# EVALUATION OF DISTANCE LEARNING EFFECTIVENESS IN A KNOWLEDGE-INTENSIVE EDUCATIONAL ENVIRONMENT

# ОЦІНКА ЕФЕКТИВНОСТІ ДИСТАНЦІЙНОГО НАВЧАННЯ В НАУКОМІСТКОМУ ОСВІТНЬОМУ СЕРЕДОВИЩІ

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*The paper is devoted to the study of the effective evaluation of distance learning process in a scientific knowledge-intensive educational environment of the modern higher technical university. The analysis of scientific literature showed the main methods and criteria for assessing the students' performance in achieving scientific and professional skills. A brief overview is given of the development of mechanisms for distance learning evaluation as a system of criteria for a number of the components of the professional competences development. The main indicators of the competencies developed in a knowledge-intensive educational environment during were estimated.*
**Key words:** *distance learning, distance education, distance learning evaluation, knowledge-intensive educational environment, professional competences.*

*Статтю присвячено вивченню ефективності оцінювання процесу дистанційного навчання в наукомісткому освітньому середовищі сучасного вищого технічного університету. Аналіз наукової літератури виявив основні методи й критерії оцінювання успішності студентів у набутті наукових і професійних навичок. Представлений короткий огляд розвитку механізмів оцінювання дистанційного навчання як системи критеріїв низки компонентів розвитку професійних компетенцій. Надано оцінку основних показників розвитку компетенцій у наукомісткому освітньому середовищі.*
**Ключові слова:** *дистанційне навчання, дистанційна освіта, наукомістке освітнє середовище, оцінка дистанційного навчання, професійні компетенції.*

*Статья посвящена изучению эффективности оценки процесса дистанционного обучения в наукоемкой образовательной среде современного высшего технического университета. Анализ научной литературы показал основные методы и критерии оценки успеваемости учащихся в достижении научных и профессиональных навыков. Представлен краткий обзор развития механизмов оценки дистанционного обучения как системы критериев для ряда компонентов развития профессиональных компетенций. Дана оценка основных показателей развития компетенций в наукоемкой образовательной среде.*
**Ключевые слова:** *дистанционное обучение, дистанционное образование, наукоемкая образовательная среда, оценка дистанционного обучения, профессиональные компетенции.*

**Introduction.** Nowadays the application of distance learning technologies in the system of student training in a knowledge-intensive educational environment is promoted by social and pedagogical conditions. Pedagogical prerequisites determine the reasons for the transition from the classical education system to distance education.

Distance learning is a component of distance education. Implemented in a system of continuing education it considers certain principles of the learning process modular design directed towards self-education and self-development. Distance learning effectiveness is dependent on the balanced use of traditional vocational training and optimality of the remote learning. This makes it possible to obtain a high result from the implementation of the distance learning system components, the step-by-step inclusion of elements of the distance learning into a system of continuous education.

Practical application of the distance learning in technical universities is widely used in students training. Various courses with elements of distance learning have been created since the computerized education proved its applicability for higher institutions. In this conditions the evaluation of distance learning effectiveness in designing different professional courses for technical students training in scientific knowledge-intensive educational environment prove its importance for the modern educational system.

**Analysis of recent researches and publications.** In the context of our research distance learning effectiveness should be measured by the certain criteria. The problem of evaluation criteria and values as described in the works of J. Biggs, S. Brown, P. Knight, C. Cooper, A. Dasher, P. Diederich, A. Middleton, D. Rowntree, D. Sadler, Y. Tatur and a number of other researchers. The authors have different approaches to the documentation and description of criteria and indicators of an assessment of vocational training levels development of the technical students. In determining the criteria, it should be taken into account that the criterion is an attribute on the basis of which the assessment is made. In other words, the criterion is the qualities and characteristics of the object under study; the indicators are a measure of a criterion development.

A criterion in pedagogical studies means an objective element for a comparative evaluation or classification of the existing studied pedagogical processes and factors.

