

A series of approximately ten horizontal, wavy blue lines that span across the width of the page, positioned above the main title.

MODERN EDUCATIONAL TECHNOLOGIES IN THE TRAINING OF SPECIALISTS IN THE AGRICULTURAL SECTOR DURING THE CRISIS

Scientific monograph



**MODERN EDUCATIONAL TECHNOLOGIES
IN THE TRAINING OF SPECIALISTS
IN THE AGRICULTURAL SECTOR DURING
THE CRISIS**

Scientific monograph

Riga, Latvia
2023

UDC 37(08)
Mo045

- Title:** Modern educational technologies in the training of specialists in the agricultural sector during the crisis
- Subtitle:** Scientific monograph
- Scientific editor and project director:** Anita Jankovska
- Authors:** Anatolii Biliuk, Olena Diachynska, Oksana Voloshyna, Olena Dzhedzhula, Viktor Dzis, Olena Diachynska, Viktor Dubchak, Elvira Manzhos, Elena Levchuk, Natalia Havryliuk, Lyudmila Novitska
- Publisher:** Publishing House “Baltija Publishing”, Riga, Latvia
- Available from:** <http://www.baltijapublishing.lv/omp/index.php/bp/catalog/book/310>
- Year of issue:** 2023

All rights reserved. No part of this book may be reprinted or reproduced or utilized in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publisher and author.

Modern educational technologies in the training of specialists in the agricultural sector during the crisis : Scientific monograph. Riga, Latvia : “Baltija Publishing”, 2023. 340 p.

ISBN: 978-9934-26-298-2

DOI: <https://doi.org/10.30525/978-9934-26-298-2>

The research is devoted to the urgent problem of formation of professional and innovative competence of future agronomists in the crisis conditions of the higher education system of Ukraine due to the consequences of the pandemic and the war. Modern approaches to the design of the content of education under martial law are highlighted. The structure, main trends and features of forms and methods of training specialists with a focus on new problems and challenges are revealed.

The publication is addressed to heads of higher educational institutions, pedagogical and research workers.

Izdevniecība “Baltija Publishing”
Valdeķu iela 62 – 156, Rīga, LV-1058
E-mail: office@baltijapublishing.lv

Iespiests tipogrāfijā SIA “Izdevniecība “Baltija Publishing”
Parakstīts iespiešanai: 2023. gada 13. aprīlis
Tirāža 300 eks.

Table of Contents

Anatolii Biliuk, Olena Diachynska

THE APPLIED ORIENTATION OF THE PHYSICS COURSE AS AN EFFECTIVE TOOL FOR FORMING THE PROFESSIONAL COMPETENCE MODEL OF FUTURE TECHNOLOGICAL ENGINEERS 1

Oksana Voloshyna

METHODS OF FORMATION OF INFORMATION AND COMMUNICATIVE COMPETENCE OF STUDENTS OF HIGHER EDUCATION INSTITUTIONS BASED ON THE USE OF EDUCATIONAL RESOURCES IN CRISIS SITUATIONS. 77

Olena Dzhezdzhula

MODERN APPROACHES TO DESIGNING CONTENT EDUCATION IN CRISIS SITUATIONS. 102

Viktor Dzis, Olena Diachynska

THE USE OF COMPUTER-INTEGRATED TECHNOLOGIES IN THE PROCESS OF TEACHING PHYSICS. 146

Viktor Dubchak, Elvira Manzhos

THEORETICAL AND PRACTICAL STUDIES OF EFFECTIVE PHYSICAL AND MATHEMATICAL MODELS OF DESIGNING EDUCATIONAL RESOURCES IN AGRARIAN INSTITUTIONS OF HIGHER EDUCATION. 185

Elena Levchuk, Natalia Havryliuk

FUTURE AGRARIANS' PROFESSIONAL-INNOVATIVE COMPETENCE AORMATION OF A MATHEMATICAL COMPONENT IN CRISIS CONDITIONS. 218

Lyudmila Novitska

DISTANCE LEARNING OF MATHEMATICS FOR AGRICULTURAL HIGHER EDUCATION INSTITUTIONS STUDENTS DURING MARTIAL LAW. 275

METHODS OF FORMATION OF INFORMATION AND COMMUNICATIVE COMPETENCE OF STUDENTS OF HIGHER EDUCATION INSTITUTIONS BASED ON THE USE OF EDUCATIONAL RESOURCES IN CRISIS SITUATIONS

