

# Methods For Evaluation Of The Education Quality In Higher Education Institutions

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**Abstract:** *The article aims to disclose the essence of the “education quality” concept, to study the international approaches and concepts of the higher education quality evaluation, to analyze specific methods and tools within one of the approaches. Establishing education quality assessment necessitates choosing the teaching personnel of higher educational institution, as well as a target group of students and independent experts in the field of organization of the educational process, on a distance basis particularly. Monitoring requires using such methods as interviews, surveys, questionnaires, and similar. The results were processed according to the authors’ algorithm allowing to calculate the quality of education. The authors’ interpretation of the concept of “education quality” is proposed. Given the insufficient study of the topic of distance education in the domestic scientific discourse, authors’ attention to this problem is an important contribution to study of the issue of distance education. The methods used to evaluate the education quality in higher education institutions at the international level are an integral element in the development of the educational space, although they cause certain controversy and criticism. The authors advise to select the methods for evaluating the educational process quality with account of the specific evaluation stage and purpose.*

**Keywords:** *competence, education quality, distance higher education, education quality evaluation, monitoring.*

## 1. INTRODUCTION

In the modern world the quality problem has become of exceptional importance. The penetration of the quality philosophy into all spheres of life is conditioned by the need to change the society's priorities, the globalization of interstate relations, and the integration processes that take place in the society and education in particular. The world experience convincingly proves that education, in particular, higher education, plays a decisive role in conducting innovative research; contributing to the world bank of knowledge; integrating national educational institutions into international educational and scientific networks; stimulating the mobility of teachers and students; ensuring ties with business, and influencing the formation of the national elite, as well as improving the system of economic and political governance.

Education, which is a key element in the creation and dissemination of knowledge and social experience, is a powerful factor in the development of human potential and economic growth (Sazonova, 2017) due to the ability of the human capital to increase the effectiveness of all other types of resources (Dudukalov & Laptander, 2015). The society’s transition at the

beginning of the 21st century to a new phase of the socioeconomic and sociocultural development is characterized by the expansion of the range of market reforms and as a result, the search for more efficient methods of achieving competitiveness in various spheres of social activity (Johnsen, 2016).

### *Research Problem*

In view of the foregoing, there is no doubt that management of a modern higher educational institution needs to switch from subjective characteristics of phenomena and processes to more rigorous and objective evaluation. In this regard, the problem of developing a clear mechanism for monitoring the evaluation of the education quality in higher education institutions, which meets the modern requirements of the evolutionary transformations of the society, acquires important ideological, social, and economic significance and is determined by various factors, starting with peculiar features of an individual higher educational institution and the national education system in particular, and ending with the specifics of the educational space as a whole.

In this regard, the arising question concerns the need to improve the quality management system when preparing future specialists, namely the quality management system for teaching in higher educational institutions with account of the current requirements of employers for specialists. However, the prerequisite for improving the quality management system is the clear formalization of approaches and methods for evaluation of the education quality in higher educational institutions, which generally determines the choice of the research topic, its conceptual platform, and the scientific tools for cognition.

### *Research Focus*

The study is an analytical survey, which seeks to determine methods and parameters of assessing education quality and teachers' competence at higher education establishments with a special attention on distance learning. The study is largely descriptive and prescriptive. It offers useful summary of existing assessment approaches and outlines advantages of applying the method of fuzzy logic for education quality evaluation.

### *Research Aim and Research Questions*

Education quality is a category, which in its essence reflects various aspects of the educational process: philosophical, social, pedagogical, political, legal, demographic, economic, etc. The World Declaration on Higher Education, adopted at the International Conference in November 1998, stated that the quality of higher education is a multidimensional concept that encompasses all aspects of the higher educational institution's activity: educational and academic programs, the educational base, and resources (World declaration..., 1998). But today, this definition seems unfit for direct practical use, since it does not consider the diversity and contradictory nature of the needs of individuals and the society, spiritual and material needs, etc. Thus, the first goal of the study was to determine, which aspects of higher education should be assessed to reveal the quality of distance education at higher education institutions. Given the innovativeness of distance education as a concept, answering this question would further domestic studies in the field.

