Effective Technology for Enhancing Learning Quality in Higher Education

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Abstract

This paper justifies the relevance of enhancing knowledge quality, personnel training, and demand for graduates of higher education institutions in the context of an open economy and international market competition. To address these problems, the need for new approaches, methods, technologies, and foreign experience in education is demonstrated. It is proposed to adopt the widely used methodology and technology of the so-called "flipped classroom" approach employed in other countries. The application of this methodology involves fundamental changes in the roles and activities of both students and teachers in the process of acquiring new knowledge. The new approach modifies the traditional learning scenario and alters the content of homework and in-class activities. Students independently learn the course material at home and then discuss and apply it in practice in the classroom with the support and guidance of the teacher. The performance of practical assignments is accompanied by critical reflection on the obtained information. In fact, what used to be done at home is now done in the classroom, and vice versa, and students have the opportunity to control their own learning.

The teacher creates a friendly online environment for interaction among students. Additionally, the teacher serves as a moderator of e-learning, monitoring and directing online discussions. The teacher acquires various roles, encouraging and motivating students, guiding and monitoring the education process, and providing feedback.

The paper presents the features of various flipped learning models for improving the knowledge quality of students in university education. Practical examples of the implementation of this new technology are given, which were developed by the authors using algorithms and syllabuses for two master's degree disciplines in the Department of Business Technology, based on the principles of modular learning and a competency-based approach to personnel training.

Keywords: knowledge quality improvement, educational process enhancement, modern teaching technologies, self-development of students, modular learning, flipped classroom

JEL codes: A12, A20, F6

1 Introduction

It is well known that in 1989, the Committee on Education and Science of UNESCO at the UN declared that the Soviet Union had the best education system in the world. However, subsequently, due to reforms aimed at transitioning the country to market relations and the commercialization of the education system, there was a widespread transition to credit technology and the Bologna system of education, which is generally characterized by the preparation of highly qualified specialists with a narrow profile. Such an approach could not fail to affect the horizons of students, the quality of their knowledge, and often leads to a lack of demand for university graduates in the job market. The country is taking large-scale measures to transition to the principles of sustainable development, digital transformation of the economy, implementing a new industrial policy in the conditions of Industry 4.0, mastering the latest high-performance technologies and innovations. All of this necessitates a radical improvement in personnel training based on modern achievements of scientific and technological progress.

Modern education in the university requires an increase in student independence, the activation of practical and analytical work. The introduction of information and communication technologies into the educational process reorients teachers towards the search for new technologies, in which the leading role belongs to self-educational activities and personal self-development of students (Vinogradova, n.d.).

Blended learning is a promising approach that allows for the introduction of new technologies into the educational process without abandoning traditional teaching methods, making the learning process more productive. This increases students' interest in mastering the material and forming professional competencies.

Blended learning includes: classroom work, out-of-class independent work of students; an information system used for creating, storing, collecting and/or delivering educational content; a wide selection of teaching materials; interactivity; control of students' independent work; a flexible system for evaluating students' achievements (Gizatulina, 2017).

A variety of blended learning is "flipped classroom" or "flipped learning," which seeks to change the traditional teaching scenario and change the purpose of homework and classroom work. In this approach, students independently master the content of the course (section, topic) at home by

watching video lectures or explanations, audio materials, and then discuss and apply the studied material in practice in the classroom with the support and assistance of the teacher, performing practical tasks and subjecting the information received to critical analysis. Essentially, what was previously done at home is now done in the classroom, and vice versa.

The purpose of this research paper is to establish definitions for the concept of "Flipped Class" and the correlation of this concept to the two core disciplines of the Department of Business Technologies, Faculty of the Higher School of Economics and Business on the basis of Al-Farabi Kazakh National University.

2 Methodology

The article has mostly applied theoretical research methods. The method of analysis and synthesis was used. The descriptive method covers all sections of this research paper. Literature review includes the method of deduction. The results and discussion section involves the method of ascending from the abstract to the concrete.

3 Literature review

Flipped Classroom is a teaching principle in which students primarily acquire new knowledge at home, while classroom time is dedicated to completing assignments, exercises, laboratory and practical research, and individual consultations with teachers (Wikipedia, n.d.).