In the modern scientific and methodological literature, the term criterion is defined as a way for an assessment, definition, classification making [6, p. 6–7]. In pedagogical literature, the criterion is the main criterion by which one solution is chosen from the set of possible ones [2, p. 11]. A number of scientists believe that the criterion is the yardstick, a

sign for evaluation, classification; judgment, a sign that allows one of the many possible solutions to be chosen. A concept of criterion describes it as a means for the levels measuring, for the degree of manifestation of a phenomenon, and is interpreted as a measure of judgments.

Modern pedagogical science singles out qualitative and quantitative criteria. The task of determining the specific qualitative or quantitative values of certain indicators of the studied pedagogical process is determined by measurement. The measurement provides the results for reasoning, analysis, and justification of functional pedagogical patterns. The measurement process includes the following components: measured value (object of measurement); criteria and indicators (method and units of measurement); measuring tools; results.

W. Wolansky distinguishes the levels of vocational training development as reproductive (minimal), adaptive (low); partially modelling (medium), systematic modelling (high) [10, p. 18].

I. Isaev describes four levels of professional competence development: adaptive, reproductive, heuristic and creative [1, p. 9].

In our work, we used the evaluation system based on the measuring methods, which provide a measurement at the scientific level. A number of general requirements were outlined at the standard level of the analysis where the measured object should be sufficiently described. The measurement technique, method and means of mathematical processing should ensure the static and dynamic measurement of the object's parameters and give the desired results in the context of their practical value. The task of measurement, which involves the establishment of relevance between the value (criterion) and its numerical value (indicator), should follow from the theoretical problem, where the specific requirements are determined, and the accuracy of the measurement takes into account the state of the object and measuring means. The method of the measurement performance should have a unified system of units for all cases of the transitive and intransitive object studying. In case of studying of the educational model instead of a single object, the accuracy of the measurement results will depend on the degree of the model's correspondence to the object, which should be identical to its original in the measured characteristics (criteria) [8, p. 125].

**Previously unsettled problem constituent.** The generalized principles of the criteria selection in pedagogical studies were presented in various scientific works and generally could be outlined as the system of evaluation based on objectivity, which allows evaluating the tested characteristics explicitly, without controversial assessments made by different persons; adequacy, which evaluates the exact characteristics, that the experimenter wants to evaluate; comparability, which allows to compare the studied object or processes; content of essential parameters of the object or process under study; and constituency over a certain period of time [4].

In the context of our research, one of the unsettled problems, outlined in the paper, is the development of mechanisms, which will make possible to evaluate the quality of distance education in a knowledge-intensive educational environment as a system of criteria and assessment of the technical students' training in distance learning comprising a number of components of professional competences development.

**The aim of the article.** The purpose of this paper is to identify the essential criteria and indicators for assessing the effectiveness of distance education in a knowledge-intensive scientific educational environment. The basis for the selection was the criteria and indicators developed by the scientists S. Bailin, H. Black, B. Bloom, D. Cheung, H. Helson, D. Rowntree, R. Thompson, and I. Zimnaya adapted to our research.

**Results.** Social prerequisites of the criteria for assessing the effectiveness of distance education could be external and internal. The external is specified by the development of the society in general and pedagogical science in particular. They include the use of the computer in the modern society, computerization of industrial enterprises, educational and scientific institutions; strengthening of the students' active position in modern information environment; the necessity in the creation and common use of a single professional information space.

The internal prerequisites are related to the needs of the education system inner development in a scientific knowledge-intensive educational environment, such as the worldwide increase of educational, scientific and professional information concern; the problems of the educational material unification and structuring within an educational institution and the entire educational environment; the development of new effective methods and tools of the learning process intensification; the transition to personal-centered learning; the changes of the students' training in the environment of rapidly developing information and communication technologies.

The external prerequisites are in the social need in the development of student professional education system, and internal prerequisites are requirements for the very system of specialists' training in the modern world of information and communication technologies.

