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IMPLEMENTATION OF AN ORAL DIALOGUE BASED ON A NEURAL NETWORK OF ARTIFICIAL INTELLIGENCE IN THE ONLINE PLATFORM IN SECONDARY SCHOOL

Abstract

Today in society there is a need for artificial intelligence that teaches schoolchildren through oral communication, questions and answers. In the first quarter of the 2020-2021 academic year, secondary school teachers in Kazakhstan spent more time checking students' written responses compared to traditional teaching in previous years. At this time, the teachers noted that there was not enough time to verbally explain the lessons and provide high-quality oral feedback to all students. To solve this problem, we propose to use an artificial intelligence neural network to verbally explain the topic of the lesson in an online learning platform.

The proposed article analyses and investigates the methodology for the implementation of oral teaching of schoolchildren using artificial intelligence neural networks in online learning in general education schools. The neural network recognizes a school textbook and processes it in a text and audio editor. oral explanation to the student of the theoretical material from the textbook alternates with the assessment of the student's voice response. An online demonstration of ways to solve programming problems is carried out in an online editor installed on an online platform. The proposed online platform can be effectively used in traditional face-to-face education.

Keywords: online platform for online learning; methods of creating internet platforms; dialogue with artificial intelligence**.**

Introduction. A large-scale experiment is being carried out in many countries during the pandemic to test distance learning technologies capabilities. More than 90 per cent of students in 185 countries around the world by the end of March 2020, according to UNESCO, had become participants in distance learning around the world, in connection with the corona virus pandemic [1]. Teachers, trying on in all lessons, in all areas of study, conclude for themselves on the use of ICT in teaching [2]. Among them are the risks associated with:

– using passive teaching methods in distance learning (passive video viewing, limited to reading or watching a presentation);

– lack of teachers' time to develop quality content;

– unequal access of students to the Internet, unequal capabilities of devices (smartphones, laptops, tablets, computers, etc.).

Unequal access of students to the Internet led to a lack of time or a discrepancy in the teacher's time for an individual oral explanation of the educational material. To intensively switch to distance technology, most teachers and scientists worldwide began to actively share their high-quality online resources, becoming members of online teacher communities. At the same time, the practice also suggests a positive impact of the experience of using distance learning: in the future, along with face-to-face learning, the best online learning practices will probably be used. Online platforms Google Classroom, moodle, daryn.online, kundelik.kz, bilimland.kz, bilimal.kz, imektep.kz are used for online education in secondary schools in Kazakhstan.

In the first quarter of the 2020-2021 school year, secondary school teachers in Kazakhstan spent more time checking students' written responses than traditional teaching in previous years. At this time, teachers noted that there was not enough time for oral explanation of the lessons and for conducting high-quality oral feedback with all students.

Oral discussion of a new lesson topic is especially important for most secondary school students. For the first time, students get acquainted with new definitions, phenomena, rules, theorems, and programming languages. Most students need a conversation with a teacher to resolve their difficulties. Difficulties can be associated with selecting the object of research, its characteristics and the concept of the essence of the issue. New educational information may be too abstract or not linked with the student's previous knowledge and experience.

Although online educational platforms used by educational institutions contain educational materials (presentations, texts, videos, etc.), tasks to consolidate the topic of lessons (exercises), forms of knowledge assessment (tests, surveys), this is not enough for a high-quality oral explanation educational material for the student in distance learning.

Since video communication applications such as WhatsApp, Zoom and Skype were not originally designed for the education system, teachers have difficulty making eye contact with 30 students in a class at the same time. School teachers also note the lack of time to discuss incomprehensible questions about the lesson assignments. To analyze the effectiveness of online learning platforms in recent years, we have studied pedagogical research on the use of neural networks that comprehensively track learning processes in online learning platforms based on publication sources in Web of Science and Scopus [3].