Oksana Voloshyna¹

DOI: <https://doi.org/10.30525/978-9934-26-298-2-2>

Abstract. The study of methods of forming students' information and communicative competence based on the use of educational resources is currently one of the most urgent research tasks in the pedagogical system of our country. The productive and effective activity of an educational institution in crisis conditions depends on the formation of students' information and communicative competence, primarily through the use of educational resources. The study of the problem of forming students' information and communicative competence based on the use of educational resources has become relevant in connection with the need and tasks of implementing state policy in the field of education, which is aimed at ensuring an appropriate level of modernization of the quality of education in crisis conditions, improving management methods, and being implemented in the modern system of education and pedagogy. *The purpose of the article* is to study the methods of forming students' information and communicative competence based on the use of educational resources. In today's difficult conditions of first quarantine restrictions and then martial law, the transfer of all representatives of the educational process to distance learning, the effective mastery of educational material and the completion of tasks by students requires a certain level of educational training based on information resources, certain information and communicative competencies of students. This type of educational activity is based on social and economic interaction with all other representatives of the educational process, the formation of motivational incentives and changes in value orientations. The formation of students' information and communicative competence by means of

¹ Candidate of Philological Sciences, Associate Professor, Associate Professor of the Department of Ukrainian and Foreign Languages, Vinnytsia National Agrarian University, Ukraine

modern information technologies is characterized by certain differences in the performance of tasks by all representatives of educational institutions, and is in the field of organization of the educational process, its culture, and the appropriate level of management. In terms of personality, the formation of students' information and communicative competence is characterized by a number of differences and features, the qualities of mastering the educational material, the organization of the educational process, which have a direct impact on the organization and achievement of learning objectives. *The research methodology* is based on the general research methods of analysis and synthesis, induction and deduction, observation and abstraction, which are used to systematize the achievements of the theory and practice of forming students' information and communicative competence through the use of educational resources. *The results the study* of have shown that methods of forming students' information and communicative competence based on the use of educational resources should be actively used in the activities of higher education institutions. *Practical implications.* Due to the wide areas of training, types of specialties and specializations, organizational, legal and economic differences in the activities of educational institutions, a large number of system and application software products (both in-house and third-party) are used. These products are used to varying degrees in the implementation of the learning process, educational, scientific, organizational, design, technical, financial and other activities, along with providing networked computer interaction (access to networks). Educational interaction in blended learning can be realized on the basis of learning management systems and Internet technologies. Internet technologies are developing rapidly, since they are cloud technologies that are considered the most rational in terms of the development of the Unified Information Educational Environment. The main models for deploying cloud technologies are: private cloud, public cloud, social cloud, and hybrid cloud. The advantages of using cloud technologies are economic, technical and technological, and didactic. The information and communicative competence of a student of a higher education institution is his/her conscious, purposeful and effective use of knowledge, skills and labor actions in the field of computer science within the framework of his/her educational activities – mastering the educational material. In each generalized function of a student of a higher education institution there are identical necessary

skills (to apply information and communication technologies) and necessary knowledge (modern information and communication technologies used in mastering the educational material). The basis of these skills and knowledge is formed by general user information competence, which is the basis of information competence of a student of a higher education institution. This level of information competence, in fact, implies the availability of minimum knowledge and skills in the use of information technologies required by a student regardless of the field of his/her future professional activity. The general educational component should include: mastering the educational material in the information environment; participation in the educational process; preparation and conduct of speeches, discussions, group activities, consultations with computer support and in the telecommunications environment; use of activity design tools; visual communication – the use of visual objects in the communication process, including conceptual, organizational and other diagrams, video editing; assessment of the quality of digital educational resources. The possession of general user and general educational competencies by a student of a higher education institution also ensures more effective implementation of the necessary skills of effective communication. *Value/originality*. The student's learning activity has primarily organizational specifics (organization of time for mastering the educational material), so the third level of information competence is also distinguished – organizational. The monitoring tools in the process of learning the educational material, designed to assess the information competence of students of higher education institutions, should have the following structure: general user information competence, general educational information competence, organizational information competence.