This method has become a small "revolution" in relation to traditional education and an opportunity for professional development and self-improvement for progressive teachers who, while not neglecting the process of knowledge transfer, focus their efforts on personality-oriented learning and the development of student competencies. The "flipped classroom" technology was proposed by American scientists Jonathan Bergmann and Aaron Sams in 2000 (Itinson & Chirkova, 2020). The idea of this technology is that the main stages of the teaching and learning process, such as classroom lessons and homework, are completely changed. That is, students independently study the theoretical material through watching video lectures recorded by teachers or on educational websites on the internet, while practical lessons are devoted to practicing the acquired skills, solving problems, and discussing the main questions with the teacher. The flipped classroom implies such an organization of the learning process in which students already have some theoretical knowledge and understanding of the issue that will be discussed in the upcoming lesson.

This makes the interaction between the teacher and students more effective and productive, as students feel more comfortable and confident, ask

questions, and discuss new material with the teacher and classmates. Therefore, homework also becomes different. Very often, students do not understand some important topics while doing homework, so they prefer to study new material rather than do some tasks independently without teacher control.

Therefore, at home, students work individually or in groups in the electronic learning environment, listening to video lectures, studying additional electronic resources. In class, students expand their acquired knowledge, solve practical problems, and create educational projects on the given topic. Such organization of the learning process eliminates the difference between classroom activities and individual work of students. In order for the flipped classroom technology to be successful at all stages of learning, the educational process must be carefully planned and integrated.

Let us consider the peculiarities and advantages of the flipped classroom over the traditional one. Firstly, in the flipped classroom, students have the opportunity to control their own learning. They can learn at their own pace thanks to the availability of all necessary resources in the electronic learning environment. In addition, students can choose when and where to learn, within what time frame, can review materials at any time when they need them or get online assistance from teachers through chats and forums. Constant access to online materials allows students to keep up with the curriculum if they miss classes due to illness or other reasons. Secondly, the flipped classroom stimulates cooperation among students through mutual projects and collaborative work. Joint projects make students collaborate, learn from each other, and help each other. Finally, the flipped classroom increases students' responsibility for their own learning. Students become more independent and motivated compared to the traditional classroom environment. They learn to manage their time, work with the electronic course, develop self-learning and autonomous learning skills. In other words, the role of students in the learning process changes, making them active participants in the educational process.

The flipped classroom technology also affects the role of the teacher. In the flipped classroom, the teacher guides the learning process of students who have not had autonomous work experience in order to make the educational process more effective. The teacher must promote the creation of a friendly online environment for student interaction. Additionally, the teacher must act as a moderator of e-learning, monitoring and directing online discussions. Thus, due to the technology of the flipped classroom, the teacher acquires a range of different roles. The teacher must encourage and motivate students, guide and track the educational process, and provide feedback. The "flipped classroom" model is based on logical and easy-to-apply principles. Short

videos, viewed at home or any other convenient place, replace lectures delivered in classrooms. Initially, the teacher who decides to "flip" their class must determine the use of technical tools.

Varieties of Flipped Learning Model.

Currently, several forms of flipped learning are identified (Dumont & Berthiaume, 2016). The classical model of flipped learning involves providing students with theoretical material prior to the class. The materials for preparation can be given in the form of lecture notes or a textbook chapter, as well as slides, video, and audio documents. In the classroom, the teacher organizes a discussion of the studied material, explains complex points, answers questions, and uses interactive teaching methods. This model still resembles the traditional education system and has a transmitting character: first, theories, concepts, and models are studied, and then their practical application.

The next model of flipped learning, tentatively called "advanced," also involves two stages - out-of-class and in-class, and provides for a gradual increase in the level of tasks and expansion of activities. During the preliminary preparation, students independently search for information on a given topic, read articles, watch videos, prepare theses in mini-groups or individually, which they will present in the classroom, questions for debates, or round table discussions. They place the results of their work on a joint electronic platform so that the teacher and other students can familiarize themselves with them in advance and better prepare for the class. Therefore, monitoring of each student's independent work is carried out. In the classroom, presentations of prepared theses are given, discussions of the material read, an argumentative analysis of the work of each group, the creation of a common conceptual picture based on opinions, comments, and judgments expressed, or a mini-colloquium in which one group gives a presentation and another organizes debates.