The article provides for two goals:

– how it is possible to implement an oral dialogue of an artificial intelligence neural network with schoolchildren based on a textbook;

– connection of the online learning methodology of the artificial intelligence neural network with Internet pedagogy, the learning platform.

Theoretical background. The activity-based approach to learning and the theory of cognitive learning were used as a theoretical basis. However, at the same time, the formation of primary knowledge among students using innovative information technologies is the basis for the adoption of Internet pedagogy as a new branch of pedagogical science.

Internet pedagogy considers in a complex the problems of distance learning, learning in augmented reality, in virtual reality.

It is essential to create a unified online learning platform around the world.

Looking at the scientific literature, we noticed that the term "virtual world" is divided into several categories. Girvan Carina discusses the definition and meaning of the word "virtual world", and the history of the term in the article "What is a virtual world? Definition and classification" [4]. In 2008, Bell and Schroeder provided an initial platform for developing a standard definition of the term "virtual worlds" [4]. However, over the past ten years, the meaning of this term has not been finalized. Instead, there were conflicts in the literature using new terms, sometimes used to classify types of virtual worlds, while others were used synonymously. Also, interest in virtual reality's potential has increased recently, leading to more confusing terms. It is known that this term does not have a precise universal definition. In his article, Girvan Carina introduces a new framework for identifying virtual worlds and discusses the user experience and technical capabilities required for a virtual world.

Online learning theories are currently being refined, as online learning still does not involve the oral dialogue of artificial intelligence with the learner. There is a need to create Internet pedagogy as a new area of pedagogy. It is also necessary to define the boundaries of training and education in online learning.

Materials and methods. The following research methods were used:

– Empirical research methods (observation, survey);

– Theoretical research methods (analysis, modeling).

Empirical research methods – observation and comparison are used to assess the current state of online education. Initial information was collected from school teachers in Zhambyl oblast through remote interviews and surveys. School teachers use online platforms moodle, Google Classroom, daryn.online, kundelik.kz, bilimland.kz, bilimal.kz in online learning (Figure 1).

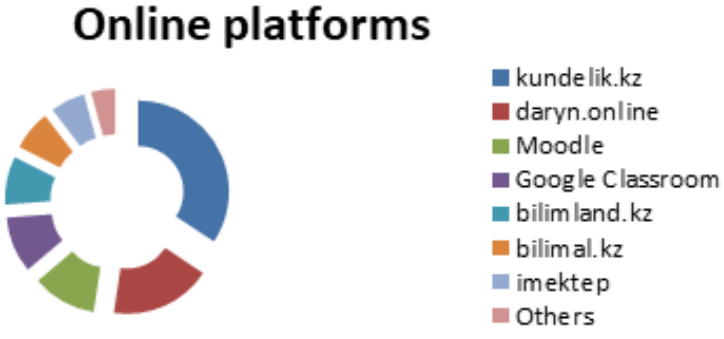

Figure 1. **Online platforms used in secondary schools in Zhambyl region**

Teachers report that they do not have enough time to create quality digital content for the class. In the first quarter of the 2020-2021 academic year, secondary school teachers in Kazakhstan spent more time checking student responses compared to traditional teaching in previous years (Figure 2). The teachers conducted online consultations with schoolchildren and their parents using video calling applications.

