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INTEGRATION OF TRADITIONAL AND DISTANCE LEARNING METHODS IN HIGH SCHOOL

Abstract. In the article the researchers are exploring the integration of traditional and distance learning methods identified as a result of quarantine measures during the coronavirus in high school.

The main complex contradictions are revealed. Methods and decisions of a complex problem are developed. The tendencies of the development of distance education are researched. Scientific assumptions about an educology methodology are formed. Main stages of modern educational technologies in universities are defined. The study of integration processes between traditional and distance learning is carried out. The relations between subjects and objects of the university department are learned. It was revealed that the structure of the educational process is complicated due to the use of mobile means of communication and distance forms of educational communications in it, which leads to a change in teaching methods and forms.

The features of the learning processes of modern students have specific features now.

The necessity of using mobile devices and new software is analyzed. Attention is drawn to the fact that not all teachers are well versed in modern means of online group communications. The basic means of group communications such as: Moodle, Zoom, Skype, Teams and others, providing remote communication of students and teachers are analyzed. The features and specificity of these means of communication are considered. Their possibilities are being studied.

Results of reengineering studies at the department are presented. The results of testing student training based on modeling methods are presented too. A digital platform of knowledge models, which consists of two components is created and used. The first component is an interconnected set of models of academic disciplines developed by teachers, and the second component is the knowledge models of these disciplines that students create during their studies. Teaching methods based on integrated intelligence during pandemic in universities are made. Ways to improve learning technologies based on the use of integrated intelligence are proposed in high school.

Keywords: online education; the digital platform of knowledge models; models of academic disciplines; personal training system; models of professional knowledge of students; integrated intelligence.

1. INTRODUCTION

The state in which our planet found itself at the beginning of 2020 is characterized as a pandemic of the coronavirus COVID-19, and Ukraine is no exception. In the fight against fatal infection in Ukraine, a long-lasting quarantine has been declared. The requirement of quarantine events limits the functioning of most state institutions, including the educational system of Ukraine.

In this regard, a complex and still poorly studied situation has arisen where the distance learning form extends not only to distance learning but also to all processes taking place in higher educational institutions and to the education system as a whole. In addition, the requirements for the quality of higher education are not reduced, and therefore the search for scientifically based solutions for the use of new forms of education is an urgent task.

The object of the research is the higher education system. The subject of the research is the processes and methods of education in universities during quarantine.

Formulation of the problem. It is known that the modern functioning of universities involves three forms of learning – traditional, distance learning, and based on integrated intelligence [1]. It would seem that under quarantine conditions it is easy to switch to distance learning with the appropriate human and technical resources, however, real quarantine conditions have shown that existing facilities and technologies (methods) do not fully justify the hopes for their high-quality and effective use.

A problematic situation arose due to the transition of universities from traditional functioning to functioning in conditions of not only quarantine, but informational singularity. A generalized scheme of such a transition is illustrated in figure 1.

