prefer transport and additional services for a specific passenger business entity for the given advantages.

3. Focusing on the narrow niche of the transport services market to improve the service of passengers with clearly distinct types of requests. This approach reproduces a strategy of focusing differentiation or concentration. Under this strategy, the passenger entity is purposefully oriented towards a certain group of potential

passengers (transport service users) or for limited types of traffic and the share of the range of additional services or a specific segment of the transport services market.

Under the lower cost of transportation, in our opinion, it is necessary to understand not only a smaller amount for their performance than competitors, and the ability of the business entity to conduct marketing research in different directions by the method of system analysis, as well as production and sales activity, more effectively than competitors. In other words, in order to achieve this type of competitive advantage, the passenger business should have the opportunity to provide at reduced costs and in shorter terms the whole cycle of operations for the organization of transportation or the provision of additional services: from technological processing to the end-user. Failure to build the whole chain will diminish the success of the business entity and the type of transport in general on any of its links.

The incentive for applying a cost-cutting strategy is a significant saving on the scale of the transportation and attracting a large number of potential passengers, for whom the price is a determining factor in choosing a type of transport. This strategy is focused on the mass supply of standardized transport products (high speed trains in various class cars), which, as a rule, is more efficient and requires less specific costs than the implementation and offering of transport in trains of various classes in small quantities. In this case, saving of variable costs is achieved at the expense of high specialization of technological processes and provision of service at stations and trains. Constant expenses per unit of transport products decrease with increase of volumes of its execution and, thus, create an additional reserve of its cheapening (it is possible to reduce the tariff).

A business entity that follows the strategy of reducing the cost of transportation should offer reduced tariffs for high-quality service of the mass consumer (high-speed transportation by electric trains and suburban transportation). The desire to be a leader in achieving the lowest cost in the industry requires the optimal, in terms of costs, volumes of transportation and provision of additional transport services, seizure of a large share of a specific segment of the market of traffic, the application of marketing data and resource-saving technologies, the implementation of clear control over invoices and other types of permanent costs, i.e. marketing and logistics management [5].

In the market of transport services for the population of the country the railway transport has the leading place, because it performs 40% of the total volume of passenger traffic. It remains the most sought after and is a leader in the industry. Frequency of transportation by rail indicates an inappropriateness of compliance with the strategy of cost benefits for transportation services for the population. However, it is becoming increasingly difficult to lead the price of railways: due to the sharp increase in inflation since the beginning of the current year, transportation costs also significantly increased, which led to the need for gradual increase of transportation tariffs. As a result, the gap in the cost of travel by the wagons of the brand-name train "Lux" and the cost of the flight in the salons of "economy class" or with low-cost airlines is becoming smaller. This situation indicates the need to formulate a set of measures, including marketing, aimed at achieving the objectives of the strategy of benefits in costs and their planned implementation.

Strategy of differentiation of transport products is based on the specialization of carrying out special trainings of different classes of trains: regional, express, Intercity train and Intercity plus or additional services, which are modifications of standard products. Such modified services become unchanged for consumers in the case when the standard ones does not satisfy them. The personification of transportation on the market, or, in the broader sense, the differentiation of their characteristics, can be carried out by creating additional services with advanced technical and other consumer (operational) parameters, quality of their performance, based on a wider range to stimulate potential passengers to choose type of transport, based on the attractiveness of prices [4].

Thus, the main idea of differentiation is to concentrate efforts of passenger business entities on transportation with limited demand, which allows to avoid price competition with more powerful competitors and, at the same time, enables them to compete with them for specific groups of potential consumers.

The most attractive way to differentiate transport products, as a rule, is the use of techniques that are as different as possible from the techniques of competitors. This forces the passenger business to constantly search for new, original ways to allocate its main and additional services and bring a variety of transport services to the transport services segment. Creating differentiation through simulation will be the cheapest way to implement this strategy, but will lead to its death.

As part of the strategy of differentiation, it would be advisable, in our opinion, to develop a service to rent train-salons, as this service is a special modification of the usual transport service for its offer to a specific group of passengers. This service is not new for users of rail transport, however, it still has no analogues on road or air transport.. Despite the latter, the demand for this service has not reached the expected level, which in many cases is due to weak marketing support of this service and the lack of a competitive strategy for its promotion on the market.