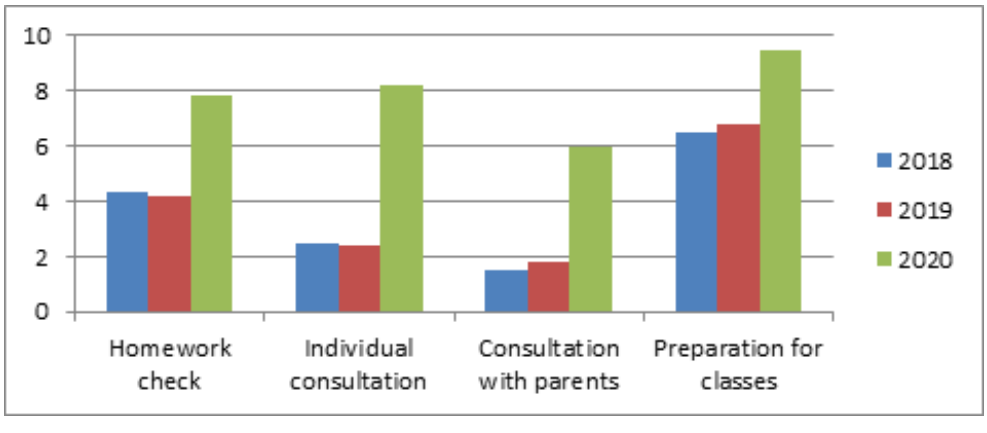

Figure 2. **Average weekly time spent by school teachers on extracurricular activities**

Teachers noted that the time for individual consultation with schoolchildren and their parents and preparation of digital content for classes also increased. The following Figure 3 shows the applications used by teachers to communicate with students.

Figure 3. **Applications used by teachers for dialogue with students**

Teachers used WhatsApp to exchange messages and make internet calls 82 per cent of the time. In secondary school, the Zoom program was used. In the middle classes, Zoom was used for monitoring once a week. The young teachers used Skype and Instagram. Our study also relied on official sources of secondary education institutions in Kazakhstan on the Internet on this issue. The theoretical research analysis method was used to create a method of oral dialogue of the artificial intelligence neural network with schoolchildren. We analyzed 233 articles on innovative learning published from 2017 to 2019 in the Web of Science database and 113 articles found by the keyword "neural networks in learning".

Results. Teachers' experience in using online learning has shown the need to create an oral dialogue technique based on an artificial intelligence neural network in an online secondary school education platform.

There are preconditions for improving distance learning in modern society - this is the use of chatbots, text generation programs, dialogue with artificial intelligence Siri, Sophia and Alice.

Based on the analysis of online learning experiences, we have created an online learning technique for a neural network with artificial intelligence, which implements oral dialogue on an Internet platform at school (Figure 4).