1. Introduction

The study of methods for the formation of students' information and communicative competence based on the use of educational resources is currently one of the most urgent research tasks in the pedagogical system of our country. In the context of the constant organization of the educational process in distance learning, which was primarily due to quarantine restrictions in connection with the COVID-19 pandemic, and then, starting from February 24, 2022, with Russia's full-scale invasion of Ukraine, which

dramatically affected the organization of student learning, the study of methods for forming students' information and communication competence through the use of educational resources is of primary importance. In the current conditions of education and pedagogy development, the issue of forming students' information and communicative competence through the use of educational resources is an extremely important area of research, which is being worked on by scientists from many countries.

The high level of relevance of the chosen topic is due to the fact that the productive and effective activity of an educational institution in crisis conditions depends on the formation of students' information and communicative competence, primarily through the use of educational resources. The study of the problem of forming students' information and communicative competence based on the use of educational resources has become relevant in connection with the need and tasks of implementing state policy in the field of education, which is aimed at ensuring an appropriate level of modernization of the quality of education in crisis conditions, improving management methods, and being implemented in the modern system of education and pedagogy. Today, our country's education system is undergoing global changes that require new approaches to the organization of the educational process. Also, modern requirements for the organization of the bulk process and the quality of the education system require a high level of professionalism from all participants in the educational process, especially students. The social processes taking place in our country today have caused an urgent need to increase the level of information and communicative competence of students who will be able to productively learn new material and perform tasks in unpredictable conditions, especially in the educational process during COVID-19 quarantine restrictions and martial law imposed in connection with Russia's full-scale invasion of Ukraine. Studying the scientific literature and regulatory acts, works of scientists, which cover the theoretical and practical aspects of the formation of students' information and communicative competence through the use of educational resources, we see that they do not sufficiently cover the issues of forming students' information and communicative competence in accordance with educational standards.

In today's difficult conditions, first of all, quarantine restrictions and then martial law, the transfer of all representatives of the educational

process to distance learning, effective mastery of educational material and completion of tasks by students requires a certain level of educational training based on information resources, certain information and communicative competencies of students. This type of educational activity is based on social and economic interaction with all other representatives of the educational process, the formation of motivational incentives and changes in value orientations. The formation of students' information and communicative competence by means of modern information technologies is characterized by certain differences in the performance of tasks of all representatives of educational institutions, and is in the field of organization of the educational process, its culture, and the appropriate level of management. In personal terms, the formation of students' information and communicative competence is characterized by a number of differences and features, qualities of mastering the educational material, organization of the educational process, which have a direct impact on the organization and achievement of learning objectives [1, p. 23; 2, p. 33–36; 3, p. 31–32; 4, p. 339].

According to the normative and legislative acts of our country regulating activities in the field of education and the latest theoretical developments in the field of educational process organization, all representatives of the educational process must carry out their activities in compliance with the principles of democracy and systematicity. However, in the activities of most higher education institutions, there is an insufficiently developed level of use of educational resources in the educational process. Consequently, there is a discrepancy between the existing level of students' information and communicative competence and the requirements set by educational institutions and state standards for students. Thus, there is a need for further development of students' information and communicative competence through the introduction of information technologies in the educational process [5, p. 206–210; 6, p. 78–82; 7, p. 77–78; 8, p. 18–20].

In recent years, participants in the educational process have faced a number of changes that have occurred as a result of the modification of both modern society in general and information technology in particular. There are significant changes in the presentation of information and its perception by the modern generation of millennials, who perceive the

world and its environment quite differently. As for their values and methods of interaction, they are quite different from previous generations, which, in turn, has prompted the need to introduce changes in the educational process of many higher education institutions. This is due to the fact that representatives of each generation have their own characteristic features, which are formed in accordance with social norms and technologies.