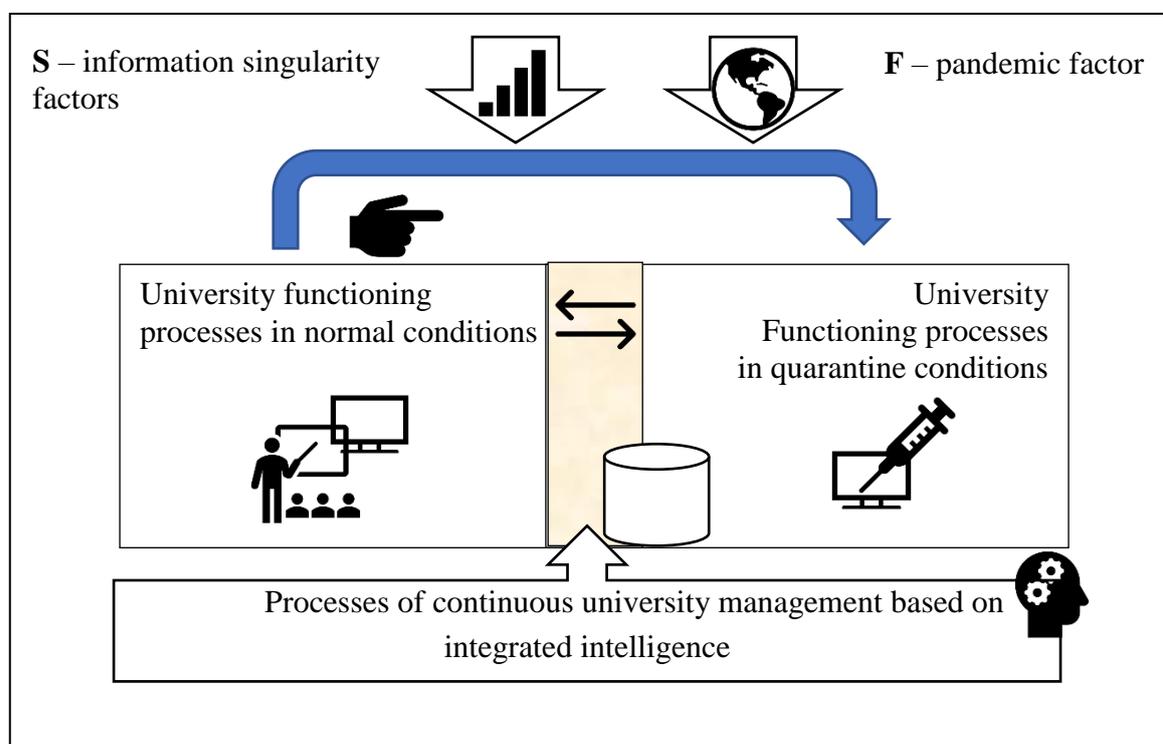


Figure 1. Generalized scheme of the university at the time of changing from traditional functioning to functioning in quarantine

In this situation, the problem arises of maximizing the use of human, technical, and information resources to ensure the high-quality and effective functioning of the university in the remote mode under quarantine.

Let us single out several basic contradictions. This is, firstly, the contradiction between the capabilities of electronic learning tools (educational communications) and the knowledge, skills of scientists and their abilities, which organize, provide and control processes in educational systems. Secondly, the contradiction between the high requirements of educational standards and the imperfection of electronic means of educational communications of the university. Thirdly, the contradictions between the high requirements of educational standards for the practical training of students in the departments, which should ensure the appropriate level of competence of their graduates, and the low efficiency of acquiring professional skills by students in the virtual space.

Fourth, the contradictions associated, on the one hand, with the change in the psychology of modern students to the perception of information in the form of images and short messages and the singularity factor, i. e. increasing and complicating educational information.

These contradictions form a complex problem of improving the quality and effectiveness of the university's functioning under quarantine, which should remain at least no lower than under ordinary conditions. In our opinion, this problem requires a comprehensive approach to solve it. This study will be devoted only to the integration processes of traditional and distance learning based on integrated intelligence. A form of training based on integrated intelligence, in our opinion, occupies an intermediate position between traditional and distance forms of training and, besides, is the most acceptable in quarantine.

To solve this problem, we will use the methods of system analysis, system theory, and cybernetics, as well as the methods of modern didactics of higher education.

The purpose of the research is an application of new forms of education in conditions of a pandemic and quarantine. This is the learning based on integrated intelligence, that occupies an intermediate position between traditional and distance learning and allows you to get the best results at the level of the quality of knowledge.

2. THE ANALYSIS OF TECHNOLOGIES USED IN UNIVERSITIES

Educational systems are studied in many works, which can be divided into two groups. The first group includes the results of scientific research that can be attributed to the humanities - philosophy, pedagogy, "andragogics", and pedagogy of higher education in general [2] – [5]. The second group includes the results of studies that are currently forming the methodology of educology [6] – [8]. Currently, this methodology is being formed according to the methods and theories, such as systems theory, information theory, data transfer theory, and the theory of pattern and speech recognition theory.

The basis of these studies is the work [9], where the processes of integration in education are studied from the integration of educational material within the framework of academic discipline to the integration of knowledge at the level of individual higher education. Also, the processes of integration of educational and information technologies are investigated here. However, the integration of traditional and distance learning processes in this work has not been studied in detail. Let us show in the most generalized form three options (fig. 2) for the implementation of modern teaching technologies in universities.