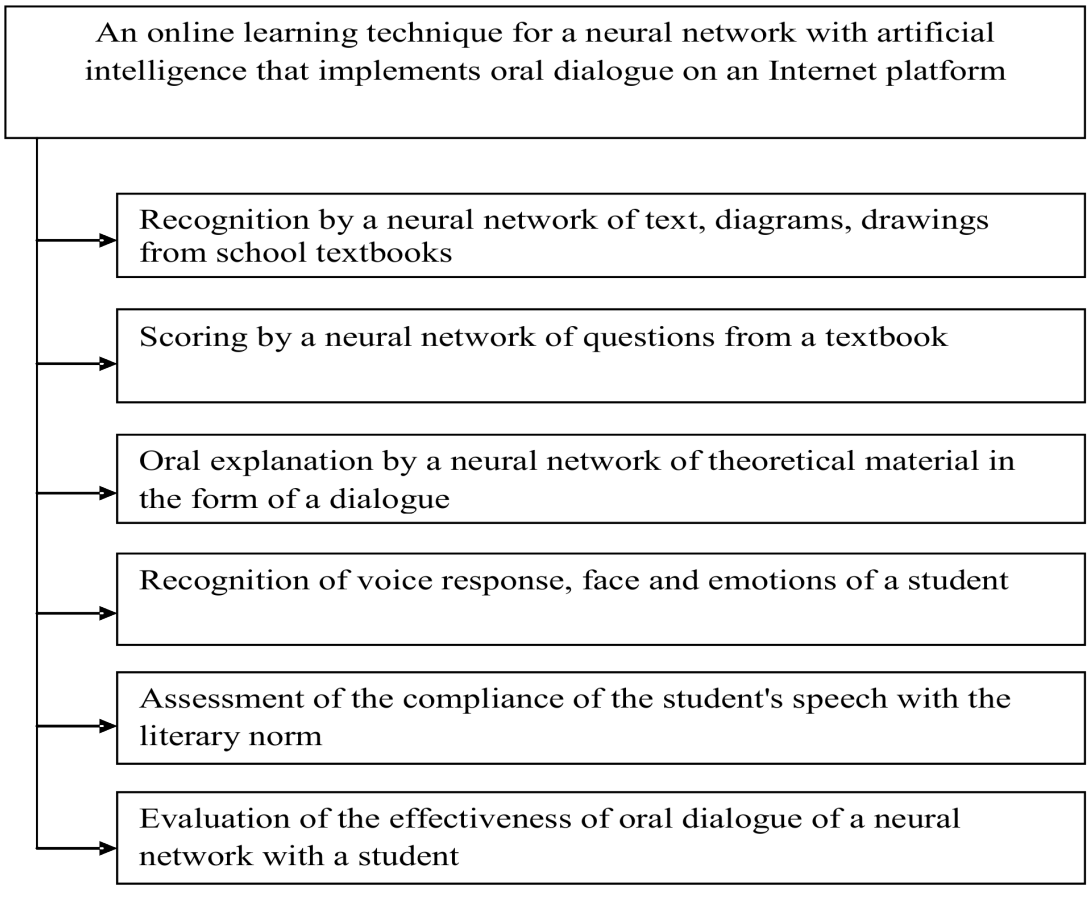

Figure 4. **Scheme of the Online training methodology for a neural network with artificial intelligence implements oral dialogue on an Internet platform**

We believe that the creation of an artificial intelligence neural network that implements oral dialogue on an Internet platform for online education in secondary school consists of the following components:

– recognition of text, diagrams, drawings from school textbooks by a neural network;
– voicing questions from the textbook;
– oral explanation of theoretical material in the form of questions and answers;

– recognition of the student's voice response;

– face recognition and student emotions;

– assessing the compliance of the student's speech with the literary norm;

–determining the strategy of effective oral dialogue of the neural network with the student;

–flexibility in the choice of learning strategies depending on the student's motivation and academic performance.

If the student does not perform active learning activities for a certain period, the neural network activates the necessary option for organizing the student's learning activities. The beginning and end of the lesson are carried out automatically without the participation of the teacher. If necessary, the student's answer is automatically checked using a neural network, and the grade is set at a time predetermined by the teacher. The learning strategy in an online platform built with a neural network can be flexible depending on parents and teachers' requirements. The neural network checks the student's oral response and corrects some errors according to the teacher's pre-selected conditions.

After the theoretical material, questions are given on self-control of the assimilation of educational material in all textbooks. Here is an example from the textbook "Informatics" for the 6th grade of a comprehensive school [5]. In the 3D graphics section, after the textbook's explanatory text, there is an instruction for the action: "Answering questions." Then five questions are given:

1. What is 3D graphics?

2. What programs for 2D and 3D graphics do you know?

3. What do you know about SketchUp?

4. How is SketchUp different from other 3D software?

5. What templates are there in the program?

The answers to these questions are contained in the explanatory text of this topic.

In online education, schoolchildren study electronic textbooks, but many students find it challenging to install the program on a computer on their own, choose an emulator and run listings. Although the student reads and understands textual information in a textbook about a computer program, in practice, errors in running the program on a computer are possible.

Using an online editor in teaching computer science in secondary school will allow:

– learn how to create 3D objects without installing the program;

– online programming results are displayed visually;

– the transition from simple to complex is accompanied by the help and hint of the neural network;

– learning takes place based on the student's actions;

– students develop the skills of independent information search, program development.