The current generation of millennials has been at the center of careful research for more than a decade. This is due to the fact that they are the largest group in the labor market. They are quite active in making changes to the global system of life, trying to make it simpler and smarter, developing innovations, and introducing artificial intelligence into the life of the population. This, in turn, has prompted representatives of science and education to introduce the latest methods for their training. In addition, fundamental changes must be made to the existing system of science and education. Therefore, representatives of the modern education system are actively involved in cooperation on this issue, since the current education system requires fundamental changes, especially in the field of educational services provided by higher education institutions that train professional specialists in accordance with the requirements of the labor market [9, p. 23–25; 10, p. 19; 11, p. 92–93; 12, p. 101–104].

Given the above, we can note that the influence of millennials is significant and significant, as they already hold senior positions in government agencies and educational institutions.

However, it should be noted that taking these aspects into account is accompanied by a number of significant problems, the main ones being the use of obsolete and technically outdated information technologies by educational institutions, ineffective teaching methods, and insufficient funding for institutions. These factors significantly complicate the introduction of modern information technologies into the education system. Therefore, the most effective and competitive are educational institutions with stable funding that provides technical equipment.

Thus, the issue of forming students' information and communicative competence based on the use of educational resources as the main factor of productive influence on the efficiency of an educational institution, along with the components of the educational process within the modern education system, is relevant today.

2. The use of educational resources in the process of forming students' information and communicative competence

In recent years, many positive steps have been taken in our country to introduce and productively use information technology in educational institutions.

First of all, it concerns the regulatory and legal support of this area. At the legislative level, 6 Decrees, 18 Laws, 4 Resolutions of the Verkhovna Rada, 20 Resolutions of the Cabinet of Ministers, 17 Orders of the Ministry of Education and Science have been adopted, which regulate the use and development of information technologies in educational institutions [13, p. 48–49; 14, p. 113–114; 15, p. 445–446; 16, p. 136–140; 17, p. 189–190].

The Law of Ukraine “On the National Informatization Program” played an important role in the introduction of information technologies in educational activities, according to which several projects of informatization of educational institutions were implemented.

The Program for the Development of the Distance Learning System was of great importance in choosing the direction and implementing the tasks of developing e-learning in our country.

Due to the wide range of training areas, types of specialties and specializations, organizational, legal and economic differences in activities, a large number of system and application software products (both in-house and third-party) are used in educational institutions. These products are used to varying degrees in the implementation of the educational process, educational, scientific, organizational, design, technical, financial and other activities, as well as in providing networked computer interaction (access to networks) [18, p. 210–211; 19, p. 29–32; 20, p. 82–84; 21, p. 103–105; 22, p. 156–160].

One of the prerequisites for the application of educational resources in higher education institutions is the use of modern computer technologies. Computer technologies should contribute to the quality of teaching and learning, and the information society should take advantage of the possibilities of computer technologies, using them as innovative and experimental tools for the renewal of education. Computer technologies have the potential to provide flexibility in the educational process that meets social needs, as well as to reduce the cost of education and increase the internal and external returns of the education system.

Educational interaction in blended learning can be realized on the basis of learning management systems (LMS) and Internet technologies.

Considering the first direction, let us clarify the concept of “distance learning system”. A distance learning system is an information system that implements the processes of planning, conducting and managing educational activities in higher education institutions (for any form of education). Examples of distance learning systems are: Moodle (<http://moodle.org/>), Sakai (<http://sakaiproject.org/>).

The Moodle system is the main one in the process of implementing a system of tools for the formation of information and communicative competence in higher education institutions. Such systems allow for active pedagogical interaction and present a wide range of tools that provide opportunities for creating and posting courses in the system. Their advantages are: focus on collaborative learning technologies, wide opportunities for communication (messaging, chats, comments, etc.), file exchange in various formats, etc.

At the same time, they are not without some drawbacks. First, teachers are often forced to work with a specific interface, within a certain logic of the environment. Secondly, the creation of learning components of the educational environment is available mainly to the teacher, which makes it difficult for the subjects of the learning process to work together, i.e., there is no communication with the network community. Thirdly, operational complexity (load on the server of the educational institution and problems with system administration) is of some importance [23, p. 1335–1330; 24, p. 19–26; 25, p. 76–78; 26, p. 128–136; 27, p. 235–240].

