# ABSTRACT

dissertation research by A. Kazanbayeva's thesis topic is «Development of an intellectual system for evaluating learning outcomes» for Doctor PhD degree in 6D075100 – «Computer Science, computer engineering and management»

**Relevance of the study.**

The current level of development of Kazakhstan is focused on the accelerated promotion of the state into the community of the 50 most competitive countries in the world. In this regard, it is necessary to give impetus to the development of the higher education system to train specialists in new industries within the framework of this economy. To do this, it is necessary to update professional standards in accordance with the requirements of the labor market and the best international experience in the field of on-the-job training.

However, the crisis associated with the COVID-19 pandemic has made its own adjustments to the development of the higher education system. The transition to broader online learning accelerated, which required the development of new solutions for online management and evaluation of learning outcomes. The problems that have arisen in the field of education are primarily related to ensuring the continuity of the entire educational process, as well as, in particular, maintaining the integrity and effectiveness of online testing. In addition, many systems for evaluating learning outcomes used in universities have become inaccessible or impossible to use effectively. Thus, the relevance of this study is due to the need to develop models and methods that allow to adapt the assessment and certification and introduce modern technologies in the process of monitoring and evaluating the learning outcomes of students.

Due to the widespread introduction of online learning, knowledge control systems have become particularly relevant for the development of control systems based on testing.

**The research goal** is to develop an intellectual system that contributes to the diagnosis of learning as a consequence of the achieved learning outcomes by applying the developed models, methods and algorithms.

**Research tasks.**

Within the framework of the formulated goal, the following tasks were set and solved:

- to study and analyze the system of evaluation of educational results of students, including methods and models of knowledge assessment;
- to analyze proctoring techniques;
- to analyze and compare testing methods;
- to study and investigate the evaluation of learning outcomes by the adaptive knowledge assessment method;

- to develop a model of an intellectual system for evaluating and managing learning outcomes;

- to develop an algorithm for integrating ready-made proctoring systems into the structure of the test system;

- develop the structure of an intellectual system;

- to evaluate the possibility of using the entropy approach for effective management of the;

- develop a module of an intellectual learning outcomes assessment system;

- to test an intellectual system for evaluating learning outcomes.

**The object of the study** is an online control system and management processes for evaluating learning outcomes.

**Subject of research:** Models, methods and algorithms in the system of monitoring the activity of students and evaluating their learning outcomes.

**Research methods:** analytical research, methods of management theory, system analysis, design of intellectual systems, group expert assessments, mathematical statistics.

**The theoretical basis** of the study was the works of domestic and foreign scientists:

A huge contribution to the formation and development of educational process management by the luminaries of post-Soviet civics: V.P. Bespalko, P.Ya. Galperina, I.A. Zimnaya, B.G. Ilyasov, T.P. Kostyukova, O.E. Lebedev, V.V. Martynov, V.A. Slastenina, L.R. Chernyakhovskaya, B.F. Skinner, etc.

Among the modern scientists engaged in the study of information support and management of evaluation results, it should be noted the works of: V.S. Avanesov, V.A. Veksler, V.A. Koroz, A.N. Mayorov, E.G. Matviyevskaya, V.V. Ovchinnikov, I.I. Bejar, H. Wainer, etc.

The dissertation uses the works of domestic, foreign, as well as scientists from abroad: S.D. Danilova, E.A. Konopko, V.P. Kulikov, V.P. Kulikova, S.I. Makarov, V.V. Martynov, G.M. Mutanov, L.P. Fandorova, E.V. Shevchuk, A.V. Shpak, H.Brides, P. Buet, P. Godfroy, J. Julliand, N. Tilmann, S. Mudraya.

**The scientific novelty** lies in the following provisions and results:

- the model of evaluation of learning outcomes by the method of adaptation of knowledge assessment is presented;

- the entropy approach is proposed as an indicative characteristic of the learning and certification process;

- a method for managing the processes of an intellectual learning outcomes assessment system has been developed;

- a module of an intellectual learning outcomes assessment system has been developed (for the use of oral/written knowledge control in an online format);

- a method of illustrating the results of the functioning of an intellectual learning outcomes assessment system is presented.

