

FORESIGHT TECHNOLOGY AS A MEANS OF DEVELOPING THE PREDICTIVE SKILLS OF A FUTURE TEACHER

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Abstract

The ability to predict is included in the implementation of all functions of teacher's activity (informational, organisational, communicative, developmental). According to the authors of the article, an effective tool for the formation of predictive skills of a future teacher is foresight technology. The article systematises various approaches to the definition of foresight in education, stages, methods application of this technology. To unleash the potential of foresight technology, the educational standard was analysed; identified competencies that were formed in the study of the discipline "Modern problems and innovations in education", and in the structure of which predictive skills were implicitly included. The key topics of the course were also identified, in the development of which it was advisable to use technology; an algorithm for using foresight technology has been developed and shown by an example. The topic of the project was "Foresight technology of inclusive competences". The main implemented technology was Rapid Foresight. The result of the project was presented in the form of recommendations for organizations of higher pedagogical education on the development of competencies for working in an inclusive educational space.

Keywords: forecasting, predictive skills, foresight technology, predictive tasks.

1 INTRODUCTION

One of the requirements for the training of a modern teacher in accordance with educational and professional standards is the formation of predictive skills and abilities. The teacher's foresight of the phenomena in the educational process, based on scientific knowledge, provides not just a reflection of the existing one, but a creation of a new pedagogical reality. The use of forecasting allows to reasonably carry out the setting of goals and learning objectives, design and organise the pedagogical process in accordance with the target settings, if necessary, make changes to it to optimise the results. The ability to predict is included in the implementation of all functions of teacher's activity (informational, organisational, communicative, developmental, etc.), therefore, thanks to this ability, the mastery of each of them is improved. ZZ structure of educational experience, contributes to the development of professional competencies, but the practice of its application is still poorly developed, as is the theory itself. The aim of the research was to study the potential of foresight technology as a pedagogical tool for the development of predictive skills of undergraduates studying "Pedagogical education" on the example of mastering the course "Modern problems and innovations in education".

2 METHODOLOGY

The theoretical and methodological basis of the research in the article was the works of domestic and foreign experts devoted to the following problems: theory and practice of pedagogical prognostics (B.S. Gershunsky, V.I. Zagvyazinsky, E.G. Kostyashkin, P.I. Podlasy, A.F. Prisyazhnaya, L.A. Regush, V.A. Slastenin, M.N. Skatkin and others); the formation of prognostic skills (L.V. Akimova, I.V. Buldakova, A. Marquez, M.V. Mironova, N.N. Osipova, N.F. Sokolova, A.M. Khubieva, etc.); foresight scrutiny as a way of foresight of the future and its methodology (M. Kinnen, O. Saritas, K. Popper, A. Miles, Yu.N. Andreev, N.V. Gaponenko, L.I. Gokhberg, A.A. Dynkin, A.V. Sokolov, N.Ya. Kalyuzhnova, V.P. Tretyak, Alsan, R. Becker, R. Ruff). Characteristics of different aspects of foresight are presented in the materials of international organizations such as UNIDO, CORDIS, UNDP. To achieve this goal, research methods were used: theoretical - analysis of literature and basic concepts on the problem of research, systematization; empirical - testing and polling.

In special literature, prognostic skills are defined as the ability to carry out actions aimed at studying possible trends, transformations and prospects for the development of subjects and objects of pedagogical activity. The formation of prognostic skills is a specially organized, purposeful process of

developing the abilities to carry out actions aimed at obtaining advanced information about the most probable trends in the development of objects or subjects of pedagogical reality on a scientific basis.

Skills are a unity of the following components: knowledge - the content of prognostic activity, activity - the processual side of prognostic activity, mental - the qualities of thinking that determine the structure of the ability to forecast. Thus, the organization of the process for the development of prognostic skills should be carried out through the solution of a system of educational tasks combined into blocks: 1) content-informational, aimed at mastering knowledge - the basis for forecasting (for example, knowledge about the development of students' personality), is implemented through associative learning mechanisms; 2) activity-technological, aimed at mastering the operational components of prognostic activity, is carried out on the basis of algorithmic mechanisms; 3) intellectual and creative, focused on the purposeful development of the qualities of thought processes necessary for the successful implementation of prognostic activity, based on creative mechanisms [1].