Figure 2 A) shows in a generalized form the traditional process of studying bachelor degree, consisting of three stages – the preparatory, the main – information and communication, and the final phase.

Figure 2 B) illustrates the same learning process, but distance learning technologies are also used in conjunction with traditional technologies. Currently, it was this scheme that was used to educate students during the quarantine period.

Figure 2 C) illustrates the proposed learning technology based on integrated intelligence, the elements of which were tested at the Department of Land Administration and Geoinformation Technologies of the O. M. Beketov National University of Urban Economy in Kharkiv.

In figure 2, the abbreviation DPMK stands for a digital platform of models of teachers' knowledge in various disciplines according to a specific specialty.

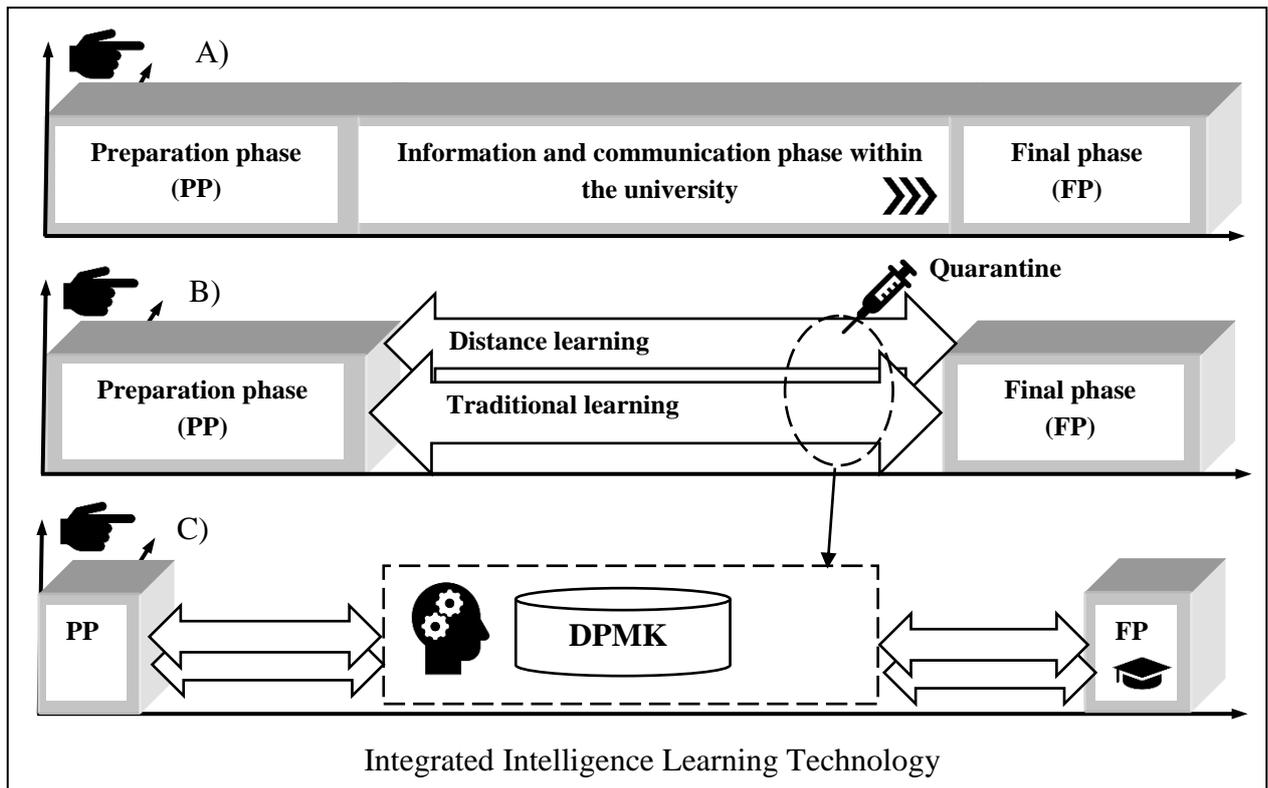


Figure 2. The main phases of the modern educational technologies in universities

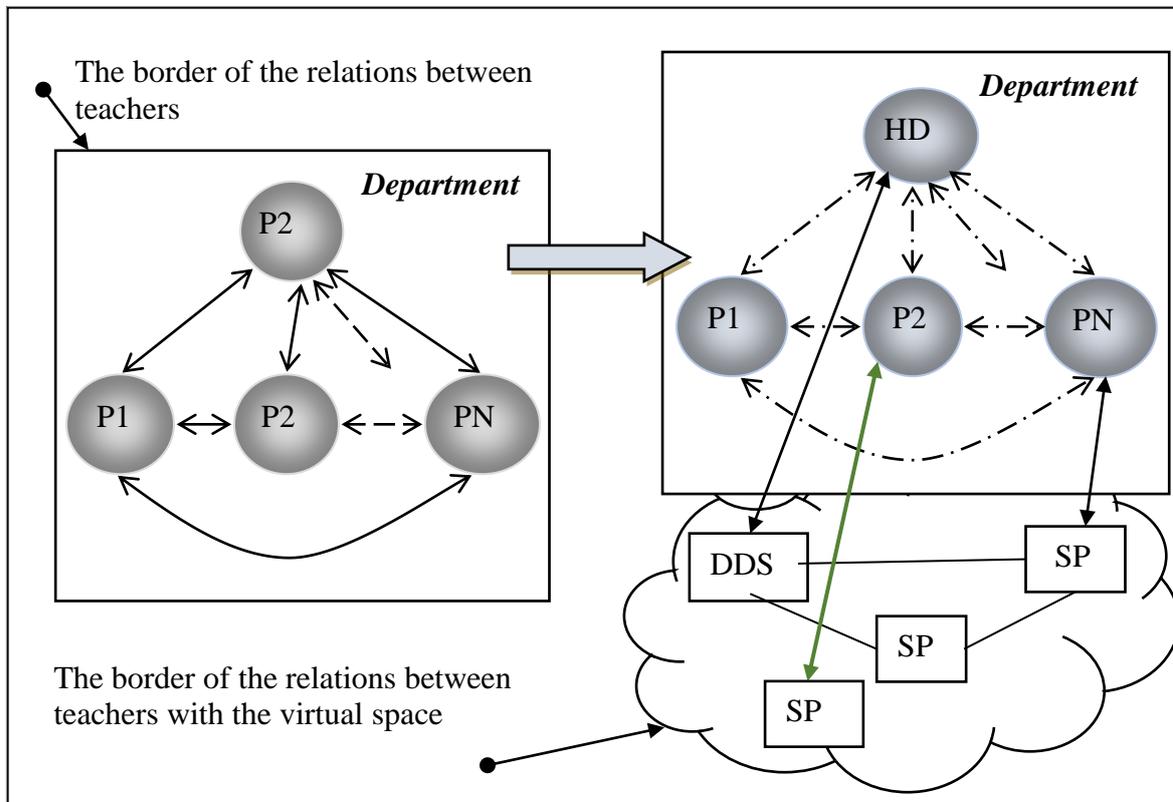


Figure 3. The relations of scientists and pedagogues at the department and their connection with the new mobile means of communication

3. PECULIAR PROPERTIES OF TRADITIONAL AND DISTANCE LEARNING TECHNOLOGIES

The structure and relations between the main elements (subjects) and the procedures of traditional educational technologies in universities are known and can be schematically represented in the form of graph models.

Figure 3 formally shows the relationship between the teachers in the department that existed 20 to 30 years ago, and how they have changed at present, in the context of informatization and the use of mobile communications and distance learning.

On the left side of the Figure, the university department is formally represented as a graph model, which consists of:

- ✓ HD - the Head of the Department (HD);
- ✓ P1 - a person 1, P2 - a person 2, ..., PN - a person N.

Between them, there are relations «boss-employee», indicated in the figure 3 and relations «teacher-teacher». This composition and the relationship between the scientific and pedagogical (SP) department are typical for classical universities during the period of using mobile communications and distance learning.

The relations between the teachers of the department developed, mainly within the department, i. e. in professors' classrooms, laboratories, and its other premises. A typical example of the relations between teachers can be a meeting of the department, where curricula, programs, teaching methods, and the results of scientific work were discussed.

We will show how these relationships and connections are transformed in modern conditions – in the context of the massive use of mobile communications and distance learning.

