ARCHITECTURE OF SMART LEARNING COURSES IN HIGHER EDUCATION

Elena E. Merzon
Kazan Federal University,
Elabuga, Republic of Tatarstan, Russia
Elena.Merzon@kpfu.ru

Rinat R. Ibatullin
Kazan Federal University
Elabuga, Republic of Tatarstan, Russia
Rinat.Ibatullin@kpfu.ru

Abstract – The article discusses the organization architecture of smart learning courses in university students' training. The course architecture is displayed in the form of a diagram. The results of testing of the proposed architecture are presented and analyzed.

Index Terms – architecture course, smart education, road mapping, student.

1. Introduction

Modern information and technologically advanced society places new demands on the education system, which includes higher education. The organization of modern learning process should promote active and cooperative work of university students in the construction of new knowledge. The educational content should be practice-oriented, provide students with tools to training activities, and promote their self-development and self-improvement [1]. Therefore, it is necessary to introduce new forms and methods of educational process organization as the main task of universities is to ensure the high quality of education [2].

One of the promising directions of education development is smart education. The concept of smart education includes flexible learning in an interactive learning environment, suggesting availability of a large number of sources, maximum diversity of media, and the ability to adapt quickly and easily to the students' level and needs. Smart education helps to develop analytical competence, skills in solving complex problems, creativity that is an ability to develop new ideas and implement them, and skills in communication with teams, groups and individuals. A key figure of smart education is the Smart student who expects multi-format flexible and personalized learning in an interactive environment, multidisciplinary training programs, and an opportunity to study and work at any time and at any place in the world on the basis of free access to the educational content.

An educational smart event is considered to be the backbone component of smart education in higher learning, the smart event meaning the logical integrity of a sequence of educational-professional and professional activities, leading to a certain result such as formation of competencies, creation of intellectual products.

Smart training can be organized only when using e-learning technologies. Taking into account the new requirements for the students' competence it is necessary to change the approach to the design of training courses that should provide accessibility, openness, mobility, interactivity and flexibility applicable to the education of today. In these circumstances, it becomes urgent to develop the course architecture providing university students' smart training.

A course is understood as a complete meaningful unit of smart educational events, developed with view of the specific educational goals. The architecture of the course is a selection of different components and the course participants with a schematic indication of their interaction.

2. Research objectives, methodology and stages

The aim of the research is in the design, specification and validation of the courses architecture, providing smart learning of university students.

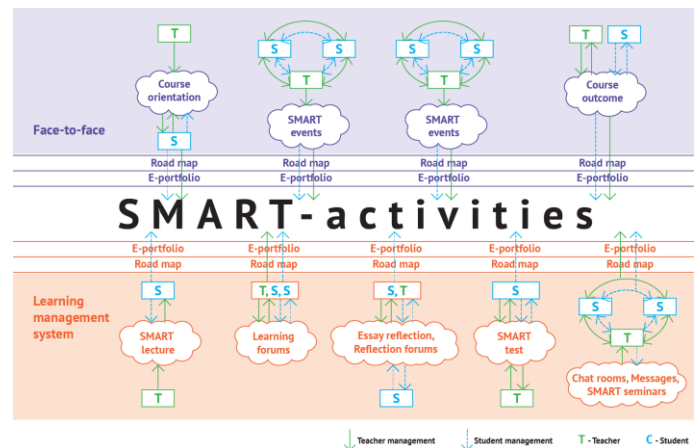The proposed course architecture is shown in Fig. 1

Fig.1. Architecture of Smart learning courses in higher education

A distinctive feature of the proposed courses architecture is its focus on carrying out classes without the teacher's systematic, consistent, oral monologue presentation of the training material that is typical of the traditional lecture. Instead, introductory, goal setting and final sessions are held, bearing information-explanatory function, in which the teacher refers to the course problems and goal, the plan and the logic of learning paths, and explains the methods of work in the training course [3].

In smart education the concept of smart lecture takes on a new meaning. With the advent of smart technology in human life, the lecture becomes an interactive, personalized, multi-format and easily accessible. Therefore interactive lectures should become an integral part of training courses architecture providing a fundamental theoretical component to the educational process. The main part of lectures is based on the students' studying theoretical material through the element "Lecture" of Learning Management System, followed by a discussion of the studied issues at the round tables, seminars, conferences and other smart events. Smart lecture allows the teacher to place the content in an appealing and flexible way. The teacher can use interactive lecture circuit, which contains a variety of ways and options for learning. For example, the theoretical material can be divided into small portions, after each of which the students are encouraged to answer test questions or a question, involving a detailed response in the form of an essay, depending on the results of which the system or the student chooses the next portion of the training content. The teacher has a possibility to track the student's work on the item. For the purpose of the students' self-control of mastering the theoretical

material, smart tests, such as multiple choice, or compliance, etc. are used.