Depending on the object of forecasting, prognostic skills can be combined into four groups: 1) forecasting the development of the collective: the dynamics of its structure, the development of the system of relationships, changes in the position of the asset and individual students in the system of relationships, etc.; 2) forecasting personality development: its personal and business qualities, feelings, will and behavior, possible deviations in personality development, difficulties in establishing relationships with peers, etc; 3) forecasting the pedagogical process: educational, upbringing and developmental capabilities of the educational material, student difficulties in learning and other activities; 4) the results of the application of certain methods, techniques and means of teaching and upbringing, etc. [2].

As noted above, we consider that the use of foresight technology in the process of preparing a future teacher can become an effective tool for the formation of prognostic skills.

To better understand what foresight is, let us give several definitions [3].

Foresight is a systematic, collaborative process of building an image of the future in the medium and long term, aimed at improving the quality of current decisions and coordinating joint actions (FOREN Guide).

Foresight is a systematic attempt to look into the future of science, technology, society and economy in order to ensure the prosperity of society, economy and environment (Asia-Pacific Economic Cooperation - Center for Technology Foresight).

Foresight is a natural human activity that has been performed in the past. Now it is formalized within the framework of a special methodology and is used to determine the long-term consequences of decision-making in the field of science and technology. Foresight can be used to develop strategies and long-term development planning for countries, regions, municipalities and other types of territorial entities (Technology and Innovation Foresight for Bulgaria and Romania - ForeTech).

Foresight is systematic thinking about the future and influencing the future (Australian Center for Innovation). Foresight is a system of methods for expert assessment of strategic directions of socio-economic and innovative development, identification of technological breakthroughs that can have an impact on the economy and society in the medium and long term (UNIDO).

Another definition is from the American researcher Ben Martin (University of Sussex): "Foresight is a systematic attempt to assess the long-term prospects of science, technology, economy and society in order to determine strategic research directions and new technologies that can bring the greatest socio-economic benefits" [4].

Thus, the goal of foresight is to determine the possible future, create the desired image of the future, and determine the strategies for achieving it. Forecasting, assessment of technology prospects, future research and other forms of foresight is an attempt to identify long-term trends and coordinate decision-making based on them.

Two aspects of foresight should be emphasized. The first is that it is a process, not a toolbox. It includes a process for ensuring the exchange of views (including feedback) between participants. Second, the starting point of foresight is the recognition of the plurality of options for the development of the future.

Foresight is characterized by the use of forecasting tools, but its purpose is not to obtain a set of forecast trends. Foresight participants open up new opportunities for shaping, and not just predicting the future, considering possible alternatives for the future and shaping the achievements of the most promising ones" [5].

According to the type of formation, all foresights are divided into those in which an attempt to look at the process of the development of an object from above prevails, and those where they try to consider this process from below.

In terms of focus, they distinguish between technological (foresight is based on the involvement of new technologies) and social (aimed at determining the long-term prospects for the development of social processes in society).

The implementation of foresights can be carried out in the form of: 1) sessions - direct exchange of different opinions on existing trends and their development. Further, a general opinion is formed, in order to then move on to practical actions; 2) a project is a series of planned events related to Foresight technology. As a result of joint efforts and discussions, a "road map" is emerging. Resources are planned, deadlines for the implementation of the assigned tasks within a limited period of time; 3) the process is a complete cycle, it complements and develops a strategy, which is inevitably taken from the plan, which was worked out and drawn up as a result of "brainstorming".

The formation of a foresight goes through three stages:

- 1 Pre-foresight stage, when foresight users and propagandists are identified and a declaration of foresight prevision goals and objectives is formulated.
- 2 The foresight stage proper, when all formed organizational institutions are involved, experts are working, studies are underway and final documents are being prepared.
- 3 Post-foresight stage, when the expected changes in the future are monitored, the research stages are repeated, and the expected events are verified.

As a rule, each foresight method is a combination of many tools. As the basic methods of Foresight in teaching, the following are used: formally logical (analysis, synthesis, induction, deduction, analogy, comparison, hypothesis, proof, generalization) and specific (expert group method, scenario methods, mapping, SWOT analysis, brainstorming, Delphi method, system analysis, etc.) methods.

In Russia, Rapid Foresight technology is more actively used - the Russian version of the foresight method, which allows achieving representative results in a shorter time frame than classical foresight technologies. From the point of view of the sequence of steps in Rapid Foresight, the following are distinguished: 1) Pre-Foresight: collection and analysis of various data; 2) formation of a group of participants (group selection) - the most competent participants are selected, representing various subject positions in the context of the subject of the foresight session; 3) generation - the actual foresight session, which includes the most effective tools for group work; 4) action. The result of foresight activity is "road maps". It is a document that reflects a given future; 5) renewal - reflection of the results obtained during a separate foresight session; regular update of the map of the future.