The fact of weakening the traditional types of relations between the teachers of the department becomes obvious. In Figure 3 they are shown by dash-dotted lines. An essential feature of the relations between the department's SP is the use of hardware and software that allows the formation of a virtual learning space that goes beyond the traditional understanding of the department, the university, and the school system. The structure of the department is complicated due to the emergence of new connections and relationships between the department's research and teaching staff, as well as the creation of personal sites (PS), static and dynamic departments sites (DDS), the organization of communication channels based on e-mail, the organization of blogs, instant messengers, web forums, chats.

We will move on to the analysis of the integration processes of traditional and distance learning.

Computer technology has long been used in education. Modern technologies have great didactic capabilities, ranging from listening to texts in foreign languages, ending with video tutorials on the study of applied software. The practice has shown that modern forms of distance learning are useful in working with students who have developed the so-called «clip thinking». Most students today are visuals - they need to look and touch, and not hear and record. It is much easier and more convenient for a modern student to study methodological material in the discipline, not in paper form (book), but electronic form (electronic textbook, link to the site with the necessary information). And most importantly – at a time when the student is more comfortable doing it. Based on this, it is currently impossible to do without the use of computer technology in the acquisition of knowledge [10] – [13], [14]. How to introduce computer technology into the educational process is a decision and the specifics of a particular discipline.

The difficulty, in this case, lies in the search for a fine line between teaching the discipline offline (the familiar form of learning), which requires a face-to-face meeting in the audience from teacher to student and a complete transition to distance learning (online). Is it possible to combine these two forms of education? What ready-made solution for maintaining the educational process online is better to choose from the well-known or recommended by the university administration? Perhaps it makes sense to develop your platform, and not waste time setting up software products that do not always adequately reflect the characteristics of the national education system?

Educational standards do not impose strict requirements on the technical means of implementing the educational process. Therefore, there are many possible variations and combinations of methods, hardware, and software, forming a particular learning technology. At the same time, the educational material of the discipline, hardware, and software, technological procedures that form a combined learning technology should ultimately lead to maximum efficiency in terms of providing students with new knowledge and the formation of appropriate skills in their specialty.

Currently, a big number of diverse effective, and affordable online distance education projects have appeared. Most used in university is Moodle. Despite a great number of shortcomings that have been identified as a result of, its use during prolonged quarantine, it is the most popular platform for conducting the online educational process in many universities. During the quarantine period teachers had to switch from online learning to distance learning. All students had to be transferred online without compromising the quality of the assimilation of the material.

As a survey of school employees showed, the capabilities of the Moodle platform were not enough to maintain the educational process at the same level, due to low reliability. High-performance learning communications showed video conferencing (fig. 4).



Figure 4. The view of the Skype window during a class in a teleconference

Among the most effective and affordable platforms that allow using this type of study have proven their quality:

Zoom – provides a platform and technical support for online conferences, training, video conferences and webinars, and cross-platform messaging and file sharing.

Skype – allows you to make conference calls, video calls (up to 50 subscribers, including the initiator), provides the transmission of text messages and files. It is possible to transmit the image from the monitor screen along with the image from the webcam, which allows teachers to effectively advise students.

Teams – a corporate platform that combines chat, conferences, notes, and attachments in the workspace, is part of the Office 365 package, which was used to conduct faculty meetings and academic councils.

In addition to the above-mentioned platforms, e-mail, and all kinds of instant messengers were actively used during the distance learning period:

Viber is a messenger application that allows you to send messages, make video and voice calls over the Internet. Also, in Viber, there is the possibility of transmitting images, video and audio messages, documents, and files, this is effectively used in the process of consulting students, as well as in the process of exchanging relevant information between scientific and pedagogical workers of the department and faculty.

Telegram is a cross-platform messenger that allows you to exchange messages and media files in many formats.

WhatsApp is an instant text messaging system for mobile and other platforms with support for voice and video communications. It allows you to send text messages, images, videos, audio, electronic documents over the Internet.

The question arises whether it is possible, with a simple substitute, to switch from traditional learning technologies to distance learning in a short time without a significant loss in the quality of training?

The answer to this question is given by a long quarantine, which forced most of the processes occurring in universities to change from traditional forms of education to distance learning and use modern technology and software communication tools.