In the context of our research, the development of mechanisms for evaluation of the level of distance education in a knowledge-intensive educational environment as a system of criteria and assessment of the technical students' training in distance learning includes a number of the following components for the professional competences development.

The first of them is *motivational*, which develops the awareness of the students' need for professional

competences, persistence in knowledge and skills acquisition, promote interests in future professional activities. Motivation helps to achieve high results in professional work, appreciate the importance of intellectual knowledge and practical skills as well as to promote lifelong learning and self-development.

Also, *cognitive* component develops thinking, memory, attention and methods of understanding, the intellectual work culture, the laws of modern information and communication technologies functioning, basic concepts, categories and tools of professional discipline, knowledge of the content of the main professional competences.

The next components for the professional competences development is *practical*, which fosters the ability to acquire professional knowledge and to use it in practical activities, to apply professional skills to alternative tasks, to search for information on the given task independently, to collect and analyze data necessary for solving professional problems and present the results of analytical research, to write articles and report the results at scientific conferences, to apply professional knowledge in a variety of standard and non-standard situations.

*Personal* component facilitates creativity, self-development, awareness and commitment, as well as self-controls professional activity and emotional state, the ability of mobilization for achieving goals. The emotional and personal characteristics are developed in the process of vocational education and self-education.

*Ethical*, which comprises career, communicative and leadership aspirations, contributes to the development of professional skills, facilitates the best way of performing professional duties and building professional pride.

The professional competencies of technical student possess their own specific features. Among all mentioned components of the students' professional competence development, only the indicators applied to the specific educational activities of distance education will be highlighted.

The indicators of students' activity in the distance education can be developed in varying degrees, which allowed us to distinguish the different levels of competence development studied among the students of the technical university during our research as low, medium, and high.

The first level (low) is characterized by poor abilities to set goals and plan activities independently, as well as select carefully the means of implementation and evaluate the received results. Such students usually demonstrate low interest for professional activities, weak scientific and educational motivation. They do not desire to participate in innovative and project activities, work on a distance course independently and as a result, have an inadequate level of scientific and practical knowledge.

The students at the second (medium) level demonstrate abilities to set goals and plan their activities at a basic level, think through the means of their implementation, and build a sequence of actions in achieving their goals by means of distance learning. However, they possess a weak interest in innovative, creative and research activities; unable to organize scientific communication. Sometimes they show a poor understanding of ethical norms and rules of behaviour and communication in a professional environment. The skills of project presentations to business partners are insufficient.

The third (high) level is characterized by the ability to set goals and objectives, think through the means of their implementation by means of distance education, choose a strategy for professional activities, individual ways of knowledge obtaining; high aspiration in professional activity, career building and achieving high results in innovative, creative and research activities. They possess high intellectual level, memory and attention; show leadership position in the project activities.

During studying students' performance in distance learning the main indicators of the competencies development in a knowledge-intensive educational environment in the organization of the educational process in the distance education were estimated as motivation for achieving good results in professional and research activities (motivational component); understanding goals and objectives of future professional activity, development of individual intellectual abilities and competencies (cognitive component); positive results aspiration, adequate level of autonomy, ability to use modern software product (practical component); appreciation of the professionally significant activities, creativeness in personal development and setting lifelong learning objectives, emotional condition (personal component); and active social position, perception of professional ethical norms and rules of behavior and communication (ethical component).

**Conclusions.** For assessment of the results of the distance education effectiveness in the knowledge-intensive educational environment, various components of both educational and scientific activities were studied and the indicators were developed for evaluation of the technical university students' educational, innovative, creative, research, communication, and business activities.

Only an integrated application of the assessment methods of the distance education effectiveness in the knowledge-intensive educational environment will objectively estimate the level of competences development of the future technical specialists. Thus, the identified criteria and indicators for assessing of the distance education effectiveness in a knowledge-intensive educational environment will allow us to assess the adequacy of the distance education model and its applicability.

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