Rapid Foresight session includes the following elements:

- Situation analysis - defining the scope of the object under consideration, trends that describe the most likely development of the situation;
- Objectification - a description of the technologies, formats, legal restrictions, pictures of a predetermined future operating within the framework under consideration;
- Subjectivation - self-determination and choice of the most favorable image of the future, including finding one's place in this future;
- Prioritization - the selection by the participants of those projects of changes that, in their opinion, most contribute to the realization of their expectations from the future [6].

The place of the practical part of the research was the Institute of Philology and Intercultural Communication at the Kazan (Volga Region) Federal University. It was attended by voluntary students - undergraduates of 22-25 years old, studying in the direction of "Pedagogical education", in the amount of 76 people. The practical part of the research took place in three stages. At the first stage, diagnostics of the prognostic abilities of students was carried out. The methodology "Prognostic problem" by L.A. Regush, N.L. Somova [7], which allows you to identify and determine the degree of development of a person's ability to predict. The use of the technique is effective in situations of determining professional competence, and based on the results, tasks for human self-development can be set. All measured indicators assess the features of the operational component of prognostic cognitive activity, which includes the advancement and analysis of hypotheses, modeling, calculation of consequences and planning. In doing so, we relied on the data that skills are fully and constructively manifested in all actions that are part of the operational composition of

forecasting. Therefore, we made the assumption that the level of development of predictive skills may be similar to the level of development of the ability to predict. The students were presented with a set of five predictive problems, which were asked to solve. The results of all tasks were assessed according to 19 indicators. The data on the indicators were summarized and compared with the test age norms. According to the methodology, there were five levels of development of predictive abilities and, accordingly, skills: very high; high; average; short; very low.

Further, at the formative stage, the foresight technology was worked out and used.

At the final stage of the study, students carried out a reflexive assessment of the foresight technology for its effectiveness for the development of their predictive skills using the "tag cloud" technique.

3 RESULTS

The results of diagnostics of students' prognostic skills showed that 6% of students have a very high level of development, 2% have a very low level, the majority - 59% have an average level of development "Fig.1".

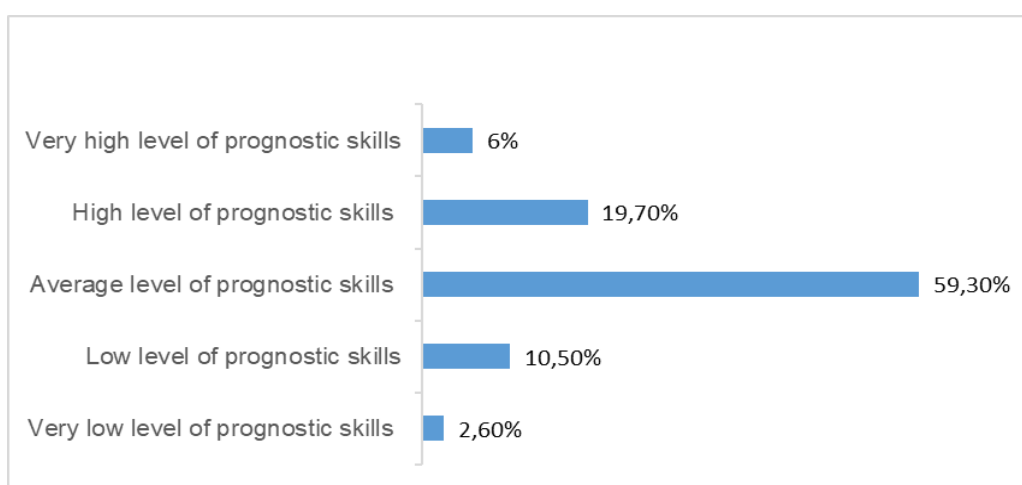


Figure 1. Number of students at different levels of prognostic skills development as a percentage of the total number of study participants.

At the second stage of the research, in order to unleash the potential of foresight technology, the authors analyzed the educational standard in the field of "Pedagogical education" at the master's level and identified general professional competences (GPC), in the structure of which, we suppose, prognostic skills are implicitly included. This judgment is substantiated by the fact that all the selected competencies presupposed the formation of abilities for the design of various objects of pedagogical reality. And forecasting, in turn, as a mandatory mental procedure, is used in design to form an informed judgment about the prospects, possible states of an object or phenomenon in the future. The topics of the course "Modern problems and innovations in education" were also highlighted, in the development of which it is advisable to use foresight technology [Table 1].

