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RECOMMENDATION FOR THE TEACHING OF TECHNICAL DISCIPLINES IN A MIXED FORMAT

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Abstract

The benefits and necessity of distance learning are undeniable, and when the whole world switches to remote access due to the pandemic, education is no exception. The data is collected during the analysis of the disciplines comprehensibility among EKTU students in the Republic of Kazakhstan; a quantitative research approach and a content analysis method are used. In total, the performance of approximately 500 students in technical disciplines is analyzed. The study is conducted at EKTU in RK, which may limit the generalizability of the outcomes. The results of the paper provide significant and useful information to teachers, developers, and students regarding the teaching of principal subjects during distance learning at universities. Based on the experience and readiness of students, the obtained outcomes determine which learning system should be applied when working out an on-line learning system to improve the efficiency of learning and teaching. The research expands the existing knowledge of distance teaching of special disciplines of technical specialties in higher education institutions of the Republic of Kazakhstan and contributes to education in the context of distance learning, confirming the expanded model of acceptance of online learning technologies from the point of view of teachers of our university and considering differences in culture, learning style, and physical environment compared to other countries.

Keywords: Distance, mixed education, methodology and methods of DL (distance learning), major and special disciplines, optional component

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1. Introduction

Since March 2020, the global pandemic spread of COVID-19 infection has launched the transition of education in an emergency, urgent manner to the on-line mode, without prior preparation and approbation.

For most universities in Kazakhstan, distance learning was minimal, only for students traveling on academic mobility abroad and concerned some teachers and their disciplines. These disciplines were assigned to young teachers with high computer literacy and ready to morally engage in on-lıne 24/7.

With the transition to distance learning of the entire university, the interaction between the teacher and the student in face-to-face formats turned into on-line and it was urgently necessary to develop methodological, educational, pedagogical, and psychological content in this format.

Currently, any teacher is able to tell, make an analysis, and provide conclusions, namely, own opinion of the transition to a remote format as soon as possible. In the paper, we describe two years of distance teaching experience and offer technical disciplines in a blended format for more efficient learning and methodologically profitable teaching.

2. Problem Statement

Basic issues encountered during the urgent transition to distance learning:

i. the complexity of adaptation (psychological, pedagogical) to on-line learning;
ii. low computer literacy (teachers and students switched to remote learning without prior retraining);
iii. lack of high-quality and stable communication – technical problems;
iv. non-compliance with the work schedule in distance learning, work and training have switched to a round-the-clock format, the majority still do not have the concept of working time and time management;
v. low independence of students – self-motivation;
vi. lack of live communication, contact – socialization, but all these problems were solved, corrected, refined in the process, as they say “experience comes with time” (Qashou, 2022, p. 158).

But the urgent problem concerning distance learning still remains. The quality of knowledge in principal subjects in terms of component and choice is much lower than in traditional training, as students have a lack of skills and abilities of practical work and the absence such experience in employment demonstrates to the employer what kind of specialist comes (Rughoobur-Seetah & Hosanoo, 2021).

3. Research Questions

Distance learning provides access to educational services and high-quality educational materials from anywhere in the world (Figure 1) at a convenient time and on a global scale (Abdur et al., 2021).

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Figure 1. Geography of distance learning of the Republic of Kazakhstan

There is a change in the educational paradigm from the traditional model of education to distance learning. Accordingly, the role of universities is changing – from a supplier of knowledge to creating conditions for students to acquire new cognition on their own. Therefore, the teacher does not become a translator of ready-made comprehension, but acts as a navigator in the endless information and knowledge space. In on-line or blended learning, the student independently acquires the knowledge he needs, applying the potential of the information society and intellectual technologies (Tihomirov et al., 2012, p. 88).

The variety of available means and forms of distance learning makes it possible to realize the innovative potential of teachers and students in the development and study of on-line courses, and generates healthy competition for developers, allows quickly updating content and edit it in real life, without wasting time and money on auxiliary movements visiting only electronic libraries and sources, online courses and educational content.