The world science has already developed various approaches and methods for assessing the quality of education in higher educational institutions. However, the existing approaches of education quality evaluation cannot be considered universal. Two best known international assessment methods are characterized by either relying on state evaluation or excluding

external assessment (Miller, 2016). Some studies are nationally specific – thus, we know that evaluation of higher education in the United Kingdom is conducted mainly through self-evaluation and based on public opinion, while in the American system evaluation consists of accreditation of educational institutions and professional educational programs, as well as of objective assessment of students' knowledge and abilities (Noaman et al., 2017).

At the same time, having familiarized ourselves with the systems of higher education quality evaluation in Finland, Poland, Sweden, Estonia, and the Netherlands, we concluded that higher educational institutions prefer their own developments and models based on the ISO 9000 international standards, the principles of the European Fund for Quality Management EFQM and TQM. According to ISO 9004: 2009, educational institutions determine the evaluation aspects and criteria on their own, based on the established organization profile (Klenowski & Wyatt-Smith, 2014).

In the Eastern Partnership countries (Russia, Kazakhstan, and Kyrgyzstan), evaluation is provided by independent accreditation services; in addition, there are unified electronic systems of educational statistics, as well as internal systems for monitoring the education quality by state research institutions (Zotova, 2017).

According to the UNESCO methodology, a system of three indicators is used to evaluate the quality of education in higher education institutions, each of which is weighted by importance: the quality index of the educational and pedagogical potential (competence of teachers) is 50%, the quality index of the educational process is 30%, the international recognition index is 20% (Kellaghan & Greaney, 2001). In the author's opinion, this approach is the most comprehensive one; therefore, it seems appropriate to formalize specific methods for evaluating the quality of education in higher education institutions precisely within the framework of this approach.

This approach perfectly overlaps with fuzzy logic, therefore, the research sought to reveal benefits of applying fuzzy logic method to evaluate the quality of distance higher education.

## **2. RESEARCH METHODOLOGY**

### **Research Design**

According to the author, the quality of education is a system of characteristics of the educational process, which includes a balanced unity of the quality of the conditions, the quality of the educational process, and the quality of the result, which determine consistent and practically effective formation of personal competence, as well as conformity of the educational system with the goals, needs, and social standards of the society development. This definition of education quality dictated the methodology of the research.

In the research the authors examine the use of an integrated approach, fuzzy logic in particular, in determining the level of competence of the teaching personnel of a higher educational institution using the example of ensuring effective distance education. Competence is defined as a combination of knowledge, skills, values, and attitudes, used in everyday life (Tarasenko, 2017). To assess the competence of a particular teacher who discharges certain duties, it is advisable to monitor targeted academic groups, as well as experts and specialists in the direction of organizing and ensuring a successful educational process.

### *Sample*

For research it is necessary to choose the teaching staff of higher educational institution, as well as a target student academic group and independent specialists in the field of education

for monitoring and as a result determining the level of competence of teachers who organize the distance learning process, distance learning course in particular. Conducting surveys, interviews and trial tests would eliminate the ineffective distance learning courses, as well as improve successfully developed programs.

In addition, it is important to consider world experience in developing the concept of assessing the quality of education. For example, the Academic Ranking of World Universities (ARWU) covers mainly the indicators related to the scientific activity, in particular: the number of graduates and employees who are laureates of the Nobel or Fields Prize; the number of cited researchers in 21 categories; the number of articles published in Nature or Science (journals); the ISI citation indexes for the natural and human sciences; the indexes of journals; the size of the university (Dobrota, 2016). The Times Higher Education World University Rankings cover 13 basic indicators, which are grouped into five categories: teaching, international outlook, industrial inventions and innovations, volumes, revenues and reputation for research, as well as citations (Stack, 2013).

### *Instrument and Procedure*

Determination of theoretical and practical value of distance learning course is provided by an individual assessment – the first impression of the target group of students; assessment of small groups through surveys, interviews, tests, testing of individual elements of the course through interaction with other members of target group; regular assessment to conduct a second qualitative analysis of the development and organization of the course. It is important to consider the review of distance learning courses by independent experts in the field of planning and organization of the educational process.

### *Data Analysis*

Qualitative data obtained from questionnaires of students of the target group, specialists in the field of education, based on remote in particular, are analyzed by reviewing documents. To determine the level of teachers' competence, an algorithm for using the fuzzy logic method was developed.