And finally, the systemic or combined flipped model, as implied by its name, involves a combination of the first two models. The essence of this model lies in the reordering of the key components of the learning process rather than the location of a certain type of activity. The traditional sequence of competencies involved (memorization, understanding, application, analysis, synthesis, evaluation) is changed. First, the practical application of theory or model is studied and only then its theoretical justification. In the context of increasing the practice orientation of the learning process, this flipped learning model is a pedagogical approach that is most realistic, as in everyday and professional life, decisions often have to be made under conditions of uncertainty or risk, especially in the field of economics. At the distance stage, students work in mini-groups with a task or problem situation,

trying to assess it, conducting a search and analysis of the information necessary for an objective assessment of events, and proposing solution options. In the classroom, they present the information and sources found, and under the guidance of the teacher, analyze the task, compare the advantages and disadvantages of each of the proposed solutions. After that, the distance stage follows again, during which students study the theoretical foundations of the issue and the experience of activity related to the indicated problem. At the final stage, in the classroom, the results and consolidation of all the material studied on the topic are summed up, and the applicability of this model or theory regarding other situations is analyzed.

The methodology outlined suggests that the use of this technology changes the very nature of knowledge. In traditional pedagogy, knowledge is presented in a ready-made, structured, and logically organized form. In contrast, flipped learning requires active student participation in its discovery, comprehension, and processing for future use, stimulating interest in the subject matter and encouraging independent thinking and expanding the boundaries of knowledge. The role of the teacher also changes. The teacher becomes a consultant, organizer of various student activities, facilitator in the formation of specific competencies, supervisor and curator of work, manager, and moderator (Mandel, 2015).

As previously stated, flipped learning is based on the principle of "swapping places" between acquiring knowledge in the classroom and doing homework. In other words, students acquire knowledge through self-education, research, purposeful selection, and meaningful analysis of information. In the classroom, students exchange opinions, present their results, knowledge, and discuss and correct them. In traditional learning systems, homework serves to practice skills and reinforce materials, whereas with flipped learning, the reinforcement stage includes comprehension, clarification, expansion of knowledge, and various ways of generalization.

The flipped learning technology is highly consistent with the requirements of a modern specialist, representing a methodology for fully or partially transferring the process of knowledge acquisition to independent student activities. In doing so, teachers can use the freed-up time for interactive activities that develop the creativity, critical thinking, and problem-solving skills of their students (Europass Teacher Academy, 2020).

The task of a teacher during a lesson is not simply to present the content of a topic, but rather to draw the student's attention to key and/or difficult aspects and activate their process of practical cognitive activity. There are several reasons for using "flipped learning". Firstly, this technology contributes to a better understanding of the material, increases interaction with the teacher and other students, develops critical thinking and makes it a

natural part of the learning process. Secondly, when using this model, classroom time is used more rationally.

To effectively implement "flipped learning", a certain cycle is used: educational video; interactive work in the classroom; observation - feedback; assessment. Each stage requires the development of control and measurement materials.

"Flipped learning" has some similarities with anticipatory self-study, where students study new material before it is presented by the teacher in lectures or practical classes. The main difference is that in anticipatory self-study, the student carries out cognitive-search or creative activities outside the classroom, whereas in "flipped learning", the student studies new material using computer technology, and the teacher is virtually present and guides this process (video explanation, control questions).

The advantages of this method are that the student acquires knowledge at their convenience, not only in the condition of being present in class. This can be a video downloaded to a smartphone or tablet, or an audio lecture downloaded to a player. The student assimilates the material at their own pace, can watch the video or listen to the audio as many times as they consider necessary, pause for note-taking or simply to perceive new information.

Individual consultations with teachers help children overcome frustration and fear of not understanding new material. This also helps the teacher to see the progress and level of understanding of each individual student.

In-class time is not spent on delivering new material, which creates more opportunities for applying knowledge.

The methodology does not require special expensive technical devices. To implement the work within the framework of a "flipped classroom," a sound recording device (dictaphone, microphone), camera or webcam, and a computer with standard software may be required.

Students can use a greater number of additional sources for self-preparation at home: the internet, home books, dictionaries, etc.

