QUALITY MANAGEMENT AS A CONDITION FOR THE DEVELOPMENT OF E-LEARNING IN A MODERN UNIVERSITY

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Abstract

E-learning development goes along with an increased attention to its quality. Quality management is based on the control not only over learners' knowledge but over learning process, its organization and used means as well.

The issue of quality management is being complicated due to the development of technologies and necessity of integrating diverse pedagogic and technological instruments into a unified learning environment. PLE and MOOC exacerbate the task of quality assurance in e-learning in an absence of common regulatory instruments and require searching for the new solutions. These solutions should ensure individualized education on the one hand, and solved management tasks concerning the monitoring of quality in education on the other hand.

This paper presents the results of Tomsk State University experience in e-learning quality assurance basing on such indicators as the quality of learning materials, delivery systems, communication, and learning process support. Opportunities for managing these indicators are reviewed with the help of the LMS MOODLE with basic instruments and specially designed services as a part of university information learning environment and infrastructure.

Keywords: E-learning, LMS MOODLE, users activity monitoring.

1 INTRODUCTION

E-learning development goes along with an increased attention to its quality. Quality management is based on the control not only over learners' knowledge but over learning process, its organization and used means as well. The quality of education is to meet the unified requirements despite its forms and the technoligies used.

Quality management in education attracts great attention in the research projects devoted to the methodological questions of quality management [1], [2] as well as to the challenges in quality management on different levels of education in various contexts including in e-learning management [3].

For quality assurance there are introduced the international management standards which include annual self-assessment and external audit such as the international standards ISO 9001:2008, model standards of business perfection of EFQM, model of award for quality in the field of education [4]. A method of independent quality evaluation depends on e-learning tasks. The globally spread mechanisms of the external e-learning quality assurance are professional-and-public accreditation and review of educational programs, institutional examination, public accreditation or audit of organization. They are still seldom used in Russia, while the tendency for wide spreading of audit and certification of management systems in the institutions relating to e-learning is obvious.

Therefore the strategic choice made by the majority of Russian e-learning system participants is connected with consistent institutional work on quality management that is to be aimed at continuous e-learning improvement. A systematic approach to quality management expects the constant analysis of requirements and expectations of e-learning system participants – students, instructors, employers, etc. for improvement of business processes in the e-learning system and their effective management. This paper is devoted to the analysis of mechanisms and tools of e-learning quality management in the educational organization and presents the experience of one of the leading Russian universities – National Research Tomsk State University.

In the e-learning quality management system there are some important quality indicators: of educational content, of learning technologies, and of learning outcomes. The certain quality indicators and their complexes are being chosen depending on the extent to which they influence the e-learning process quality and could be quickly estimated for actual use in the quality management system.

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These indicators include the quality indicators of learning materials, of electronic environment and of learning process support.

At the present point of e-learning development the most effective quality management instruments are concentrated in learning management systems – LMS. Although various forms of non-formal education extend the frontiers of virtual learning environment (VLE) to social media, specialized MOOC platforms, cloud services, etc., and enhance thereby individualization of learning and unique character of personal learning environments (PLE) [5], [6]. This could be confirmed by the conducted research projects and the e-learning development tendencies at National Research Tomsk State University (TSU). The comparative research of LMS features and social media [7], [8], demonstrated in the students' opinion the advantage of social media in such criteria as communication frequency and efficiency, learning motivation and emotionality, and group interaction efficiency. In 2015 the total number of TSU learners increased threefold thanks to learners of MOOCs created at the university.

In the paper the management capabilities of quality indicators of learning materials and communications under the multicomponent and multilayered electronic learning environment at the TSU example are considered.

Methodology of the study includes description of the empirical experience, statistical data processing and comparative analysis of the results.

2 QUALITY OF LEARNING MATERIALS

E-learning imposes requirements to the representation form of learning materials (multiple layers, interactivity, openness, etc.), as well as to the technologies (e-learning courses in LMS, MOOCs, network resources, resources with remote access, simulators, etc.). The evaluation of materials' quality is to be carried out at the content and technological levels.

One of the effective ways of learning materials' quality evaluation is their review by experts in a subject content and e-learning methods and technologies.

2.1 Review of e-learning courses in the LMS MOODLE

Introduction of the e-learning courses that passed the review indicates productivity of professional activities of the university instructor. The main goal of the review is to establish the extent in which e-learning course structure and content meet the Russian federal state educational standards and teaching materials of relevant subjects.