Thus, every developed on-line course is an innovative embodiment of the outcomes of methodological and research work of teachers and students (Karasneh et al., 2021).

A brief overview of existing educational programs, distance courses and forms of self-study in on-line format.

An analysis of the world experience in the use of distance learning technologies in educational programs has shown that the majority of leading universities apply elements of on-line learning, the so-called “blended learning.” Lectures, video materials, virtual laboratories, on-line practices, seminars, lecture debriefing – webinars are held on-line. Meanwhile, gaining skills, such as working on machines, or laboratory research are possible only when visiting laboratories and practical classes in special audiences or enterprises (Gómez-Rey et al., 2021; Hsiao & Su, 2021).

At present, the number of implemented educational innovations in our universities, such as massive open on-line courses (MOOCs), is increasing. The difference in the application of distance

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learning technologies by foreign universities from ours is that these technologies are more often used in the implementation of educational programs, including completely in on-line format. Leading world universities such as Harvard University, University of California, Columbia University, New York University, and Pennsylvania State University have been practicing on-line education and obtaining a diploma for a long time. On the example of the leading universities, it has been proved that on-line education can and should be of high quality. The requirements for applicants for on-line educational programs are identical to the requirements for those who choose traditional form of studying. Distance courses are not sufficiently represented in educational programs, and special disciplines in the format of an electronic course in distance learning have not been developed yet (Feitosa de Moura et al., 2021; Tantsura, 2020).

Ways of solution and suggestions:

After two years of adjustments and optimal solutions to the issues that have arisen on-line, we voice our proposals, solutions and conclusions that we have applied in distance learning when teaching technical, special disciplines for technical specialties.

We offer the use of the method and methodology of conducting classes in a mixed format, depending on the competence, skills and abilities required by the specialty.

Currently, the main task is to return the efficiency of learning in general, because when switching to distance learning, the quality and amount of knowledge have turned out to be lower than with off-line.

The main objectives in the transition to distance learning:

1. Development of the concept and methodology of a distance course based on the achievements, analysis and conclusions of practical training for two years, methods of vocational education.

2. Creation of the distance course concept.

3. Design of a flexible model of student knowledge management based on the inseparable relationship between theory and practice.

4. Development and implementation of monitoring means for mastering competencies and skills.

5. Recording video lectures on course.

6. Placement of educational materials (lecture notes, video lectures, practical tasks, individual task, reference materials, links to open educational resources, relevant thematic publications and video links, control tests, and etc.).

7. Conducting webinars on the main topics of the lecture course.

8. Surveys and interviews of students, course instructors and third-party experts.

9. Approbation of the project in the educational process, evaluation of its efficiency and opportunities for mass application, as well as publication of outcomes.

The use of distance learning changes education completely from traditional to distance learning → STEM education (Figure 2) to distance learning → e-learning and further to Smart-education, which modernizes and develops education itself as a whole, not to mention its accessibility to everyone (Yavuzalp & Bahcivan, 2021).