The strategy of concentration requires a deep segmentation of the market of transport services and is aimed at providing advantages over competitors in a personified and often single segment of the market, which is allocated by geographical, psychographic, demographic or behavioral principle. The main idea behind this strategy is that business entities are able to serve their narrow target segment of the transport services market more effectively than competitors that spill their forces across the market. As a result, there is an advantage over competitors or through the differentiation of transportation and additional services based on more complete satisfaction of the needs of the target segment of the market, or by achieving the lowest costs when servicing the selected segment [4].

Thus, without pursuing the goal of achieving leadership in reducing the cost and (or) differentiation of transport products throughout the market, the passenger entity, focusing on market trends, achieves the results on the target segment. Having low cost and offering a large selection of transport products for a specific, personalized segment, it protects itself against counteraction by business entities of other modes of transport that use other competitive strategies..

The strategy of concentration can be developed by applying it to the main - transportation service of passengers through its differentiation [6]. The target market for rail passenger traffic is rather voluminous, and to achieve its homogeneity, a strategy of undifferentiated (aggregate) marketing should be applied. However, the predominant share of this segment is made up of people with average and below average incomes, so the existing differentiation of fares, depending on the train categories and type of train, is insufficient. Development of the strategy of concentration requires an increase in the differentiation of the cost of travel (depending on the place inside the train, day of the week, time of day, etc.), and in the future - the differentiation of the cost of service support services. This will enable

not only to protect rail transport from competitors, but also to make the transition to comprehensive passenger service.

Practice shows that the strategy of concentration (segmentation) is applied mainly to the types of transport of the passenger complex, which offer differentiated transportation. An attempt to cover the whole market of transport services often requires high costs for their advancement to potential customers. The strategy of targeting a specific segment (segments) of this market can lead to significant profits if the transport product fully meets the requirements and wishes of consumers of the selected segment. At the same time, the significant costs incurred by the passenger business entity in connection with the provision of differentiated transport and additional services for a particular segment may be reimbursed at the expense of their economies of scale and their high attractiveness for the customers being serviced.

It is obvious that this strategy will be the most rational for high-speed transport by electric trains and suburban railways, and the main feature of segmentation must be geographical.

Today's strategy for introducing innovations is rather relevant: the current world experience proves that the absolute majority of recently created monopolies arose on the basis of discoveries, inventions and other innovations that allowed the creation of a new, previously unknown market, with great opportunities and the prospect of accelerated growth.

Business entities that will implement innovation strategies do not link themselves with the need to reduce the cost of transport products, to differentiate it or to offer a specific segment of the transportation market: they concentrate efforts on finding fundamentally new, efficient passenger service technologies, designing the necessary, however, still unknown types of additional services, methods of organization of transportation, methods of stimulating demand, etc. The main goal - to outsmart competitors and alone take a market niche, where competition is absent or extremely low. For obvious reasons, such a revolutionization of the market, which is a source of large volumes of sales of profits, however, in most cases (80 out of 100) bankruptcy ceases because of the market's unwillingness to accept the innovations, technically or technologically inexpedient technology of transportation and organization of passenger services, employment of distribution channels, lack of replication experience and the dissemination of innovation and for other reasons.

Application of the strategy for introducing innovations in passenger rail transport can take place only in relation to service services, and due to lack of competitors, railways are not threatened by the markets, usually associated with the imitation of this strategy. It should be distinguished between the strategy of introducing innovations from the strategy of new transport products: if the first involves the development and launch of a real novelty in the market, then the second means the improvement of the existing technology of organizing transportation and passenger services and offering them in the well-developed market segments [7]. Consequently, the introduction of electronic cards for passengers to pay for travel documents (or other services that the passenger wishes to use at the train station or during a trip), the use of Internet ordering travel documents, etc. are consistent with the strategy of new transport products, since all these innovations are aimed at improving the technology of providing services for the design and sale of travel documents.

The strategy of instant response to the needs of the transport services market: the availability of solvent demand for a specific type of transportation only in theory automatically creates its proposal. In practice, most passenger business entities are not able to engage in activities that do not fit their profile without pre-training. Unlike those, business entities that follow the strategy of instant response to market needs, aim at the fastest satisfaction of the needs that arise in various business areas. The basic principle of behavior - the selection and implementation of projects that are most profitable in the current market conditions. The fast-responding passenger companies [4] are ready for an immediate reorientation of production processes, changes in the scale of transportation in order to maximize profits over a short period of time, despite the high specific costs associated with the lack of specialization in transport production.