The key review stages of TSU on-campus e-learning courses are concentrated within a certain department. The experience has proven that this organizational principle is the most effective and appropriate due to the following reasons. Firstly, the expert (educational and methodical) commissions in each department could evaluate e-learning courses from the subject specifics. E-learning courses in humanities, natural and physical and mathematical sciences significantly differ in their content for quite obvious and objective reasons. Secondly, localization of the main review stage allows to increase professional activity indicators both of the department and of a certain instructor. Objectivity and independence of department expert commission reports are being administrated by the Institute of Distance Education that has the highest authority in e-learning courses review. However, within the university e-learning competitions there are established independent expert commissions and advisory councils.

The additional tool to monitor how well the learning process is equipped with the electronic training materials (concerning the educational program or department and university activity) is the on purpose developed service. It is a supplement to the LMS MOODLE which allows to carry out the analysis of e-learning courses quantity and status by differentiating them according to the academic degrees, the academic majors, labor input, and expert assessments.

2.2 Review of MOOCs

The course content review is performed by the specialists in the subject area of the MOOC. The review objectives are as follows:

- to evaluate the MOOC relevance, exhaustiveness and reliability of the provided data, the course potential target audience;

- to define if the references are reliable and author's comments are reasonable;
- to understand if the examples and illustrations provided by the author are correct and appropriate;
- to make the mind concerning methodological value of the course, if it meets the requirements to the way of teaching the subject if the MOOC is planned to substitute an on campus course and to be integrated into the curriculum. Therefore, answer the question "Do the course academic workload, curriculum, assignments and references respond to the on campus course requirements?";
- to consider the way of presentation: the material is easy to comprehend, there is enough number of examples in the course, the material is well-structured, it correlates with the MOOC topic and the target audience;
- to see if the author has any presentation peculiarities, whether they are appropriate to the course (should we get rid of them or vice versa recommend the author to keep on practicing them in the video lectures).

The expert should provide valid conclusions about the MOOC materials in general, constructive feedback, recommendations and suggestions on improving the MOOC.

In addition to the MOOC content review at TSU, the MOOC quality is also analyzed by learners' questioning. It has the following results: 93% of 417 learners (from 1668 people in general population) considers the video lectures as the most useful MOOC elements, 33% rates tasks and additional materials as helpful elements, 85% will use MOOC materials in professional activity, 95% will recommend MOOC to the friends. In TSU MOOC learners' opinion, their level of knowledge in the subject has grown more than twofold. In the entering questionnaire we also include the questions concerned with learners' recommendations about MOOC quality improvement. The analysis allows the MOOC team to make corrections in the course materials as appropriate.

2.3 Quality evaluation of learning materials in social media and cloud services

The most difficult stage of learning materials' quality evaluation is work with social media and cloud services, as the materials there are marked by high mobility and variability. In this regard TSU staff uses by developing the course content in the LMS MOODLE those cloud based apps that expand the LMS functionality without its duplicating. The most popular of them are timelines, mindmaps, chatbots, and interactive presentations. The quality evaluation of learning materials presented in these formats is carried out within the review process of on-campus e-learning courses and MOOCs described above.

3 QUALITY OF LEARNING PROCESS SUPPORT AND PEDAGOGICAL COMMUNICATIONS

The quality indicators of learning process support and related pedagogical communications are the most difficult to be measured.

3.1 Learning process support in LMS MOODLE

At TSU there is developed a service of users' activity monitoring in LMS MOODLE to work with these indicators. The service is available as an auxiliary application in the LMS MOODLE to the staff of dean's offices and specialists responsible for e-learning in each university department.

The service allows to carry out the monitoring of students' and instructors' activity, to establish a rating of the most active e-learning instructors that is a significant motivator. The instructor' activity monitoring is based on the statistics data taken from LMS MOODLE and considers the following indicators:

- average activities in content viewing done by one student;
- average activities in completing the assignments and in learning communication done by one student;
- average instructor' activities in content creation calculated per one student;

- average instructor' activities in learning process support calculated per one student;
- a total number of students in the LMS enrolled to the courses designed by the certain instructor;
- a total number of launched e-learning courses designed by the certain instructor.

The monitoring data are downloaded as a report in the table form by using a special script. Various types of students' and instructors' activities are differentiated on the base of analysis of all the user's actions in the LMS MOODLE. The example of the distribution of activity types within the monitoring carried out at TSU you could find on the link (https://goo.gl/dZ0hYv).