The neural network uses text recognition software to highlight questions, discussions, and explanatory text based on language markers. The elements that make up the text (heading, explanatory part of the text, questions, tasks) can, using generative grammar principles, be voiced in several styles (popular science and oral spoken). She should explain the educational material in parts, and every three or four sentences (syntactic whole) ask oral questions to the student. The artificial intelligence neural network evaluates the student's listening and response process by observing their face. The student's answer is recorded as an audio file and converted into text format. With quick and correct answers, she encourages the student's answers. To approve the status of good academic performance, the program issues questions from the previous sections in no particular order. If necessary, the material is explained several times. This can happen at the request of the student. Or until the student reaches a certain threshold.

In the case of repeated incorrect answers of the student, the neural network program warns the teacher and the student's parents via email. In these cases, the reasons can be eliminated: a separate room or area in the house for one student is allocated, a different time of day is chosen for the lesson, the situation of the student's health or illness is clarified. Other reasons are also possible. The neural network compares the student's oral response with the template and verbally informs the student about errors.

Discussion. Virtual reality technology allows teachers and students to feel like a participant in a virtual environment in the visual, auditory and sensory three-dimensional worlds and get a new education level.

In some cases of teaching disciplines of geosciences and nature, oral dialogue with a neural network must be combined with virtual glasses. Nearpod VR Virtual Glasses allow you to convert workflow materials created in pdf, jpegs, ppts formats to 3D and create a 3D virtual tour accessible on any device (iPad, Chromebook, Mac or PC).

Elements of a computer game are also studied in distance education. For example Horacio Rodriguez Guillermo and others compared a traditional Kteacher virtual course with a traditional distance learning method using the Kinect tool [6] in a Kinect-Based Approach to Enhance Students' Learning Experience. Sometimes the explanation of the topic of the lesson should be carried out playfully. In this case, the artificial intelligence neural network uses educational games as a warm-up during the lesson. Zhang Yongjiang provides an introduction to the development of WebGL-based Virtual Teaching Platform for Mold Design [7]. There are, of course, experiences in tracking the digital traces of trainees. Several studies clarify the characteristics of users in the virtual world. For example, large amounts of student data were tracked within the university's virtual campus's educational platform, and student fingerprints were analyzed in four groups: user behavior, user activity, content activity, and forum activity [8]. Although the use of artificial intelligence in teaching English [9; 10] and the Chinese programming learning platform [11] has been described, the neural network did not perform the functions of oral learning. Of course, some researchers [12; 13] and others. The use of neural networks in education is implemented using limited functions (for example, real-time testing in education using a student-eye-movement-monitoring program). In recent years, quite a lot of research has been published on innovative pedagogy [14; 15; 16], in some regions of digital education [17; 18; 19]. For such a long time, new terms have been introduced - virtual pedagogy, communication pedagogy, interactive pedagogy [20], digital pedagogy [21; 22] seem to be synonyms at first glance, but if you analyses the teaching aids, the dominant teaching technology becomes clear. In higher education, virtual worlds are applied in virtual lectures, virtual labs, virtual field trips, simulations, creations in the world, games, assessment, and socialization [23]. The conducted pedagogical experiments have shown the effectiveness of using ICT in education. However, to systematize knowledge in this area, it becomes necessary to develop Internet pedagogy dealing with training and education issues through single access to Internet resources.

Comparing the connotations of the terms defining innovative teaching methods, we can see that the term "Internet pedagogy" is the most generalized and collective. It implies the combination of the above teaching methods used through the Internet. Thus, it can be determined that Internet pedagogy is a branch of pedagogy, a separate search engine that implements the principles of e-learning for learners of all ages, categories, stakeholders, based on single quick access to all e-materials of distance learning. In some countries, the adoption of distance learning technology as a form of education at the legislative level is being discussed.

In this case, the question arises of defining the principles and mechanisms of online learning. It is necessary to clarify the boundaries of confidential information of an individual taken to preserve his constitutional rights to freedom.

Principles of Internet Pedagogy:

– quick search for information on pedagogy in a separate browser;

– qualitative analysis of content, assessing the implementation of the principle of humanism and universal values in Internet resources;

– for consumers.