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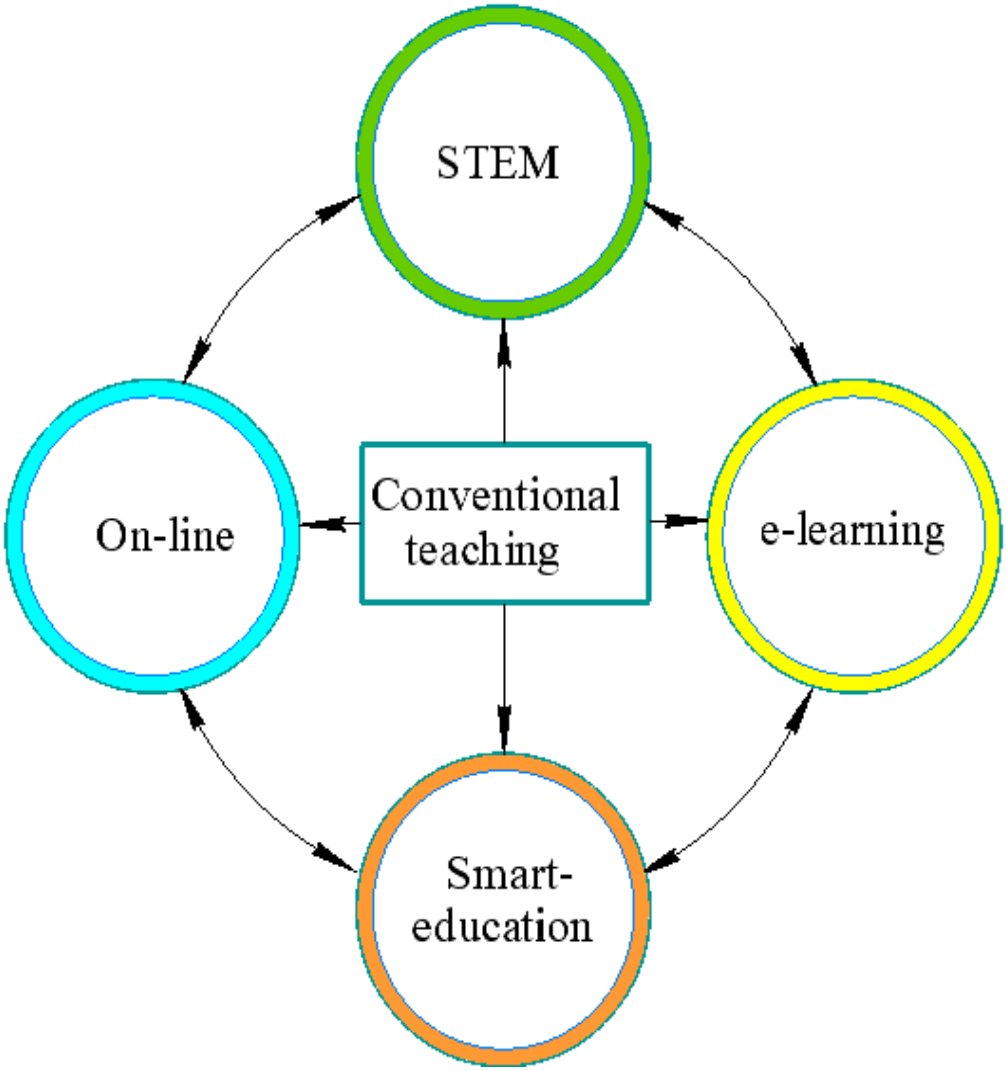

Figure 2. STEM education scheme

4. Purpose of the Study

The purpose of the paper is to improve the obtained knowledge during the study of technical, special disciplines, a component of choice in the proposed blended learning format; to perfect the applied methodology and methodology for teaching technical specialties in distance learning and its further effective implementation.

5. Research Methods

The methodology of the article consists in combining (introduction, merging) on-line and off-line elements of the course in the educational process.

The novelty is due to the implementation of an individual approach to the development of special technical disciplines in accordance with the course structure. A student (with the help of the teacher) chooses the format of learning that seems optimal and aimed at:

a) mastering elementary knowledge within the discipline;

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b) forming of basic knowledge within the discipline;

c) developing broad worldview – in-depth knowledge.

The methodological novelty of the paper is the interconnection of teachers in the form of projects, forums, on-line discussions, webinars, blogs, and scientific consultations and practical, labyrinthine experiments and research with further possible joint publications.

The developed distance course includes two components: on-line and off-line. On-line is represented by lecture notes, video lectures, workshops, project assignments, reference materials, and glossaries of terms, links to open educational resources, relevant thematic publications in the press, interactive tests, and other assessment tools.

The course summarizes knowledge as a combined product into a single system, mixing theoretical cognition and practical skills for further professional activity. It contains a flexible system of knowledge management for students, which is implemented using an online component to organize independent work and a skill on the studied subject controlled at the university by a teacher.

The developed special courses are a set of educational and methodological materials designed in a particular way in the form of an on-line course and an on-line component for organizing independent work of students in a remote form.