Table 1. Correspondence of educational competencies, prognostic skills and the topics of the course "Modern problems and innovations in education" recommended for their formation.

Nº	General Professional Competencies (GPC)	Prognostic skills	Course topics "Modern problems and innovations in education"
1.	GPC-2. Able to design basic and additional educational programs and elaborate scientific and methodological support for their implementation	Prediction of the pedagogical process: educational, upbringing and developmental capabilities of educational material, student difficulties in learning and other activities	Pedagogical design as a methodology for the designing, creation and evaluation of teaching materials (including materials for an inclusive education system)

2.	GPC-3. Able to design a collaborative and individual educational and educational activities students, including those with special educational needs	Forecasting the development of the collective: the dynamics of its structure, the development of the system of relationships, changes in the position of the asset and individual students in the system of relationships, etc.	Technologies for organizing educational cooperation of students in blended learning models (including with students with special educational needs)
3.	GPC-6. Able to design and use effective psychological and pedagogical, including inclusive, technologies in professional activities, necessary for the individualization of training, development, education of students with special educational needs	Prediction of personality development: her personal and business qualities, feelings, will and behavior, possible deviations in personality development, difficulties in establishing relationships with peers, etc.	Adaptive learning, adaptive educational technologies (including for inclusive education)
4.	GPC-8. Able to design pedagogical activities based on special scientific knowledge and research results	Forecasting the results of the application of certain methods, techniques and means of teaching and education, etc.	Skills and competencies of a teacher of the XXI century (including for inclusive education)

As can be seen from the table, all design competencies presented in the standard imply their extension to the practice of inclusive education. This led to the choice of the topic "Skills and Competencies of a Teacher of the XXI Century" for conducting classes based on foresight technology in the discipline "Contemporary Problems and Innovations in Education".

The following is a step-by-step description of how to conduct a Rapid Foresight (RF) lesson. The method is based on conducting a foresight session, which is carried out in three stages (Pre-Foresight, group selection, generation or actual foresight session). Obtaining a significant and verified result within the framework of this technique takes days or even hours, in contrast to months of research required with other techniques. The result of a foresight session using the RF method is a map of the future, which allows to see the entire subject area, the image of its future, as well as various ways and ways to achieve certain desirable and undesirable states and factors that affect the likelihood of a particular scenario.

Stage 1 - Pre-Foresight (preparation of a foresight session) - included:

- A review of theoretical sources on the subject of work (including the search for international experience, search for scientific and research publications);
- Analysis of the statements of recognized opinion leaders in the field;
- Analysis of public opinion (forums, social networks, queries in search engines);
- Data published by expert institutes.

Carried out preliminary work allowed us to conclude that there is a problem of assessing the range of inclusive teacher competencies by the pedagogical community. Research shows that the educational community is not well-formed with a holistic assessment paradigm in relation to the inclusive competencies of the teacher. This is reflected in the divergence of the corresponding evaluative positions of university teachers who train pedagogical specialists, teachers of mass and correctional schools. Consequently, there is a need for further elaboration of the model of inclusive competence of a teacher, and its subsequent implementation in professional educational programs. As noted above, inclusive competencies are included in the structure of general professional competencies, but since their specificity is not defined, the problem of finding effective educational technologies for their formation is especially acute.

This problem determined the choice of the foresight topic - "What are the effective educational technologies for the formation of the inclusive competence of modern teachers?"

2nd stage - the formation of a group of participants (group selection). At this stage, the composition of the expert group was determined, competent participants were selected, representing various subject positions in the context of the subject of the foresight session. The expert group included: practicing teachers working with inclusive children and having experience in managing students' practice; university teachers who train students in pedagogical specialties, senior students who have gained experience in inclusive education during pedagogical practice.

3rd stage - generation, or actual foresight session. In the process of its implementation, the following methods were used: SWOT analysis, Nominal group technique, Stakeholder Mapping. The stage began with the formation of working groups, each of which included undergraduate students and practicing teachers (online participation). Then the topic and problem were announced. In the format of group work, the primary layout of the "Map of the Future" is being created: a vision of the problem (in what exactly this group sees it), identification of possible trends. The reference table - template [Table 2] was used as an analytical framework for the map.