These problems accompany the development of the second area – the use of Internet technologies in the learning process. Internet technologies are understood as an automated environment for obtaining, processing, storing, transmitting and using knowledge in the form of information and its impact on an object, which is implemented on the Internet, including machine and human (social) elements. Internet technologies are developing rapidly, as cloud technologies are considered to be the most rational in terms of the development of the Unified Information and Educational Environment.

Cloud technologies are understood as: cloud services – a functionally complete set of services provided by a cloud technology provider that has its own interface and the ability to be modified in the course of operation

without interrupting the work of users [28, p. 562–570; 29, p. 263–268; 30, p. 86–90; 31, p. 98–106; 32, p. 50–64].

Cloud technologies are characterized by:

- on-demand self-service, i.e., the ability for users to use computing resources in the required amount without coordination with the provider (system administrator);

- pooling of resources, i.e. dynamic redistribution of capacities (storage devices, RAM, network bandwidth, etc.), distribution of resources between several data centers allow the use of IT resources by different programs and users in a simple mode;

- universal network access, i.e. consumers receive cloud services regardless of the terminal device via the Internet from high-tech data centers;

- elasticity (“infinite” scalability) of services, which provides access to the system even at the “peak” of requests, the list of services can be expanded or contracted automatically, without additional interactions with the supplier;

- consumption accounting (payment by usage).

We can identify the main models of cloud deployment, namely:

- private cloud – IT infrastructure that is controlled and operated for the benefit of one organization. The private cloud is managed independently or outsourced. There are various options for infrastructure placement: on the premises of a higher education institution, with an external provider, partially in the organization and partially with the provider;

- public cloud. IT infrastructure for the simultaneous use of the services provided by multiple higher education institutions. The responsibility for managing and maintaining such a cloud lies with its owner. The owner is usually a commercial, scientific or governmental organization;

- community cloud. The use of possible resources by a community of consumers who share common principles (mission, regulations), both on the part of the consumer and the external provider. Such cloud infrastructure can be managed by higher education institutions, organizations or a third party;

- hybrid cloud is a combination of several cloud structures associated with certain data transmission technologies. It is used if the internal IT infrastructure of a higher education institution is not able to cope with current tasks.

The main service models, namely, technology-enabled services, are as follows:

1. Infrastructure as a Service (IaaS). The main components of IaaS:
 - hardware (servers, storage systems, client systems, network equipment);
 - operating systems and system software (virtualization, automation, basic resource management tools);
 - connecting software. An example is two main products of Amazon: EC2 (Elastic Compute Cloud) and S3 (Simple Storage Service).
2. Platform as a Service (PaaS). Providing an integrated platform for developing, testing, deploying, and maintaining web applications as services. Control over the cloud infrastructure, with the exception of user-developed applications, rests with the cloud provider. Examples of platforms: AppEngine by Google; Cloud Sites, Cloud Files and Cloud Servers by Mosso; Windows Azure by Microsoft.
3. Software as a Service (SaaS). A model that allows an end user to use application software, most often through an Internet browser. Examples: Google Apps, MobileMe (Apple), Azure (Microsoft), and LotusLive (IBM). Workplace as a Service (WaaS). Applications as a Service (AaaS). Data as a Service (DaaS) Hardware as a Service (HaaS).

Thus, the relevance of using the latest information technologies in education is dictated primarily by pedagogical needs to improve learning outcomes. The competency-based orientation of the learning process, where practical skills are increasingly important, along with the increased dynamics of the educational process, a significant increase in the role of distance education technologies, and the global transition of information resources to the virtual environment, encourages higher education institutions to adopt innovative models of activity.

Among the reasons for the introduction of cloud technologies in education are at least the following

- significant financial investments in the purchase and maintenance of hardware and software products;
- often difficult adaptation of ready-made software products to the teaching process, and, as a result, only fragmentary use of them;
- the need to develop the information environment of higher education institutions.

Currently, higher education institutions are most actively using SaaS services. Free server-based solutions for integrated communications and collaboration among educational stakeholders are offered, for example, by Google (Google Apps for Education Edition) and Microsoft (Microsoft Live@edu).