At its core, a compelled measure to protect the health of citizens of Ukraine has turned into a global experiment, as a result of which, it has become apparent that distance learning can never fully replace the study of new material under the guidance of a teacher offline – that is, with the direct presence and assistance of a teacher. This is especially true for the study of technical and knowledge-intensive disciplines.

However, the coronavirus pandemic made a strong impact on the development of distance learning because one of the priority tasks of a teacher in quarantine is to continue teaching students «without gaps» in acquiring knowledge in a particular discipline.

An important result of long quarantine is the identification of teachers who are poorly skilled in the hardware and software of distance learning. Besides, quarantine made it possible to identify precisely, those platforms for conducting distance learning, which are more convenient not only from maintaining the educational process at a high level but also from mastering these platforms, both by students and teachers.

4 THE RESULTS OF RESEARCHERS OF EDUCATION PROCESSES BASED ON INTEGRATED INTELLIGENCE

The main point of using the idea of teaching students based on both the natural intelligence of scientific and pedagogical workers and their knowledge models in various academic disciplines is to create an analog of the knowledge base that is used in systems with artificial intelligence. For example, in expert systems, decision support systems, in intelligent systems based on neural networks, etc. However, most of the created intelligent systems are focused on solving typical problems in one specific subject area. In the case of building educational systems with artificial intelligence, it is necessary to build a distributed knowledge-oriented base for many specialties, into which it is necessary to «lay down» many models of various subject areas (humanitarian, fundamental and professional) and use the entire existing «arsenal» of knowledge representation methods, and this is currently a difficult task.

At the same time, in the process of reengineering the Department of Land Administration and Geoinformation Systems at the O.M. Beketov National University of Urban Economy in Kharkiv [15] a support system for educational processes (SSEP) was developed in the form of a dynamic site [16], using some of the experiments that were conducted, and individual conceptual provisions were tested building a system of «smart university». The studies and their results have shown the feasibility of creating a curriculum model based on the modeling of academic disciplines set by educational standards. The experience in creating models of academic disciplines has shown clear advantages over the traditional design of educational material in the form of manuals, lecture notes, and manuals. The main advantage of the models of academic disciplines is the ability to expand the boundaries of educational material by providing students with multi- and video information on the subject area being studied. Also, be aware of the links between disciplines through appropriate hyperlinks, as well as systematize the results of their training [17], [18], [19].

The set of models of academic disciplines, interconnected by a multitude of relations «to provide» and «be provided» represent one of the components of the so-called digital platform of knowledge models (DPKM) that is isomorphic to the curriculum. It is summarized in figure 5.

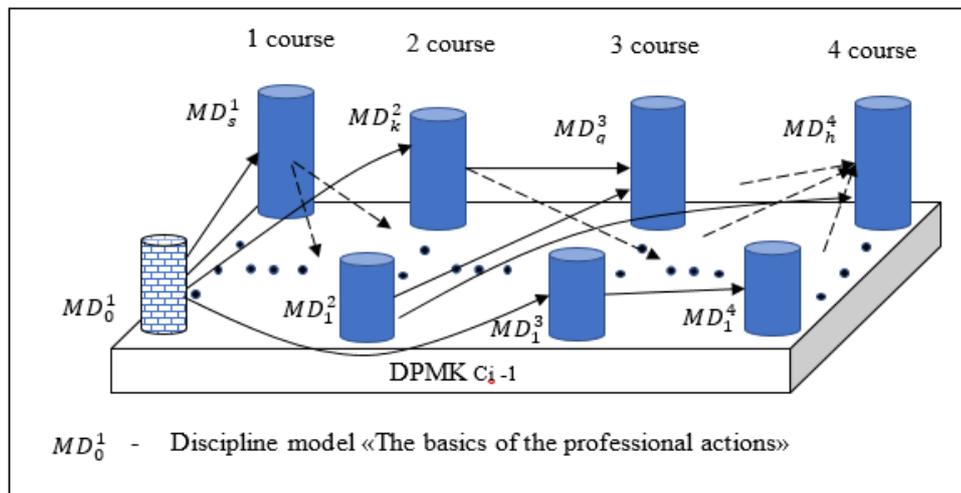


Figure 5. Generalized scheme of the digital model of the curriculum (DPMK Ci -2)

The second part of the digital platform of knowledge models (DPMK Ci -2) also consists of models, but from the students' knowledge models, the structure of which, in turn, must isomorphically display all models of academic disciplines, i. e. curriculum models. In other words, a bijective mapping must exist between the models of the DPMK Ci -1 component and the component of the knowledge model platform DPMK Ci -2 (fig. 6).