Three time horizons are located on the vertical axis of the map:

- Close (I am a student - undergraduate in the direction of "Pedagogical education"), it contains the phenomena and trends that are already observed now, or the emergence of which is expected in the near future;
- Average "I am a young specialist - a graduate of the magistracy in the direction of" Pedagogical education ". In this horizon there are phenomena, the prerequisites for which there are already now, but they will occur or gain strength (according to the participants' assumption) in the next 5 years;
- Long-distance "I am a competent professional with work experience." This includes the phenomena, the occurrence of which is expected by the participants on the basis of their ideas in 5-10 years.

On the horizontal axis of the map there are cells "Trend", "Format of inclusive competence of a teacher", "Technologies for the formation of inclusive competencies". The trend - the main essence of RF - characterizes a stable process that develops over time that affects the object (area) of analysis. It is described by the formula - "what?", "Under what conditions?" To describe the trend, opportunities and threats are also analyzed - changes that are significant for subjects that affect activities and even existence itself. The format of the teacher's inclusive competence is a personnel response to the challenge of the trend. In our case, it was a list of professional inclusive competencies of a teacher. The last cell is individual decisions on the search for effective technologies for teaching teachers aimed at the formation of inclusive competencies. The limited scope of this article allows you to illustrate only part of the table used to draw up the map of the future.

Table 2. Reference Table - Future Map Template.

Horizons	Trends	Opportunities and threats	Format of inclusive competence of a teacher	Technologies for the formation of inclusive competencies
Near I am an undergraduate student in the field of "Pedagogical Education"	The growth of digitalization of education in the world	Opportunity: facilitates the process of individualization of training Threat: Students' Emotional Issues in Distance Learning		
	Extending the practice of inclusive education to all levels of education	Opportunity: Threat:...		

Using the above methods, the group members drew up initial versions of their maps of the future, where all objects were represented in the form of cards. Further, the maps of the future were evaluated by experts, and then supplemented and transformed into roadmaps. The final result of working with roadmaps was recommendations on the use of effective educational technologies for the formation of inclusive competencies of teachers. These recommendations were addressed to the system of higher professional pedagogical education and took the form of presentations.

At the final stage of the study, we asked students to give a reflective assessment of foresight technology in terms of its effectiveness for the development of their predictive skills. Namely what in their opinion are its capabilities in general and how much this technology has helped them understand the prospects for the development of their competencies in the field of inclusive education. The questions were formulated as follows:

- I learned that technology allows ...
- This technology can be used for ...
- To use the technology was ...
- It was interesting to use the technology, because ...
- Technology helped to navigate in ...
- Thanks to technology, I realized that inclusive competencies ...
- You can develop inclusive competencies ... etc.

In the overwhelming majority of answers, students assessed positively the influence of foresight technology on their predictive skills and abilities and rather fully characterized its potential in this direction.

4 CONCLUSIONS

Foresight technology makes it possible, through forecasting, to identify the main threats and development opportunities in education, in the current pedagogical process. It represents an alternative to the usual planning, orients future teachers not to the reproduction of the existing education system, but to its qualitative change and the construction of the future, taking into account the existing experience.

The work done allowed us to adapt the foresight session for training students in the field of pedagogical forecasting. We note the wide possibilities of using this technology for the development of predictive skills of future teachers.

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REFERENCES

- [1] A.V. Zakharov, "Mechanisms for the formation of predictive skills in future teachers," *Siberian pedagogical journal*, no. 1, pp. 268-272, 2009. Retrieved from URL: <https://cyberleninka.ru/article/n/mehanizmy-formirovaniya-prognosticheskikh-umeniy-u-buduschih-uchiteley-1>.
- [2] V.A. Slastenin, *Pedagogy*. Moscow: Academy, 2002.
- [3] G.A. Afanasyev, *Stra [tag] .ru What is foresight? Attempts to define*, 2006. Retrieved from URL: <http://stra.teg.ru/library/global/Prognoz/foresight/4>
- [4] B. Martin, *Research Foresight and the exploitation of science base*. HSMO, London, 1993.
- [5] R. Popper, "Methodology: Common Foresight Practices & Tools, in Georghiou," in *International Handbook on Foresight and Science Policy: Theory and Practice*, 278 p., Edward Elgar, 2007.
- [6] Methodology RAPID FORESIGHT 0.4, 2017. Retrieved from URL: https://files.asi.ru/iblock/9a2/9a28c0a2a83f95c34a65378924657fe0/Foresight_0.4_2017.pdf
- [7] N.L. Somova, *Diagnostics of the ability to predict. Methodology and its standardization*. Saint Petersburg, 2002.