– focus on age-related and organizational forms of education (for preschoolers, schoolchildren, schoolchildren, teachers, scientists, parents, etc.);

– self-regulated learning (implementation of the principles of developmental education for a specific person in Internet resources, health-saving technologies, reducing the load on the student with the possibilities of individualizing approaches);

– connection between theory and practice (hyperlinks to the achievements of the best pedagogical practices of universities, schools, mobile feedback);

– the activity of trainees during distance learning (previously agreed upon in the conditions of training or consulting, expressed in regular online actions, strategies for individual developmental learning);

– interactivity and clarity of educational material, achieved by variations of presentation in the form of presentations, computer educational games, online puzzles, online/ offline quests, etc .;

– ease of use of the interface for parents, children;

– trust in the pedagogical approaches of the authors of online resources, courses;

content security

Internet pedagogy distributes its resources according to the indicated categories. She not only provides the requested information but also analyses views, preferences, and self-control. At this stage, it is necessary to take into account the experience of open educational resources and the development of computer 3D educational games [24; 25] having analyzed the choice of hardware and software. Artificial intelligence neural networks have been effectively used in teaching through oral dialogue [26; 27; 28; 29]. In traditional education, the teacher's oral interpretation of educational material in school teaching plays an essential role in forming an internal assessment, the student's worldview.

An artificial intelligence neural network can replace the teacher's function of verbally explaining and reinforcing lessons for an effective online learning organization. In a distance learning environment, the teacher should devote more time to the student who finds it difficult to work independently.

Conclusions. The effectiveness of distance learning technologies will be realized by integrating active, playful online teaching methods with an oral dialogue of an artificial intelligence neural network. Modeling an oral dialogue based on a neural network with artificial intelligence is especially important when training is individual work with students in distance education. With the proper instructional design, artificial intelligence neural networks can save secondary school teacher time during online teaching. The artificial intelligence neural network collects statistical data, provides it to the teacher for analysis, and simplifies assessment work. The artificial intelligence neural network's primary goal is to conduct online teaching of schoolchildren in the form of oral dialogue and formative assessment of educational skills. Changes in the methodology and theory of pedagogy resulting from the use of ICT in teaching have defined a new frontier of pedagogy as an academic discipline and a methodology for forming a new society.

This study has shown the need to create a unified search platform for Internet pedagogy. As a separate branch of a pedagogical science, the subject, principles of Internet pedagogy, have been determined. Many online learning methods have not been fully utilized due to incomplete perception of the digital environment or the lack of established methods for their implementation.

Teachers and scientists' role in the information world has grown as they teach and educate progressive youth in the most advanced achievements of science and technology.

Every society strives to obtain the most advantageous position in the context of globalization of economic processes. In developed countries, most of the adult population receive higher education, contributing to the formation of a high standard of living in society. Despite the difference in the economic situation over time, information culture will be developed in all countries. The task of modern pedagogy is to prepare a new digital generation, educate universal human values, such as humanism, the desire for scientific progress in the name of humanity and peace; helping teachers and academics pool pedagogical resources.

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Орта мектептегі онлайн оқытуға арналған интернет платформасында ауызша диалогты жасанды интеллект нейрожелісі негізінде құру

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Аңдатпа

Бүгінгі қоғамда оқушыларға ауызша сөйлеу, сұрақ-жауап арқылы үйретететін жасанды интеллектке деген қажеттілік пайда болып отыр. 2020-2021 оқу жылының бірінші тоқсанында Қазақстандағы орта мектеп мұғалімдері алдыңғы жылдардағы дәстүрлі оқытумен салыстырғанда оқушылардың жазбаша жауаптарын тексеруге көбірек уақыт бөлді. Осы уақыт ішінде мұғалімдер сабақты ауызша түсіндіруге және барлық оқушыларға сапалы ауызша кері байланыс беруге уақыт жеткіліксіз екенін атап өтті. Ұсынылған мақалада жалпы білім беретін мектептерде онлайн оқытуда жасанды интеллект нейрондық желілерді қолдана отырып, мектеп оқушыларын ауызша оқытуды жүзеге асыру әдістемесі талданады және зерттеледі. Нейрондық желі мектеп оқулығын таниды және оны мәтіндік және дыбыстық редакторда өңдейді. оқулықтағы теориялық материалды оқушыға ауызша түсіндіру оқушының дауыстық жауабын бағалаумен ауысады.