## **3. RESEARCH RESULTS**

Methods for evaluating the competence of the teaching staff of higher educational institutions

Thus, the competence of a teacher should be understood as his ability to effectively perform his job duties or the functions assigned to him. Undoubtedly, competence evaluation is a multi-criteria task; therefore, it requires an integrated approach. In this case, it seems reasonable to consider competence as a fuzzy discrete set, whose values are the required competences, and the membership functions of the elements of the set characterize the degree of mastering this competence by the person, which generally makes it possible to use fuzzy logic methods for its evaluation.

Next, we consider in more detail the peculiar features of the fuzzy logic method application. First, on a discrete set of competencies  $Y = \{y_j : j = 1, m\}$ , we determine the membership functions  $\mu_D(y_i) \in [0; 1]$  of fuzzy set D "Requirements that are necessary for the effective performance of duties and functions in a particular job position." These membership functions characterize the reliability, priority, importance of the relevant competence for a particular job position or function.

Discrete fuzzy set D is recorded as follows (1):

$$D = \langle (y_1 / \mu_D(y_1)); (y_2 / \mu_D(y_2)); (y_3 / \mu_D(y_3)); \dots (y_n / \mu_D(y_n)) \rangle \quad (1)$$

For each job position, the set of competencies and the corresponding membership functions will be different.

In order to evaluate quantitatively the competence of a particular teacher, it is advisable to use testing, interviewing, testing, monitoring relevant classes, and other methods. Competency evaluation should be reduced to a scale from 0 to 1. Thus, for each teacher, his personal fuzzy competence vector A is defined as a fuzzy set, which reflects his competence. To find  $\mu_A(y_i)$ , a group of experts can be involved, who answer the question: "Is competence  $y_i$  inherent in the respective teacher?" When expert  $L_x$  from the total number L of experts answers acceptably, then (2):

$$\mu_A(y_i) = \frac{L_D}{L} \quad (2)$$

Since the answer to the above question is, as a rule, multivalent, experts can apply not only binary logic:  $\mu_{A\gamma}(y_i)$  is either 0 or 1, where  $\gamma$  is the number of the expert, but also fuzzy logic (a significant truth scale), specifying value  $\mu_{A\gamma}(y_i) \in [0; 1]$  (subjective evaluation). When the number of experts is L, then we take the weighted average of these estimates evaluations for  $\mu_A(y_i)$  (3):

$$\mu_A(y_i) = \frac{\sum_{\gamma=1}^L k_{\gamma} \mu_{A\gamma}(y_i)}{\sum_{\gamma=1}^L k_{\gamma}} \quad (3)$$

where  $k_{\gamma}$  is the factor of competence of the  $\gamma$ th expert.

In order to determine the level of competence of the teacher through the competence coefficient value, we need to set the linguistic variable "Person's competency coefficient", which is determined by the following tuple (4):

$$\langle E, E_j, j = \overline{1,5}; \mu_{E_j}(x) \in [0;1], x \in [0;1] \rangle \quad (4)$$

The terms of the Competence linguistic variable can be: E1 — very low competence; E2 — low competence; E3 — medium competence; E4 — high competence; E5 — very high competence. For a more adequate definition of terms, the Delphi method can be used.

Thus, the algorithm for applying the fuzzy logic method to assess the competence of the teaching staff of higher educational institutions consists of the following stages:

1. Assigning a set of competences for a job position or functions.
2. Defining the functions of the competencies' membership (setting a fuzzy set).
3. Defining the fuzzy set "Competence of the person."
4. Defining the linguistic variable "Competence of the person".
5. Calculation of the coefficient of competence of the person.
6. Calculation of the functions of the teacher's competence factor for the corresponding terms of the "Competence of the person" linguistic variable.

#### *Methods for Evaluating the Educational Process Quality*

In practice, in the evaluation of the quality of an educational process, a standalone procedure is the quantitative (statistical) and qualitative (with the help of expertise) measurements, which together enable obtaining an integrated estimate. However, the main problem of determining the education quality through the prism of any measurement is connected with the choice of criteria, parameters, and methods of the measurement.

Under these conditions, it seems that one of the decisive factors that makes it possible to clearly formalize the education quality measurement methods is the specific stage of the evaluation and its purpose.