Another option for using cloud services is to partially move learning management systems to the cloud (if it is impossible to purchase hardware or software).

Thus, based on the literature [1; 5; 8; 10; 12; 16; 23; 25; 28; 31], which studies the problems of introducing cloud technologies in education, we can distinguish the following groups of advantages of their use, which correlate with the reasons for their implementation:

- economic group. Cloud services provided to users are free or conditionally free. The cost of licensed software is reduced. There is an opportunity to effectively use the space of higher education institutions;
- technical and technological group. These services have minimal hardware and software requirements. The services are accessed via a web browser with an Internet connection. Most cloud services do not require special knowledge when using them or require minimal support;
- didactic group. The range of such tools is quite wide, they provide educational interaction.

Like other information technologies, cloud technologies have educational functions and capabilities. Identifying the didactic potential of cloud technologies, let's consider possible applications in the educational process. Cloud operating systems and remote desktops, as well as cloud storage services accessed through a browser, can be used in the learning process. Based on the cloud operating system (Web OS), it is possible to perform documentation in higher education institutions (software packages are integrated into it), prepare projects, etc., outwardly the process is similar to your own computer without the Internet. Examples of free cloud operating systems that can be used in the learning process: Zero PC (<http://zeropc.com/>), CloudMe and CloudTop (<http://cloudme.com>), Glide OS (<http://glidesociety.com>), AstraNOS (<http://astranos.org>), Joli OS (<http://jolicloud.com>), etc.

Virtual desktops look and function almost identical to traditional desktops, but programs and files are located on a server, not on a local computer. You can connect to a remote desktop via the Internet using a

secure channel. A remote desktop can include an operating system, office software, archivers, antivirus software, utilities, etc. Cloud desktops are usually provided by different companies for a fee. A simpler option for using cloud technologies in the process of managing a higher education institution is to work with cloud storage.

Thus, we can point out the following advantages of using common cloud storage in student education:

- file exchange can be carried out in different directions: student to student, higher education institution to student, teacher to student;
- practically no training in working with cloud storage is required;
- different types of files are supported, and they can be published on the Internet;
- simultaneous work with several files and folders is possible;
- data on the local computer is automatically updated when updated on the Internet;
- when several users work simultaneously, file updates affect all users [33, p. 188–192; 34, p. 72–80; 35, p. 160–162; 36, p. 125–129].

Thus, we can specify the benefits of using cloud technologies for both the teacher and the student.

Advantages of using cloud technologies for teachers:

- the possibility of easy structuring and reliable storage of educational information and literature;
- the ability to store regulatory and organizational information (programs, guidelines, consultation hours, assignments, questions, etc.) and distribute it online;
- control of students' assignments, adding comments;
- the ability to individualize student learning.

Advantages of using cloud technologies for students:

- constant access to educational resources for the course;
- no “clogging” of educational resources in the course due to the teacher's recommendations;
- no software compatibility issues and no need to purchase software products, including for individual learning;
- constant access to their files and works.

The possibilities of using cloud technologies in the learning process based on Google Apps Education Edition services are based on the following factors:

Scientific monograph

- exchange of information and documents between students and teachers, including checking assignments, consulting on projects and essays;
- performing practical tasks on processing various information objects (text, tables, diagrams) and joint group projects;
- discussing educational issues in real time.

Thus, the use of cloud technologies:

- provides an opportunity to increase communication and interactivity of students' teamwork;
- provides them with a choice of convenient time and place of study;
- control of knowledge in the form of the Internet;
- conducting on-line lectures and seminars, the possibility of recording them and viewing them later;
- presentation of educational materials in various forms (graphic, sound, animated);
- organization of lists of links to useful sources;
- virtual defense of reports, abstracts, and term papers; provision of video instruction works [5, p. 206–210; 6, p. 78–82; 7, p. 77–78; 8, p. 18–20].

Also, it is important to use cloud technologies in practice-oriented learning using the Google Drive cloud technology as part of extracurricular independent work or joint projects in groups.