The following tasks are set, the solution of which contributes to the achievement of the main methodological goal:

1) development and implementation of efficient methods of educational material visualization in on-line format;

2) designing a flexible model of student knowledge management based on the relationship of on-line and off-line;

3) working out remote forms of organization of students' independent work;

4) creation and implementation of a system for monitoring the assimilation of educational materials on-line.

The methodological organization of the educational material includes the course structure development with the justification of interactive and innovative teaching methods, the scenario of the course on-line component, based on competencies that a student must acquire as a result of learning using provisions of the pedagogical organization, the preparation of text materials, presentations, required graphic objects, assembly of the course on-line component and its placement in distant educational technology – electronic educational environment.

Materials placed in distance education technologies include:

- presentations of the leading teacher on the main topics of the lecture course;
- fragments of video lectures;
- workshop for classroom and independent work;
- tests to assess skills and abilities;
- reference materials for the course,
- links to open educational resources;
- current thematic publications in the press, etc.

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It is envisaged for the placement of presentations prepared by students on their own using distance learning technologies, as well as the collective creation and editing of text and graphic materials on the subject of educational tasks proposed by a teacher or student.

The expected scientific and practical result is the designed concept and practical approbation of teaching methods and distance course methodology. In the future, it is required to transfer other taught courses and special disciplines to a distance form in order to introduce distance learning into the education system.

Relevance and need are determined by an innovative approach for organizing independent work of students in training specialists in the technical field through a system of distance educational technology.

It is planned to introduce the practice of independent work of students of the education traditional form in organizing the content of the distance form and modeling on this basis; to create a new educational product (on-line component of the course).

The study of special disciplines data is based on the model of blended learning, in which work in the classroom is summarized (combined) with independent work in distance educational technology. The implementation of independent individual and project tasks on the course subject develops such competencies as the ability to develop own educational routes, find the most optimal ways to solve a problematic issue, and work in a team, showing initiative and creativity, as well as leadership skills.

The technologies used in the development of a distance course must have the indispensable software, multimedia equipment, as well as a distance learning portal.

The following research methods are proposed to solve the set goals:

- systematic approach is needed in the design and formation of the course;
- theoretical synthesis and analysis of electronic resources for educational purposes – in the development of tools for distance learning in order to generalize literary sources;
- interviewing and questioning students in the field of teaching the discipline – in the process of identifying priority areas for the implementation of the on-line course;
- analytical and expert assessment of quality – for the created distance course;
- monitoring the process of students' activities in a real educational and virtual environment;
- evaluation of the experimental method efficiency on the practice of experimental learning in the developed model of distance content;

Applying scientific methods and techniques allows ensuring innovation, relevance, competitiveness, and dissemination of outcomes in teaching at universities.

6. Findings

Expected results:

- material assimilation is improved;
- less time and moral resources of the teacher and student are spent;
- mastering the skills and abilities is required for production;
- access to knowledge is opened anywhere in the world, and only at a certain time the student needs to work out practical exercises and laboratory work in the classroom;

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- independence of the student increases and the teacher distributes the remaining time for personal growth and for scientific activities;
- connection with practice and production in the learning process;
- motivation, teamwork, self-organization and specific focus of the student.

7. Conclusion

The scientific and methodological significance lies in the development of methodology and methods for applying distance learning technologies, in organizing the dialogue, project, and practical activities of students in the studied special and technical disciplines and a component of choice. The interaction of on-line and off-line educational content allows modernizing the current situation with temporary quarantine measures and ensuring the further growth and improvement of education and self-development in general. The proposed approach to designing the content of distance learning courses makes it possible to achieve the goals of learning and ensure the activation of the cognitive activity of students, using the opportunities in distance learning technologies efficiently and mutually beneficial.

The outcomes of the study are the following:

1) methodology and method for applying remote technologies is described for the organization of project activities;

2) optimal system is recommended for creating a distance course;

3) mixed model algorithm is proposed for teaching technical disciplines with the acquisition of working skills in a distance format.

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