4 Results and Discussion

The result of this study is the identification of the key characteristics of the concept of "Flipped Class" and familiarisation with the results of the implementation of this innovative type of learning in the framework of two major disciplines of the Department of Business Technologies, Faculty of the Higher School of Economics and Business on the basis of Al-Farabi Kazakh National University.

At the Higher School of Economics and Business of Al-Farabi Kazakh National University, the innovative educational technology of "Flipped

Learning" is being introduced into the educational process in the "Business Technologies" department. This technology allows for the use of prepared educational materials by the teacher for providing information with feedback to the audience, conducting testing, seminars, training, etc., in the study of a particular topic from the curriculum. The syllabus (GLS4301) for Strategic Management of Logistics Infrastructure for the Spring semester of the 2022-2023 academic year for the 7M11301 Master's degree program in "Logistics (by branches)" was prepared by Doctor of Economics B.K. Kazbekov with 15 topics for a comprehensive study of the course. The objectives of mastering the discipline are to develop the knowledge and competencies of the master's students in the management of material flows and related information and other flows in accordance with market needs during the creation and optimization of logistics infrastructure, as well as to develop the skills of the master's students in forming a warehousing network for companies in various business sectors (Kazbekov, 2022).

Expected Learning Outcomes (ELOs). Upon completion of the discipline, the master's students will know: ELO 1 - Composition, types, and interrelationship of objects of logistics infrastructure. Processes taking place within logistics infrastructure. Modern information technology and equipment used to optimize the functioning of logistics infrastructure. Objectives, tasks, and criteria for building an effective logistics infrastructure; ELO 2 - Ability to optimize the composition of objects of logistics infrastructure. Determine the effectiveness of the functioning of objects of logistics infrastructure; ELO 3 - Develop models of functioning for a company's warehousing network. Apply the appropriate tools to calculate the parameters of the functioning of objects of logistics infrastructure; ELO 4 - Substantiate strategic decisions for the formation and optimization of logistics infrastructure. Conduct a comprehensive analysis of the state and prospects of the development of logistics infrastructure; ELO 5 - Master the methods of optimizing the functioning of objects of logistics infrastructure and the processes taking place between them, as well as the tools for optimizing the warehousing network based on information technology.

Achievement indicators of expected learning outcomes (AI ELO). During the course of the discipline, a master's student should: AI 1.1 - be capable of independent mastery of new research methods, changing the scientific and scientific-production profile of their activities; AI 1.2 - possess skills in economic analysis of organizational activities and the development of organizational-management decisions in the organization of logistics infrastructure and the design of infrastructure objects; AI 1.3 - be able to generate fundamentally new ideas and products, possess creativity and initiative in justifying the stages of strategic planning, applying the principles

of logistics analysis of the company; AI 1.4 - possess methods of organizing logistics infrastructure and designing infrastructure objects; AI 1.5 - be able to formulate and test scientific hypotheses, choose and justify instrumental means, modern technical means, and information technologies for processing information in accordance with the scientific task set; AI 2.1 - be able to analyze calculation results and justify the conclusions drawn, understand the stages of logistics business processes for effective management of production with a system of logistics business process indicators; AI 2.2 - possess methods of strategic analysis of logistics infrastructure and designing infrastructure objects; AI 2.3 - be able to use strategic management tools to develop a strategy for forming a network of infrastructure objects; AI 2.4 - be capable of analyzing, verifying information, and assessing information during professional activities; AI 2.5 - be able to replenish and synthesize missing information when necessary and work under conditions of uncertainty.ID 3.1 - Able to develop corporate strategy, business strategy, and functional strategies for the organization; ID 3.2 - Able to justify and choose methods for making strategic, tactical, and operational decisions in managing infrastructure objects; ID 3.3 - Possesses skills in analyzing regulatory documents, statistical and other information that regulate and characterize the professional field of activity, and building diagnostic tools for enterprise strategies; ID 3.4 - Able to apply various tools to calculate the parameters of the functioning of logistics infrastructure objects; ID 4.1 - Able to identify the data necessary to solve management tasks for infrastructure objects; ID 4.2 - Possesses methods of operational analysis and can use operational planning tools to solve operational management tasks for infrastructure objects; ID 4.3 - Able to carry out monitoring of physical distributions and sales, determine types, and parameters of the analysis of product and company competitiveness; ID 4.4 - Able to conduct a comprehensive analysis of the condition and prospects of logistics infrastructure development; ID 4.5 - Able to justify the choice of methods for making strategic, tactical, and operational decisions in managing infrastructure objects; ID 5.1 - Able to select and justify instrumental tools, modern information technologies for processing information in accordance with the task in the field of management of infrastructure objects; ID 5.2 - Able to apply tools for optimizing the warehouse network based on information technology; ID 5.3 - Able to justify the choice of tools, technical means, and information technologies used to support and ensure the implementation of management decisions; ID 5.4 - Able to develop instrumental strategies for the development of infrastructure objects based on the use of input, internal, and output material flows planning.