Thus, the didactic capabilities of cloud technologies are:

- the ability to store a large amount of data in various formats (audio, video, graphics, text, databases) and simplify the publication of materials, posting them online for quick access by both students and teachers
- interactivity and continuity of the educational process even in conditions of temporary and geographical separation of the subjects of learning;
- group orientation (corporate) – the ability to organize joint work of a large team (teachers and students);
- innovativeness and modifiability – expanding the scope of existing forms and methods of teaching and control, rapid incorporation of created products into learning, stimulating independent activity and reducing the cycle of obtaining a specific result;
- meta-subjectivity – the ability to integrate academic disciplines and generate universal meta-knowledge;
- informality and friendliness – the ability to pay attention to students' interests, their worldview and organize personality-oriented learning;

- development of critical thinking – improving the skills of comprehensive evaluation and comparison of information received;
- immersing students in an environment where discussion is mandatory;
- mastering decentralized models – participants in joint activities are not required to be present at the same time, etc.

Thus, it can be noted that cloud technologies have didactic properties inherent in the technologies of presentation, transmission and organization of the educational process and implement didactic functions:

- educational function (information and reference, cognitive, i.e. studying and consolidating new material, self-education, familiarization with different points of view, obtaining information, etc.);
- developmental function (development of methods of searching mental activity, analysis, synthesis, abstraction, etc.);
- educating function (personal and moral qualities);
- motivating function (justification of the usefulness and necessity of studying a particular field through an adapted story);
- individualization and differentiation of the learning process (providing tasks of varying difficulty in classroom and independent study);
- controlling function (objectification, feedback, self-control);
- Corrective function (e.g., providing consultations based on information technology, training opportunities);
- diagnostic function (informing the teacher about the learning outcomes, including the most common mistakes);
- automation of management processes (registration, storage of data on learners) and processing of learning outcomes;
- modeling, simulation of real processes and phenomena;
- self-presentation function [13, p. 48–49; 14, p. 113–114; 15, p. 445–446; 16, p. 136–140; 17, p. 189–190].

Considering the didactic functions of cloud technologies in relation to the main forms of education, we can note a significant focus of their implementation on classes and self-study of students (increasing the share of independent work of students – up to 60% of the total workload, practice-oriented training).

In addition to the above advantages, it is necessary to mention possible difficulties in the use of cloud technologies. The following is a list of possible problems:

- technical (lack of or low speed of the Internet);
- competence and motivational (difficulties for teachers and students and lack of understanding of the feasibility of using such services;
- content (mismatch between educational needs and the content of resources);
- methodological and organizational (insufficient time to master the educational material within the hours allotted by the class schedule).

These also include limitations of the functional properties of software (compared to local analogues), the lack of a regulatory framework for the use of cloud technologies in education in general. The risk is also tied to the service provider.

Thus, it is possible to use cloud technologies in the educational process, due to a number of advantages (economic, technical, technological and didactic).

Improvement of the learning process by means of cloud technologies is based on their didactic capabilities (the ability to store a large amount of data in various formats, simplify the publication of materials, place them on the network; group orientation; innovation and modifiability; meta-subjectivity; informality and friendliness; the possibility of developing critical thinking; decentralized models), their didactic functions (educational, information and reference, cognitive, developing, educating, motivating, functions of individualization and differentiation of the process).

3. Formation of students' information and communicative competence based on the use of educational resources

The content of the qualification requirements for students of higher education institutions, including information and communicative competence, should be reflected in the relevant educational standard. Many international organizations, such as the European Union, the Council of Europe, UNESCO, and others, are working on the development of educational standards and requirements for information and communicative competence of students of higher education institutions: The European Union, the Council of Europe, UNESCO, international educational associations ESHA (European School Heads Association), NASSP (National Association of Secondary Schools, USA), the European Qualification Network for Effective School Leadership (European Qualification Network for Effective

School Leadership), which includes 29 countries of the European Union, has been created and is working effectively. In the United States, the National Educational Technology Standard (NETS-A) has established requirements for the activities of educational leaders (National Educational Technology Standards and Performance Indicators for Administrators).