This strategy in somewhat modified form should be applied to passenger transportation: the demand for transport service is clearly seasonal and has the ability to change even during the week and within 24 hours. Because of this, the entire range of services for passengers - from transportation to service - needs to instantly adjust to the volume and structure of passenger traffic. That is, in order to maximize passenger satisfaction and avoid unnecessary costs and inevitable losses, the strategy of rapid response to the needs of the transport services market in the

transport segment should be organically supplemented by the strategy of synchro-marketing (equalization of demand).

Table 1 summarizes the basic competitive strategies and the transport services that they are responsible for.

However, this does not mean that it is impossible or dangerous to follow two or more competitive strategies. On the contrary, analysis, practice shows that successful modern passenger entities with a wide range of transport products and covering different business areas simultaneously apply several approaches to different types of transportation and additional services in the regions, segments and periods of its development.

Table 1

Basic competitive strategies for rail transport

Basic competitive strategies	Transport services
Price leadership	The gap in the cost of travel by trains of the branded train class "Lux" and the cost of the flight in the salons of "economy class" or with low cost airlines. This situation indicates the need to formulate a set of measures, including marketing, aimed at achieving the objectives of the strategy of benefits in costs and its planned implementation.
Differentiation	A permanent search for new, original ways to highlight your goods and services, bringing diversity to the market (for example, train rental, salon rental).
Concentration	Differentiation of the cost of travel (depending on the city inside of the train, day of the week, time of day, etc.), as well as the differentiation of service support services. Characteristic for a specific (concentrated) segment of the market (eg, suburban transportation).
Introduction of innovations	The introduction of electronic cards for passengers to pay for travel documents (or other services that the passenger wants to use at the station or during a trip), the use of Internet ordering travel documents, etc.

Instant response to market needs	Demand for transport service is clearly seasoned and has the ability to change even within the week and within 24 hours. Because of this, the entire range of services for passengers - from transportation to service - needs to instantly adjust to the volume of passenger traffic (combining the rolling stock of trains).

[ownresearch]

The main criterion for choosing a competitive strategy for a passenger business entity is the adaptation of its own capabilities to the competitive conditions of the transport services market. And in this sense, the basic competitive strategies are a fundamental, general economic basis on which competitive strategies and competitive practices are built.

The basic competitive strategies for transport should be developed in the formulation of functional strategies that need to be developed specifically for each functional unit of the business entity of the passenger complex. The purpose of such a strategy is to divide the resources of the unit and search for its effective conduct within the framework of the overall strategy.

The main types of functional strategies should include the following:

– a strategy of innovation, which summarizes the main ideas about a new product or service from its initial development to market introduction. This strategy has two varieties: an innovative strategy and an imitation strategy. Innovative strategies involve the development of fundamentally new products and services, and therefore require high costs and are quite risky: according to statistics, on average only one in seven innovations has market success, the remaining six are turning into unrecovered costs for the organization. Because of this, imitation strategies have become more popular, which are widely used even in modern high-tech industries, for example, in computer. Such a kind of innovation strategy is acceptable and appropriate for the rail industry, including in the field of passenger transportation: transport service users constantly require improvements in their services, but the logistical capabilities of railways in the country do not always allow these requirements to be met. And compliance with the simulation strategy (ie, the strategy of developing a new product) will be the best strategic solution in terms of resource and technology constraints;

– a production strategy that focuses on decisions on the required capacity, equipment placement, the main elements of the production process, and the regulation of orders. The main direction of the winning production strategy is the flexible assortment manipulation, the approaching of quality characteristics of the grade to the specific requirements of the customer. Two of the most important aspects of a production strategy are cost control and efficiency improvements in technological operations. In this strategy, the activity of laundry complexes can be built, which will allow them to effectively manage their capacities, costs, revenues and quality of work performed;