As an example of the productive implementation of the "Flipped Classroom Technology," the syllabus (BPL 5301) "Business Processes of

Logistics" is proposed for the 7M11301 master's degree program in "Logistics (by branches)," which consists of 15 topics for comprehensive study of this course (Kazbekov, n.d.).

The aim of the discipline is to develop the ability of the master's student to develop market strategies using modern logistics business processes for evaluating business planning results in logistics. Upon completion of the course, the master's student will be able to:

LO 1 - explain the concept of logistics business processes based on scientific planning and management tools; LO 2 - master the procedure of logistics business processes for recommending fragmented planning optimization; LO 3 - apply diagnostic tools for logistics business processes to analyze and evaluate the current activities of the enterprise; LO 4 - develop supply chain management in the logistics planning system based on information flows for the effectiveness and flexibility of the company's development and competitiveness; LO 5 - develop instrumental strategies for business process elements and a complex of work based on the use of planning for the need for input, internal and output material flows.

During the course of their studies, a graduate student should: LO 1.1 - determine the goals, tasks, functions, and objects of studying logistics business processes; LO 1.2 - justify the stages of strategic planning using logistics analysis principles in a company; LO 1.3 - form the components of strategic planning for logistics business processes; LO 1.4 - classify logistics business processes and their main characteristics in production organizations; LO 2.1 - understand the stages of logistics business processes for effective production management with a system of logistics business process indicators; LO 2.2 - understand the diagnostic tools for logistics business processes and optimization of planning models; LO 2.3 - apply the procedure for directions of improvement and evaluation of business process organization; LO 2.4 - justify the types of external logistics business processes and optimization methods in business. LO 3.1 - determine the parameters of external logistics business processes and business process principles based on analysis and evaluation of the company's current activities; LO 3.2 - develop diagnostic tools for enterprise strategies; LO 3.3 - develop corrective parameters of business processes for enterprise forecasting. LO 4.1 - classify objects and evaluation parameters for planning and determining control stages and analysis; LO 4.2 - manage events in the logistics business process for demand calculation, evaluation of market potential/capacity methods; LO 4.3 - monitor physical distributions and sales, determine types of parameters for analyzing product and company competitiveness; LO 4.4 - propose an active supply system for enterprise development strategies based on logistics business process planning. LO 5.1

- apply planning methods for key business processes: sales management and customer service; LO 5.2 - develop forecasting parameters for the product flow based on information flows for analyzing the company's products; LO 5.3 - develop an analysis and selection of project sensitivity and risk methods, promoting the logistics business process; LO 5.4 - choose fragmentary optimization of business processes and plan deliveries.

5 Conclusion

Thus, the "flipped learning" technology indeed solves the problem of creating a situation of open communication during class, allowing each student to show initiative and activity, independence, selectivity in methods of activity; provides conditions for independent meaningful study of the topic; assists in the analysis and evaluation of new knowledge. At the same time, this technology allows the teacher to organize learning in accordance with the State Educational Standard of Higher Education, develop skills in information and communication technologies in teaching their subject, and increase their level of professional training, all of which contributes to a significant improvement in the quality of modern education and leads to the solution of the main task of educational activities.

Students are actively involved in the cognitive process. "Flipped learning" motivates students to engage in independent activity, so the main part of the theoretical material is mastered by students independently at home in an electronic environment using various teacher-prepared resources (video lessons, presentations, etc.). Thus, this new innovative technology stimulates the development of personal characteristics such as activity, responsibility, and initiative. This technology also contributes to the development of meta-subject skills such as self-organization and time management. Most importantly, this technology improves the quality of students' knowledge and contributes to the mastery of subject results.

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