As the need arises, the teacher in the mode 'face-to-face' conducts explanatory or corrective smart events, where the material causing difficulties for students and requiring the teacher's participation is studied. During these events the students discuss on an equal footing with the teacher the problem situations, illustrate their opinions and positions using a variety of visual materials. It should be noted that in contrast to the traditional training, in smart courses students become more active, learn to formulate questions, argue their position, and convince interlocutors. Such events are most effective if they are preceded by training in communication forums (chat rooms, wikis, etc.) of the e-learning course. Here the participants ask questions and discuss problems that they encountered in the implementation of practical tasks, as well as exchange views on educational issues. As a general rule, it is difficult for the teacher to listen and to assess each student's spoken language, and the use of educational forums allows overcoming this predicament, as well as evaluating the level of the students' competence in the theoretical part of the course and determining their scope and possession of the conceptual apparatus of the studied subject.

Modern educational process in university will be successful only if it is based on the principles of mandatory feedback [4, 5]. The undoubted advantage is the use of feedback in the process of students' reflection of their activity on reflection forums. Due to the use of this element students' reflection of their competencies is performed continuously. Namely, on the basis of performance in each block of educational activities the student, using a questionnaire for self-analysis and self-assessment, prepares a reflective report in an electronic form and sends it within the frame of the smart course. This allows the teacher not only to get an idea of the student's ability to adequately evaluate the level of completeness of the results of his work, but to analyze the results obtained in a timely manner, to predetermine the purpose of further work and to adjust the educational process to the particular student's needs.

TABLE 1. Fragment of the road map for the course "IT in Education" for students of pedagogical direction

No	1	2
Event	Round table "Secondary education: studying a computer or studying with a computer?"	Individual work + mutual control + self-esteem
Student's activities	Participation in the collective discussion of the problem, comparison of different points of view, opinions and suggestions in the discussion.	Student's work in the electronic instructor-led course: using the recommendations and given (and found) sources independent (in a co-operation mode) study of the material, performing interactive tasks; participation in educational forums. Student's preparing for participation in the seminar "Portrait of an IT-competent teacher".
Reporting documentation	Essay-reflection, photo-report of presentation materials at the round table "Secondary education: studying a computer or studying with a computer?", publishing essays in electronic course for discussion and evaluation by the teacher and group-mates.	Running interactive activities and participating in the educational forum "Teachers' IT competence. Ways to effective change"."
Place of event	School, e-learning platform of Kazan Federal University	E-learning platform of Kazan Federal University
Date		
Mark		
Signature		

In order to ensure the course personification, the possibility of the student's reflection, correction and prediction of the student's ascent to the goals, one of the "smart" elements of the course, in our opinion, should be the student's road map, a fragment of which is presented in TABLE 1.

One of the main problems in the control of the student's progress on the learning path is the lack of a clear individual plan and the lack of his awareness of the interim results. Therefore, it is necessary to have a step by step scenario of training events with a clear indication of activities, reporting documentation, event dates, and etc. Such a scenario will be called the "Course road map". The phrase "road map" appeared from the English "road mapping", which means the process of mapping activities in any sphere. The student's road map is in fact a student's plan of development through the events, taking into account all the known factors. In this case, in contrast, for example, with the course curriculum, the road map includes several development scenarios and is focused on a particular student. The basis of the road map is certain nodes or points at which it is necessary to make decisions important for the student in studying the course and depending on the current situation. The node corresponds to a definite stage of development and the expected time in which the student must reach this stage. It should be noted that changes can be introduced into the course road map. As a result, following the road map, the student together with the teacher is able to respond quickly to the changes in his progress.

Learning Management System creates and stores the results of each learner: the handed works, the teacher's evaluation and comments, and posts on the forum [6]. A mandatory student's road map extension is forming an e-portfolio of achievements. An important component developed by the author of the course architecture, is the formation of a single student e-portfolio for the course, including the results of classroom work. Thus, all the student's results of the course will be placed in the system.

The above-described components of the proposed architecture, and the indicated relationships between them, create the conditions for students' smart activity, their co-operation with the teacher providing successful development of professional activities. In these circumstances, the participants' roles change. Management of training course is carried out not only by the teacher but also by the students. The teacher acts as a consultant for the implementation of various educational-professional and professional actions arising in the course of training, and as an employee to address common problems in organization of cooperative work [7, 8]. A new smart content is formed by all participants while the students are going through the stages of the course.