– a marketing strategy that identifies the appropriate goods, services and markets to which they can be offered. This strategy establishes the most effective composition of the marketing complex (market research, commodity and pricing policies, sales promotion, distribution channels) and is particularly successful for productions oriented towards the mass consumer with low real incomes, which tend to decrease. The rationality of following this strategy in the field of passenger transport by rail is obvious;

– financial strategy, which is responsible for forecasting financial indicators of the strategic plan, assessment of investment projects, planning of future sales volumes (transport - volumes of passenger transportation and volumes of forecasting of service), distribution and control of financial resources. This strategy ensures the implementation of all other strategies, as each strategic decision for its implementation requires costs.;

– business entities of the passenger complex who are concerned about the future must develop strategies for personnel management, which solve the problems of increasing the attractiveness of work, motivation, certification of staff, maintaining a balanced correspondence between the number and need of employed, types of professions, workplaces.

Unfortunately, in the railway transport of Ukraine to improve the efficiency of passenger transportation, the strategy of personnel management is not developed, therefore, this activity is stochastic in character, which periodically leads to certain personnel problems.

Table 2 summarizes the possible main functional strategies for transport.

Table 2

Transport functional strategies and their characteristics

Functional strategies	Characteristics
Production	Manipulation of the assortment, approximation of quality characteristics of the grade to the specific requirements of the customer. In this strategy, the activity of laundry complexes can be built, which will allow them to effectively manage their capacities, costs, revenues and quality of performed work.
Marketing	Market research, commodity and pricing policies, sales promotion, distribution channels.
Financial	Forecasting financial indicators of the strategic plan, evaluation of investment projects, planning of future volumes of passenger transportation and volumes of forecasting of service, distribution and control of financial resources.
Organizational	Management of labor productivity, motivation, certification of personnel on transport.

[ownresearch]

Summing up the above, we draw the attention of managers to the fact that with the help of system analysis of functional strategies we can more effectively affect both the size of the contribution of the functional unit in the general case, and the amount of costs of financing the activities of this unit. According to the famous foreign scientist B. Carlof: "The formation of functional strategies - not raised goal of management, where huge reserves of efficiency may be hidden."

Conclusions. The proposed model of Eurointegration development of railway transport of Ukraine will lead to improvement of economic results of work of this sphere of activity, which will enable railroaders to compete effectively in the transport market of Europe..

Since any general strategy for increasing the efficiency of passenger transport of economic entities is based on selected general competitive strategies, the link

between general and competitive strategies indicates that choosing a general competitive strategy, the business entity determines how to achieve its strategic objectives. In addition to the basic strategy, which includes a combination of different strategic areas of activity of business entities, competitive strategies determine the approaches by which they should act in each such area.

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The Pilot Study of Actual Problems in a Physical and Cultural Education of Children of Preschool Age

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Abstract: This article presents a methodology of the pilot study of actual problems in a physical and cultural education of children of preschool age. Analyzed the results of the study and highlighted a series of problems and difficulties in planning, organization of physical and cultural education of preschool children in of preschool institutions.

Keywords: education, pilot study, actual problems of the physical and cultural education of children of preschool age.

In the modern terms of reformation and modernization of pedagogical education a necessity is integration of domestic education to European and world educational space, that, accordingly, is provided modern and innovative activity of educational establishments. Therefore, today in documents conceptually legal to character(Law of Ukraine «On higher education») and row of position papers (National doctrine of development of formation of Ukraine in ÕÕ² age, Government program «Patriotic education of citizens of Ukraine», Conception of nacional'no-patriotichnogo education of young people) the necessity of search of the perfect system of preschool link of education aktualizuet'sya, as important the constituent of Ukrainian education [12, 13, 14].

Will notice that education of children of preschool age is one of actual and difficult problems, because, exactly from babyhood education begins all those qualities which need the future citizen of the country. Education of citizen, patriot, physically and spiritually the developed man, professional, it is possible only in an integral pedagogical process[2].

In accordance with it in the last years the problem of physical and spiritual education of children of preschool age purchased the special value. It is predefined the objective circumstances of domestic education, by the necessity of more early

orientation and creative personality of preschool child. In fact, physical and spiritual development of children of preschool age is them by base quality and, at the same time, difficult and many-sided process which needs purposeful work [1, 8]. Will mark, that progress of this process depends on the awareness of importance of physical and spiritual education adults (by teachers, parents) from preschool childhood, knowledge of ways of its development and terms which are instrumental in becoming of personality of child [6].