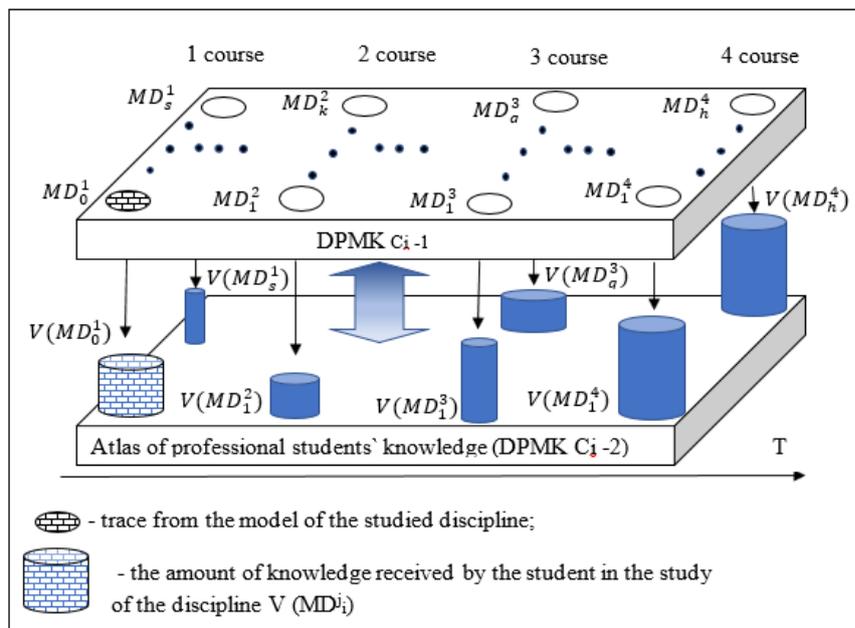


Figure 6. Illustration of the DPMK with the bijective display of knowledge models on its two components $f: (DPMK Ci -1) \leftrightarrow (DPMK Ci -2)$

Such an organization of knowledge imitates the process of educational communication and independent acquisition of knowledge by university students (blue cylinders in figure 6) during the quarantine period (T).

5. CONCLUSIONS AND OUTLOOKS FOR FURTHER RESEARCH

Thus, the studies conducted at the department showed the effectiveness of student learning based on knowledge modeling methods, both of scientific and pedagogical workers, and students. Unfortunately, not all models of disciplines have been created at the department, and so far, it has not been possible to fully evaluate the effectiveness and quality of distance learning based on integrated intelligence. However, the practice of teaching students to individual disciplines has shown advantages expressed in reduced time for mastering educational material, easy accessibility to the material, the dual nature of studying related disciplines, and the ability of students to compile and summarize educational information.

The authors of this work see the expansion and prospects of further research in the creation of a «smart university» system, in which models would be used not only that directly concern education, but also all types of ensuring the functioning of the university as a whole. In our opinion, such an ambitious task requires significant material, temporary and intellectual resources. However, modern methods of mathematical modeling and formal presentation of both declarative and procedural knowledge in the knowledge base «smart university» allow solving this problem.

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ІНТЕГРАЦІЯ ТРАДИЦІЙНИХ ТА ДИСТАНЦІЙНИХ МЕТОДІВ НАВЧАННЯ У ВИЩІЙ ШКОЛІ

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Анотація. У статті досліджується інтеграція традиційних і дистанційних методів навчання, які застосовуються сьогодні в закладах вищої освіти. Під час пандемії коронавірусу цим процесом потрібно приділяти особливу увагу у зв'язку з можливим погіршенням засвоєння матеріалу. Навчальний процес під час пандемії і карантинного режиму має свої особливості. Необхідність використання мобільних пристроїв і нового програмного забезпечення при проведенні занять стала очевидною. Звертає на себе увагу той факт, що не всі викладачі добре розбираються в сучасних засобах групового онлайн спілкування. У зв'язку з цим у статті було проаналізовано такі основні засоби групового спілкування, як-от: Moodle, Zoom, Skype, Teams та інші, що забезпечують віддалене спілкування студентів і викладачів. За мету було поставлено виявлення найбільш ефективних засобів для дистанційного навчання у вищій школі. Також були досліджені тенденції розвитку дистанційної освіти.