To establish a rating of instructor's activity the obtained statistics data are transferred to points. Each of six criteria is evaluated on a scale from 0 to 10. The received points are multiplied by diverse weight factors and than summed up. The rating of instructors' activity is defined within each university department and at the university in general.

The monitoring allows the university administration to make the managerial decision concerning encouragement of active instructors, to reveal the best e-learning practices, to analyse e-learning success rate at the departments for its further development. The monitoring and the rating increase instructors' interest in e-learning and their motivation for active using of distance educational technologies in learning process as well as demostrate an effective approach to e-learning quality management in a higher education institution.

3.2 Learning process support in MOOCs

For quality evaluation of MOOC learning process support by course authors or their assistants a TSU MOOC curator on the Coursera platform monitors the admin board and analyses learners' and instructors' activity at course forums day-to-day. This monitoring allows to conclude that an instructor spends from 3 to 5 hours on average per week to support his/her MOOC. It depends on the course learners' number, on the assignment types and the MOOC subject. The experience has proven that the instructors are more involved into the interaction with learners if their courses contain peer review or programming assignments. For example, the authors of MOOCs in programming and theory of probability spend from 5 to 7 hours a week for learners' consultating. The instructors of the courses with test questions with a multiple choice spend at the forums from 2 to 4 hours per week depending on the learners' number and the course subject.

The monitoring allows the university administration to decide to include this work into the instructor' individual working plan or to give him/her financial encouragement.

3.3 Student support in social media communities

In contrast to the LMS the range of standard tools for analytics in social networks does not allow to obtain enough data for quality analysis of learners' communications in an educational community. It could be compensated by external special services. The web app jagajam.com developed for activity monitoring in social networks communities allows to receive quantitative data for learners' activity analysis and content demand. The app provides the following data:

- a number of active and uninvolved participants;
- an average level of activity according to the time of day and the day of week;
- an average involvement level;
- a total number of certain types of activities (likes, comments, reposts, publications);
- a rating of users according to their activity;
- a rating of publications according to their popularity;
- time of learners' presence at the community.

The analysis of these quantitative data allows to evaluate students' and instructors' work activity in an educational community in social networks and to integrate these data with monitoring results into the LMS for complex assessment of support quality.

4 STUDENTS' EVALUATION OF QUALITY OF EDUCATION

Students are one of the stakeholders group of education quality management. Their ideas of quality are important for formating a complex evaluation system considering opinion and interest of all the parties involved. For identification of e-learning evaluation criteria from the users' position there was held a pedagogical experiment with 23 TSU Master's degree students. The students were offered to state the e-learning evaluation criteria. The criteria were combined in five categories: quality of teaching materials, learning process management, individualization of learning, pedagogical communication, test and assessment system.

According to the experiment results the quality of learning materials in an e-learning course is associated by the students with the following characteristics:

- compliance of learning materials to the course subject, goals and objectives;
- completeness of teaching materials for the course: course syllabus, course curriculum, main and additional learning materials, testing content, instructions on passing of a course;
- sufficiency of learning materials for successful course completion;
- sufficiency and clearness of instructor's recommendations for self-study;
- clearness of content of learning materials;
- diversity of learning materials' formats;
- availability of interactive and learning materials: mind maps, interactive infographics (animation), timelines, interactive video, informative games, virtual laboratories.

It is worth mentioning that students emphasized by determining the quality criteria of teaching materials that their content and a representation form could stimulate interest in a subject.

The experiment participants defined a separate group of the criteria measuring quality of learning process organization in the electronic environment:

- compliance of time spent for studying an e-learning course to the subject goals and objectives;
- logical sequence of course topics and assignments, their compliance to the syllabus and time schedule;
- online-on-campus learning balance for succesful educational process.

From the point of students' view individualization of learning could be evaluated according to the following indicators:

- availability of assessments with various types of answer to choose from: test, essay, project, personal task, etc.;
- possibility to establish a personal learning model for each student considering online-on-campus learning balance;
- possibility to reverse the roles during course studying: student, expert, instructor.

The system of pedagogical communications in e-learning could be evaluated by the following criteria:

- using the motivation methods by the intsructors in the LMS MOODLE for successful and prompt course learning: deadlines, notifications, rating system and encouragement of the most active students, support of retarded students;
- instructor's access for feedback in the electronic environment;
- constructivity and richness of the instructor's comments and remarks.