Table 1 provides the stages of education quality evaluation and methods corresponding to each stage using the example of distance learning at higher educational institutions.

**Table 1**  
*Stages and methods for distance learning quality evaluation*

Stage	Purpose	Methods
Planning assessment	Improvement of the quality of pedagogical planning of a distance learning course	Involving third-party planners or experts familiar with the pedagogical planning strategy and teaching theory
Expert review	Avoidance of the development of a course that cannot be effectively used by potential students because of unacceptable content, incorrect approach to its presentation, missing or insufficient materials, etc.	Involvement of experts from teachers, test developers, and other professionals who can draw a conclusion about the suitability of the course content and training activities for the target audience
One-on-one evaluation	Work with the course prototype (the data obtained give the first idea of the opinion of real students about the course, the convenience of using it, and the quality of the materials)	A meeting of a member of the course development team with a representative of the target audience
Evaluation of small groups	Approbation of the course components in an environment inviting to the interaction between the target group representatives	Conducting surveys, group interviews, trial tests, etc.
Current evaluation	Conducting a second qualitative analysis of the course planning and development	Regular, current evaluation

In addition, to quantify the quality of the educational process, it is expedient to use the symbolic mathematics methods MathCad. In this case, it is necessary for the self-analysis of the education quality in higher educational institutions and the level of development of certain quality indicators, as well as for the possibility of comparing the quality of education in different educational institutions, to form a matrix of education quality indicators by certain criteria, which matrix in mathematical notation will have the following form (5):

$$P: \begin{pmatrix} P_{11} & P_{12} & \dots & P_{1n} \\ P_{21} & P_{22} & \dots & P_{2n} \\ \dots & \dots & \dots & \dots \\ P_{m1} & P_{m2} & \dots & P_{mn} \end{pmatrix} \quad (5)$$

For example, a system of indicators for assessing the quality of the educational process of a higher educational institution can be formed by the following 10 parameters:

1. General indicators of development.
2. Indicators of the formation of the student cohort and the content of the specialist training.
3. Indicators of the organizational, scientific, and methodological support of the educational process.
4. Characteristics of the teaching staff.
5. The state of development of the educational material base.
6. Indicators of the effectiveness of educational work and the state of the social sphere

development.

7. Characteristics of the research work.
8. Financial and economic activities.
9. The output results, the use and adaptation of specialists.
10. International liaison.

Quantitatively, the value of the quality of education in higher educational institutions can be estimated by the following formula (6):

$$Q = \sum_{i=1}^n \sum_{k=1}^m v_{ik} \cdot P_{ik} \quad (6)$$

where  $v_{ik}$  is the weight coefficient of the indicator, reflecting its importance;

$P_{ik}$  are the indicators that ensure the quality of higher education;

$n$  is the number of parameters;  $m$  is the number of indicators in each parameter.

Calculations should be performed in the following order:

1. The value of each indicator  $P_{ik}$  is multiplied by corresponding weighting coefficient  $v_{ik}$ , that is,  $v_{ik} \cdot P_{ik}$ .

2. For each parameter (from  $k = 1$  to  $k = m$ ), we need to find the total of the obtained products (7):

$$\sum_{k=1}^m v_{ik} \cdot P_{ik} \quad (7)$$

3. Find the total of all indicators for all parameters (from  $i=1$  to  $i=n$ ), that is, adding all the terms obtained in the previous step.

Experience shows that the main criteria for the quality of the educational process are indicators of graduate employment, international relations, research work, scientific and methodological support of the educational process. These indicators are the most important for obtaining better results from the view point of both educational service consumers and the management of the educational institution.

#### Methods for international recognition evaluation

To date, independent rating agencies and authorized institutions in order to evaluate the international recognition of a higher educational institution form a variety of ratings, both regional and global, using a wide range of different methods, tools, and techniques.

It should be noted that almost all of them are aimed at evaluating several aggregated indicators, the composition of which varies depending on the purposes and direction of the rating (for example, the Academic Ranking of World Universities (ARWU), the Times Higher Education World University Rankings).

It should be emphasized, of course, that along with a large number of enthusiasts of university ratings, there are many critics who substantiate either the inconsistency of certain indicators and methods of their calculation, or the problems related to financing, representativeness, inadequate selection of indicators, and biased conclusions and recommendations. However, the existing reality is that regardless of the methods used, evaluation of the international recognition of a higher educational institution, in its function as an indicator of the education quality, exists, is formed, tracked, and used by all stakeholders of the educational process as the guide for their development and decision-making.