Author position consists in that today the changes of priorities and approaches came to a head to the problem of physical and spiritual education of children of preschool age, revision of its bases and reorganization in accordance with modern terms. For this reason, the leadthrough of pilotage research of issues of the day in physical and spiritual education of children of preschool age will allow to analyse and select the row of problems and difficulties in relation to planning, organization of physical and spiritual education of children of preschool age, in the conditions of preschool educational establishments.

Analysing methodological bases of problem of physical and spiritual education of personality, it is necessary to pay regard to aggregate of weekend of philosophical and psikhologo-pedagogical ideas:

- in relation to philosophical influence on education and education (Demokrit, Sokrat, Plato, Aristotel'. Rassel, A. Shopengauer but other);

- positions of theory of personality as a subject of humane activity and moral conduct (In. Zen'kivskiy, O. of Bodalev, Gramme. Kostyuk, And. Maslou, S. Maksimenko, And Petrovskiy but other);

- positions of theory of process of education (Sh. Amonashvili, And Mudrik, Gramme. Trocko);

- in relation to an educate aspect of education (And. Disterverg, M. of Montessori, I. Korchak, S. Rusova, M. of Stel'makhovich, In. Sukhomlinskiy, K. Ushinskiy but other);

it is research of integrity of an educate process (It is. Bondarevska, And. Isaev, L. Necheporenko, V.Slastenin, Gramme. Ponomareva, I. Prokopenko but other);

are problems of change of paradigm of an educate process (And. Bekh, S. Vitvicka, N. Krilova and in).

Will mark that the psychological aspect of the probed problem is represented in labours. Anan'eva, L. Vigotskogo, In. Vilyunasa, O. of Zaporozhian Cossack, O. of Leont'eva, In. M'yasischeva.

The special position to physical and spiritual education of under-fives registers in scientific labours L. Artemovoy, And. Bogush, O. of Kononko, In. Kotirlo, From. To plokhiy, T. Ponimanskoy, Yu. Prikhod'ko, N. Yarishevoy.

The analysis of the educational programs of preparation of children of preschool age grounds to draw conclusion, that in them the ways of physical and spiritual education are marked for the children of preschool age, certainly task of becoming of the noted quality in the period of early and preschool childhood. Thus it should be noted that state and the additional complex programs do not expose maintenance and ways of decision of problem of physical and spiritual education.

Therefore organization of an educate work in this direction needs development of methodical recommendations for teachers in relation to the use of modern methods and forms of physical and spiritual education of children of preschool age [1, 8].

Consequently, purposeful study of problem of issues of the day in physical and spiritual education of children of preschool age, degree of its developed, in theories represented in practice of an educate work, exposure of essence descriptions of issues of the day, in physical and spiritual education of children of preschool age allowed us to begin the leadthrough of pilotage research of issues of the day in physical and spiritual education of children of preschool age.

The purpose of writing of the article is presentation of method of pilotage research of issues of the day in physical and spiritual education of children of preschool age. Such work enables to analyse the level of awareness of preschool educational establishments of meaningfulness of physical and spiritual education teachers, ways of his forming on the stage of preschool childhood. In addition, an important value is acquired by the exposure of level of domain of preschool educational establishments teachers by technologies of forming of physical and spiritual for children preschool age.

Exposition of basic material. With the purpose of decision of the put tasks by us a questionnaire, the educators of different categories which work in preschool educational establishments of the Kharkiv area took part in which, was used (all is polled 335 persons).

The method of questionnaire had for an object to find out the level of knowledges of teachers about the issues of the day in physical and spiritual education of children of preschool age; determinations of pedagogical terms, which, in opinion of teachers, assist development physical and spiritual education of children of preschool age.

Will mark that questioning prokhodilo in natural terms, not in contempt of logics and to motion educational-educate to the process of preschool educational establishments of the Kharkiv area.

QUESTIONNAIRE IN RELATION TO EXPOSURE of ISSUES of the day In PHYSICAL And SPIRITUAL EDUCATION of CHILDREN of PRESCHOOL AGE Respected kolego!

Ask you to answer the question of questionnaire. Questioning is not verification of Your activity. His purpose is collection and generalization of information on the issues of the day in physical and spiritual education of children of preschool age.