**Practical and theoretical significance.**

The main practical significance of the research lies in the fact that the results obtained can be used in the development of intellectual testing systems, to assess academic achievements, in the discipline as a whole or in a separate subject of the discipline, as well as in the organization of interdisciplinary control (exam).

The conclusions and results of the theoretical research can be used in the management of the process of determining the level of readiness of students in various sections: discipline in general, partially / thematically discipline, higher education institution, faculty, specialty, etc. serve as the basis for the development of a system for assessing academic performance.

**Thesis provisions to be defended:**

- a model of an intellectual system for evaluating and managing learning outcomes;

- a general algorithm for integrating ready-made proctoring systems into the structure of the test system;

- structure of the intellectual system;

- a method for managing the adaptation of the evaluation of learning outcomes based on entropy;

- adaptive test device diagram;

- the algorithm of the module of the intellectual learning outcomes assessment system;

- the method of presentation is an illustration of the results of the functioning of the ISORO.

**The approbation of results.**

The results of the dissertation research were reported and discussed at:

- International scientific and practical conference «Continuing education in the twenty-first century: problems, trends, prospects», (2016, Shadrinsk, Russia);

- The international forum «Innovation and Global Issues in social Sciences 2017», (2017, Patara, Turkey);

- Seventh International scientific-technical conference «Power engineering, Informatics, innovation – 2017», (2017, Smolensk, Russia);

- Soft Proceeding he II International Scientific and Practical Conference «Topical issues of science and education», (2017, Warsaw, Poland);

- The Fourth International scientific-practical conference (workshop) for young scientists «Applied mathematics and Informatics: current research in the field of natural and technical Sciences», (2018, Togliatti);

- International scientific - methodical conference «Modern trends of continuous education in Russia», (2019, Novosibirsk, Russia).

**Publications.**

The main results of the study were reflected in 13 scientific papers, including 5 articles published in the editions recommended by the Committee for Quality

Assurance in the Sphere of Education and Science of Ministry of Education and Science of the Republic of Kazakhstan, 6 papers reflected in the proceedings of international scientific conferences, and 2 articles are in the international scientific journals indexed in the Scopus database, as well as in copyright certificate №11321 dated July 10, 2020 and the act on the practical use of the results of the dissertation work.

**The author's personal contribution.**

The author independently obtained the main results of theoretical and experimental studies. In published scientific works as part of the team of co-authors, the applicant is the main contributor in receiving, summarizing and analyzing the achieved results.

**The thesis structure and scope.**

The dissertation consists of an introductory part, the main part (four chapters), a conclusion, a list of sources used and an appendix. The work is presented on 117 pages, including 53 figures, 17 tables and 79 titles of bibliographic sources.

In the introduction, the choice of the research topic is reasoned, its relevance is revealed, the purpose of the study is formulated, its tasks are determined, the object and subject of the study are presented, the scientific novelty, practical and theoretical significance of the work are revealed, the main stages of the study are highlighted.

The first chapter comprehensively examines the current state of continuous, necessary control of the qualitative assessment of educational achievements to determine professional competencies. The applied aspect of using the result obtained in the process of research is the possibility of application in the design and development of a system for evaluating educational achievements. A review and analysis of current testing systems has been carried out.

The second chapter describes the models of an intellectual learning outcomes assessment system. The analysis of the test results is carried out, the features of the system are described.

The third chapter presents methods and algorithms for managing the processes of an intellectual learning outcomes assessment system. An algorithm for developing a testing management system is proposed.

The fourth chapter is devoted to the design of the system's tools and a separate module (for the use of an oral/written exam in online format) for evaluating learning outcomes, as well as an entropic approach to the training and certification system. Methods of illustrating the results of the functioning of an intellectual learning outcomes assessment system are also presented.

In conclusion, the research results are presented, including the main conclusions based on the results of the dissertation research.