#### 4. DISCUSSION

To date, a wide range of different approaches and concepts has been developed to evaluate the education quality in higher education institutions, which in turn determines the list of

methods for conducting evaluation procedures. The specified approaches and, accordingly, methods reflect the specific nature of the definition of the “education quality,” which has never been unambiguously interpreted among experts and scientists, as well as reflect the peculiar features of national education systems, higher school development strategies, requirements of international standards, etc.

Domestic scientific researchers (Raev, 2018; Glushko & Zueva, 2018; Borzov et al., 2016) consider that the problem of assessing the quality of education remains relevant to this day. This is directly related to permanent changes in the market sector and as a result, to high qualification requirements of graduates of higher educational institutions (Hasan et al., 2019). Therefore, an objective, reliable, public and understandable system for monitoring and assessing the quality of education is a very important and relevant issue (Raev, 2019). Despite the active monitoring, ratings, and surveys conducted in Russia to assess the quality of higher education, an independent assessment of students’ knowledge is at the development stage, which has led to the implementation of various projects and programs lately – monitoring of independent assessment of the employees’ qualification, assessment model qualities of higher and additional professional education (Raev, 2018) – and determines authors’ scientific interest in this relevant problem.

A special requirement due to the formation of modern economy is the modernization of the higher education system by expanding the use of information technologies that are consistently presented in distance education (Modorskaya et al., 2014). Without monitoring distance learning, its quality and training, it is impossible to imagine developed and competitive system for use of distance learning technologies in higher education (Alajmi, 2019), which should clearly respond to the needs of students and the labor market.

This research will help educators to analyze their own training courses and / or prepare and conduct objective monitoring of the quality of educational process, remote in particular. Politicians should pay attention to the problem of establishing an independent and objective assessment of education in higher educational institution, and the professional competence of teachers. In addition, representatives of the Ministry of Education of the Russian Federation should develop a clear regulatory framework for regulating distance education (Modorskaya et al., 2014).

The research would help to identify weaknesses in training courses, for distance learning in particular, as well as in higher education institution in general. In addition, this scientific work would help to determine promising areas and technologies of education, that positively affect the development of higher education system, distance learning in particular.

## **5. CONCLUSIONS AND IMPLICATIONS**

Considering the variety of approaches to defining the “education quality,” the author's interpretation of this concept is proposed in the process of the research. The methods for the education quality evaluation in higher education institutions are analyzed through the prism of the UNESCO's methodology, which is based on three indicators: the index of the teaching potential quality, the index of the educational process quality, and the index of the international recognition, which are of different importance and significance.

To evaluate the quality of the pedagogical potential, that is, the competence of the teaching staff of higher educational institutions, it is suggested to use the methods of fuzzy logic, a detailed algorithm for the implementation of which has been developed in the article.

In the author's opinion, given the complexity of the selection criteria, parameters, and methods of measurement, it is advisable to select the methods for evaluating the educational process quality with account of the specific evaluation stage and its purpose. The specific stages of evaluation, the purpose of each of them, and the corresponding methods have been



provided through the example of the quality evaluation of distance learning in a higher educational institution. In addition, for the purpose of quantitative evaluation, it seems appropriate to apply the methods of the symbolic mathematics MathCad. Using the model system of indicators consisting of 10 parameters, we contoured the enlarged assessment stages and their features.

An analysis of the methods for evaluating international recognition of higher educational institutions has made it possible to define the existence of a multitude of ratings, both regional and global, in the compilation of which numerous methodological tools are used, which allow evaluating various aggregated indicators.

Since the developed authors' algorithm, used in the study to assess the competence of teachers of higher educational institution, was not used earlier, it is quite naturally, the applied methods are not ideal and in some cases the procedure for their use is imperfect as well, however, these ratings are crucial because they serve as indicators of the quality of education for all stakeholders in the educational process and make them an integral element in the development of educational space around the world.

Further scientific research requires the topic of advantages, quality and prospects of distance education, as well as the problem of objective and independent assessment of the quality of higher education and the professional competence of teachers.

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