Сформовано наукові припущення про методологію едукології. Визначено основні етапи сучасних освітніх технологій у вищих навчальних закладах. Проведено дослідження інтеграційних процесів між традиційним і дистанційним навчанням. Вивчено відносини між предметами і об'єктами кафедри вищого навчального закладу. Виявлено, що структура навчального процесу ускладнюється через використання в ньому мобільних засобів зв'язку і дистанційних форм навчальної комунікації. Це призводить до необхідності зміни форм навчання та використання комбінованих методів.

Представлені результати реінжинірингових досліджень на прикладі окремо взятої кафедри. Наведено результати тестування навчання студентів на основі методів моделювання. На кафедрі «Земельного адміністрування та геоінформаційних систем» ХНУГХ ім. А.Н. Бекетова була створена і використовується цифрова платформа моделей знань, що складається з двох компонентів. Перший компонент – це взаємопов'язаний набір моделей навчальних дисциплін, що розробляються викладачами, а другий компонент – це моделі знань з цих дисциплін, які студенти створюють під час навчання. Також створені методики навчання на основі інтегрованого інтелекту. Надалі пропонується вдосконалення запропонованих технологій навчання та розробка більш досконалої платформи для підтримання дистанційного навчання у вищій школі.

Ключові слова: цифрова освіта; цифрова платформа моделей знань; моделі навчальних дисциплін; персональна навчальна система; моделі професійних знань студентів; інтегрований інтелект.

ИНТЕГРАЦИЯ ТРАДИЦИОННЫХ И ДИСТАНЦИОННЫХ МЕТОДОВ ОБУЧЕНИЯ В ВЫСШЕЙ ШКОЛЕ

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Аннотация. В статье исследуется интеграция традиционных и дистанционных методов обучения, применяемых сегодня в высших учебных учреждениях. Во время пандемии коронавируса эти процессы стали особенно злободневными.

Учебный процесс во время пандемии и карантинного режима имеет свои особенности. Необходимость использования мобильных устройств и нового программного обеспечения при проведении занятий стала очевидна. Обращает на себя внимание тот факт, что не все преподаватели хорошо разбираются в современных средствах группового онлайн-общения. В связи с этим в статье были проанализированы основные средства группового общения, такие как: Moodle, Zoom, Skype, Teams и другие, обеспечивающие удаленное общение студентов и преподавателей - с целью выявления наиболее эффективных. Также были исследованы тенденции развития дистанционного образования.

Сформированы научные предположения о методологии эдукологии. Определены основные этапы современных образовательных технологий в высших учебных заведениях. Проведено исследование интеграционных процессов между традиционным и дистанционным обучением. Изучены отношения между предметами и объектами кафедры высшего учебного заведения. Выявлено, что структура учебного процесса усложняется из-за использования в нем мобильных средств связи и дистанционных форм учебной коммуникации, что приводит к изменению методов и форм обучения.

Представлены результаты реинжиниринговых исследований на примере отдельно взятой кафедры. Приведены результаты тестирования обучения студентов на основе методов моделирования. На кафедре «Земельного администрирования и геоинформационных систем» ХНУГХ им. А.Н. Бекетова была создана и используется цифровая платформа моделей знаний, состоящая из двух компонентов. Первый компонент – это взаимосвязанный набор моделей учебных дисциплин, разрабатываемых преподавателями, а второй компонент – это модели знаний по этим дисциплинам, которые студенты создают во время учебы. Созданы методики обучения на основе интегрированного интеллекта. В дальнейшем предлагается совершенствование предложенных технологий обучения и создание более совершенной платформы для дистанционного обучения в высших учебных учреждениях.

Ключевые слова: цифровое образование; цифровая платформа моделей знаний; модели учебных дисциплин; персональная обучающая система; модели профессиональных знаний студентов; интегрированный интелект.