A questionnaire is anonymous. Will be drawn on the results of questioning only in the generalized kind. Attentively read a question and designate a that variant which most answers Your position.

1. Define problems which it will be you to decide the children of preschool age during physical and spiritual education (designate most actual):

1) problem of logistical support;

2) navchal'no-metodichnogo providing;

3) problems of analysis and self-examination of own pedagogical activity;

4) problems, related to absence of motivation for teachers;

5) absence of the system and integrity in organization educational-educate to the process;

6) problems do not exist;

7) the variant.

2. Define, is Your preschool educational establishment well-to-do by necessary navchal'no-metodichnoy literature in relation to the leadthrough of physical and spiritual education of children of preschool age? 1) yes; 2) no.

3. Define sources, where do you get information from about the modern state of problem and modern methods and forms of physical and spiritual education of children of preschool age? 1) pedagogical conference 2) the pedagogical press; 3)

pislyadiplomna education; 4) participating is in conferences, trainings, seminars of different level; 5) Internet, MASS-MEDIA (television, radio); 6) the variant.

4. Define, whether there is (at the level of Your DNZ) a method of leadthrough of diagnostics in relation to determination of level: 1) physical development of children of preschool age; 2) spiritual development of children of preschool age; 3) vocal development of children of preschool age; 4) khudozhne-estetichnogo development of children of preschool age; 5) cognitive development of children of preschool age; 6) it is not existed.

5. Define, is monitoring of mastering of knowledges, purchased abilities and skills, foreseen in Your DNZ on questions physical and spiritual development of children of preschool age ? 1) yes; 2) no.

6. Estimate, bud'-laska, navchal'no-metodichne providing educational editions in Your preschool educational establishment for effective realization of physical and spiritual education of children of preschool age 1) there are needments; 2) mediocre; 3) insufficient.

7. Define, degree of developed of methodical recommendations for help educators for introduction of physical and spiritual education of children of preschool age in establishments? 1) developed; 2) not developed; 3) the variant.

8. Define, whether an individual help the parents of children is organized on questions physical and spiritual education at home 1) yes; 2) no.

9. Define, is refinancing foreseen in Your preschool educational establishment from physical and spiritual education of children of preschool age? 1) it is foreseen; 2) financing for the money of parents; 3) the variant.

Very beholden you for a collaboration!

These questions were select not by chance, as they profile for the noted problem. As a result of questionnaire in relation to the exposure of issues of the day in physical and spiritual education of children of preschool age among the teachers of preschool educational establishments – 40 % answered that during this type of activity in the work they did not feel substantial difficulties. At the same time 36 % respondentiv ran into difficulties at an analysis and self-examination of the conducted work, 30 % – during organization of individual help the parents of children on questions physical and spiritual education at home. It testifies to insufficiency of knowledges of teachers on probed issue, low level of reflection and methodical preparation them to employments,, as supervisions certify, after formal signs.

Approximately the identical amount of teachers marked difficulties, which arise up in relation to information about the sources of receipt of information about modern methods physical and spiritual education of children of preschool age (11%), his organization and leadthrough (10 %), about the leadthrough of monitoring of mastering of knowledges, acquisition of abilities and skills, by children on questions physical and spiritual education (15 %), leadthrough of diagnostics, in relation to determination of levels of an educate activity at DNZ and drafting own (13 %), drafting of report, from conducted work (9 %). Identically the low percent of found out difficulties, related to socializing of teachers with parents in relation to elucidation of the proper work (for 5 %), in our view, specifies on sufficient development of communicative abilities and skills of teachers, about what they mark and.

There almost quite not were difficulties with an information retrieval on questions physical and spiritual education (1,5 %). It is explained that teachers widely used modern information technologies and had possibilities of free access to the network of Internet. Noted difficulties, as convinces experience, selection through negative attitude toward the large volume of a methodical, educational, educate work of teachers of preschool educational establishment.

Answers are for a question about difficulties which are related to the problems during physical and spiritual education of children of preschool age: problem of logistical support (12%), navchal'no-metodichnogo providing (3%), and problems, related to absence of motivation for teachers (4%) collected the two-bit of percents.

All other variants of answers were not marked teachers.

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