3. Research results and discussion

The described course architecture was tested at Kazan Federal University. Kazan University keeps pace with the times, adhering to global trends in the development of science and education, and making a significant contribution to the development of the most advanced forms and methods of teaching. Among them are the innovative educational technologies, e-learning. The purpose of the e-learning introduction into the University education is to increase the efficiency of the learning process through the use of active learning methods and individualization of educational trajectories.

Smart learning testing took place in Elabuga Institute of Kazan Federal University from September 2014 to May 2016. The experiment involved 14 teachers and over 750 students.

As part of the experiment part of the classroom activities was transferred into the e-learning courses developed on the e-learning platform in Learning Management System. Part of teachers abandoned traditional lecturing almost completely.
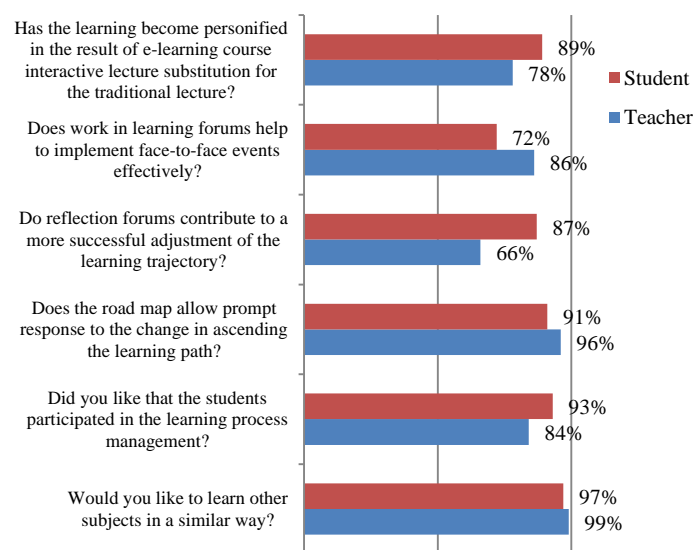

Fig.2. Results of testing participants' questionnaire

In order to get an idea of the effectiveness of the author's course architecture teachers and students were surveyed. As can be seen from the survey results, the majority of the respondents approve of this form of training. The students note such positive aspects as accessibility and openness of the course content; the availability of means of interaction with all participants in the educational environment through the forums, chats, workshops, etc.; the teacher's evaluation of the student's performance transparency, timeliness and informative character; the ability to manage their time; participation in the organization of the learning process; roadmap allowing to see the learning path clearly.

All the testing participants, without exception, noted that the undoubted advantage is the ability of the system to evaluate the student's work with the theoretical material automatically, which is impossible with lectures-monologues. The teachers expressed the view that the students' responsibility for the learning outcomes increased; the teacher's awareness about the state of students' learning also increased as the teacher knows about difficulties and successes, which allows adjusting the learning process to the students' needs.

Some teachers faced the challenge of creating lectures that should meet the requirements of the new format. Therefore, they need to improve their competence constantly, in particular, by immersing themselves in the training course built on the basis of the proposed architecture. As a result, the teacher is able to try on the role of the student, experience all the features of this training and prevent possible errors in the construction of their copyright courses. Teachers studying in an environment based on this course architecture are able not only to learn, but also to exchange opinions, help each other to resolve the difficulties that they may encounter.

4. Summary and Conclusions

The designed course architecture allows for a fresh look at the organization of learning through Learning Management System. This approach uses the system elements for the organization of the students' and teachers' cooperative smart work. The results showed that the rejection of lecture-monologue in favor of smart event format is not only possible, but also effective. With this organization of learning students become more active, independent, learn to design their own learning path and create new knowledge in cooperation with all the participants of the educational environment. One of the significant results of the architecture application is the student's willingness to implement smart activities in an open, interactive and multi-format educational environment.

The undoubted advantage of the proposed architecture is the student's work on the road map, which in turn generates a student's ability to implement self-diagnosis, planning and forecasting of his activities. This solves the problem of learning personalization in students' academic groups.

Furthermore, the advantages of the proposed architecture is its flexibility, which is the ability to add, move, arbitrary arrange the course elements at the author's judgement. The tested course architecture is equally well applicable to both humanities and natural sciences. The results of testing can be used to build training courses, providing flexible learning in an interactive learning environment.

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