To the evaluaton system of learning results the students have the following requirements:

- compliance of assignments to the learning material;
- clarity and clearness of instructor's requirements to task performing;
- use of various assessment forms: tests, tasks, discussions at a forum, peer-to-peer review;
- compliance of assignments' criteria to their complexity, more difficult and labor-intensive criteria are estimated by an higher point;

- compliance of assignments' quantity and complexity to the course goals and objectives;
- timely checking and assessment of assignments;
- compliance of the received markes to the students' work.

In the questionnaire there is offered the evaluation scale from 0 to 4 points, where 0 means that e-learning does not correspond to the criterion, 1 means that e-learning does not correspond to it essentially, 2 means that e-learning corresponds to the criterion partially, 3 means that e-learning corresponds to it essentially, 4 means that e-learning corresponds to the criterion completely. The questionnaire example in Russian is avaliable in Google form here https://goo.gl/QEsNRq. The questionnaire and its results allow to reveal problems and successful practices both in a certain e-learning course and within a department in general.

The questionnaire tested on 160 students (1% of total number at TSU) approved that e-learning courses were ranked with 3-4 points in the majority of criteria. Only individualization of learning was evaluated with 2-3 points according to the criteria (Fig. 1).

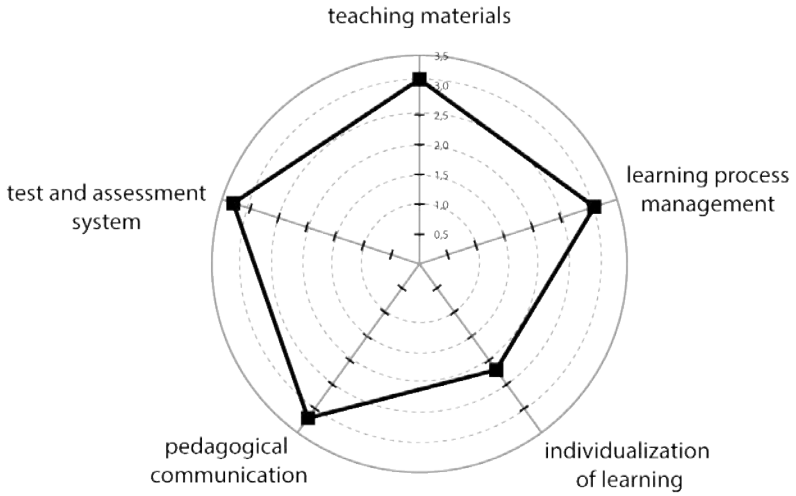

Fig. 1. Students' evaluation of quality of e-learning courses.

The pilot questioning results indicated that students' ideas of e-learning quality correspond in general to the design approach of e-learning courses and to the practice of their use at the university. The rather low point for individualization of learning could be explained with blended learning of TSU students where personalized approach could be implemented in electronic environment as well as within on-campus learning and consultating.

The experiment results could be specified through involving in discussions within a wide group of students, joint defining the quality evaluation criteria, accounting the specific features of the level of education and academic majors. Further work in this direction will allow to consider students' evaluation within the e-learning quality management system at the university, to develop it to a more complex, objective and transparent system.

5 CONCLUSION

E-learning quality management is an effective tool for development of this educational format allowing to apply qualitative educational products for various target audiences, in view of various pedagogical tasks, etc. and to achieve the quality of on-campus learning which is still a certain benchmark of educational activity outcomes.

LMS is an effective evaluation tool and an e-learning quality assurer. Developing individualization of learning and expansing personal environments lead to complication of e-learning quality management and evaluation process through involving non-formal technologies the quality of them is difficult to measure using traditional tools. Thus, individualization of e-learning is followed by developing personal learning environments available for a single participant of learning process.

The issue of quality management is being complicated due to the development of technologies and necessity of integrating diverse pedagogic and technological instruments into a unified learning environment by introducing various additional tools into a familiar LMS. These tools establish PLE or are connected with MOOCs. PLE and MOOCs exacerbate the task of quality assurance in e-learning in an absence of common regulatory instruments and require searching for the new solutions. These solutions should ensure individualization of learning on the one hand, and solved managerial tasks concerning the learning quality monitoring necessary for formal education at the university on the other hand. The mechanisms for evaluation of quality of such environments are to be found. Integration of LMS, PLE and MOOCs grows to one of the effective tools for e-learning quality management under expansion of informational and educational environments, development of technologies and diversification of educational tasks.

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