Бағдарламалау мәселелерін шешу жолдарының онлайн көрсетілімі онлайн платформада орнатылған онлайн редакторда жүргізіледі. Ұсынылған онлайн-платформаны дәстүрлі бетпе-бет оқыту барысында да тиімді пайдалануға болады.

Түйін сөздер: онлайн оқытудың онлайн платформасы; интернет -платформаларды құру әдістері; жасанды интеллектпен диалог.

Реализация устного диалога на основе нейронной сети искусственного интеллекта на онлайн-платформе в средней школе

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Аннотация

Сегодня в обществе существует потребность в искусственном интеллекте, который обучает школьников посредством устного общения, вопросов и ответов. В первом квартале 2020-2021 учебного года учителя средних школ в Казахстане тратили больше времени на проверку письменных ответов учеников по сравнению с традиционным обучением в предыдущие годы. В это время учителя отметили, что не было достаточно времени, чтобы устно объяснить уроки и дать качественную устную обратную связь всем ученикам.

В предлагаемой статье анализируется и исследуется методика реализации устного обучения школьников с использованием нейронных сетей искусственного интеллекта в онлайн-обучении в общеобразовательных школах. Нейронная сеть распознает школьный учебник и обрабатывает его в текстовом и аудио редакторе. устное объяснение студенту теоретического материала из учебника чередуется с оценкой голосового ответа студента.

Онлайн-демонстрация способов решения задач программирования осуществляется в онлайн-редакторе, установленном на онлайн-платформе. Предлагаемая онлайн-платформа может быть эффективно использована в традиционном очном обучении.

Ключевые слова: онлайн-платформа для онлайн-обучения; методы создания интернет-платформ; диалог с искусственным интеллектом.

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СТУДЕНТКЕ ОРТАЛЫҚТАНДЫРЫЛҒАН ОҚЫТУДЫ ЦИФРЛЫҚ ТРАНСФОРМАЦИЯЛАУДЫҢ ИННОВАЦИЯЛЫҚ БАҒДАРЛАМАСЫН ӘДІСТЕМЕЛІКПЕН ҚАМТУ

Аңдатпа

Студентке орталықтандырылған оқытудың (СОО) дербестендірілген формасын цифрлық трансформациялаудың инновациялық бағдарламасын ұйымдастыруды әдістемелік қамту кезеңдері, өлшемдері, көрсеткіштері деңгейлері ұсынылған. 1-4 курс студенттеріне жүргізілген эксперимент нәтижесінде цифрлық орта жағдайында студентке орталықтандырылған оқытудың дербестендірілген формасын трансформациялау бағдарламасының нәтижелері көрсетілген. Авторлар болашақ мұғалімнің цифрлық ортада студенттерге бағытталған оқыту негізінде кәсіби даярлығын жақсартуға арналған ғылыми-әдістемелік нұсқаулық ұсынады.

Бұл мақала ҚР БҒМ № AP08857119 – «Болашақ мұғалімнің студентке орталықтандырылған оқытуын цифрлық орта жағдайында трансформациялау» ғылыми жобасы аясында орындалған (келісім-шарт № 294 16.11.2020ж.).

Түйін сөздер: инновациялық бағдарлама; студентке орталықтандырылған оқыту; дербес траектория; цифрлық орта; студенттер; фасилитатор; тьютор