In recent years, our country has also been developing and introducing educational standards that regulate the qualifications required for a student to perform a certain type of bulk activity. However, due to the specifics of the learning activities of students of higher education institutions, the existing monitoring tools need to be modernized. Since competence is a dynamic, stable personal structure that allows to realize the competencies related to a given type of activity with maximum efficiency. Information competence, accordingly, is the ability and willingness to effectively use information and communicative technologies in the framework of their educational activities. Under the information and communicative competence of a student of a higher education institution, we understand his or her conscious, purposeful and effective use of knowledge, skills and labor actions in the field of computer science as part of his or her educational activities – mastering the educational material.

In each generalized function of a student of a higher education institution, there are identical necessary skills (to apply information and communicative technologies) and necessary knowledge (modern information and communicative technologies used in mastering the educational material). The basis of these skills and knowledge is formed by general user information competence, which is the basis of information competence of a student of a higher education institution [18, p. 210–211; 19, p. 29–32; 20, p. 82–84; 21, p. 103–105; 22, p. 156–160].

General information competence is defined as:

- use of techniques and compliance with the rules of work and safety with information technology tools, troubleshooting, ensuring the consumption of consumable materials;
- compliance with ethical and legal standards of information technology use;
- audio-video-text communication;
- Internet and database search skills;
- systematic use of existing skills in everyday and educational contexts.

This level of information competence, in fact, implies the availability of minimum knowledge and skills in the use of information technologies required by a student regardless of the field of his or her future professional activity. However, since we are talking about the educational space, we should also emphasize the need for a student of a higher education institution to have general information competence.

The general education component should include:

- mastering educational material in the information environment;
- participation in the educational process;
- preparation and conduct of speeches, discussions, group activities, consultations with computer support and in the telecommunications environment;
- use of activity design tools;
- visual communication – the use of visual objects in the communicative process, including conceptual, organizational and other diagrams, video editing;
- assessment of the quality of digital educational resources (sources, tools) in relation to the set educational tasks of their use;
- accounting of public information space;
- support, formation and use of the general user component in the learning process [23, p. 1335–1330; 24, p. 19–26; 25, p. 76–78; 26, p. 128–136; 27, p. 235–240].

Due to the fact that general user and general educational information competence is a prerequisite for the implementation of educational functions by both students of higher education institutions and pedagogical staff, a single monitoring tool (e.g., testing) or its invariant part can be used to assess these two levels of information competence.

The general education component should include:

- mastering educational material in the information environment;
- participation in the educational process;
- preparation and conduct of speeches, discussions, group activities, consultations with computer support and in the telecommunications environment;
- use of activity design tools;
- visual communication – the use of visual objects in the communicative process, including conceptual, organizational and other diagrams, video editing;

- assessment of the quality of digital educational resources (sources, tools) in relation to the set educational tasks of their use;
- accounting of public information space;
- support, formation and use of the general user component in the learning process.

Due to the fact that general user and general educational information competence is a prerequisite for the implementation of educational functions by both students of higher education institutions and pedagogical staff, a single monitoring tool (e.g., testing) or its invariant part can be used to assess these two levels of information competence.

Possession of general user and general educational competencies by a student of a higher education institution also ensures more effective implementation of the necessary skills of effective communication. A number of generalized academic functions of a student of a higher education institution contain the necessary knowledge and skills to organize oral and written communication with external actors (teachers, teaching and support staff), and to negotiate. Despite the fact that to ensure these specific aspects of communication, it is enough to have a sufficient level of general and general educational information competencies, the monitoring can include special business cases aimed at assessing the readiness and ability to use information and communicative technologies in the course of interaction with participants in educational relations [28, p. 562–570; 29, p. 263–268; 30, p. 86–90; 31, p. 98–106; 32, p. 50–64].

Since the student's learning activity has primarily organizational specifics (organization of time for mastering the educational material), we can also distinguish the third level of information competence – organizational. To determine the competencies included in the organizational information competence in education, it is necessary to refer to the educational standard.

The analysis of these necessary knowledge, skills and actions of the student allowed us to identify the main information competencies for the organizational level:

- building an information space in the process of mastering the educational material, organizing communicative channels and ways to protect information;
- ensuring openness and accessibility for all participants of the educational regulatory and legal sphere of the organization of the educational process;

- creation and updating of databases of all participants of educational relations in the higher education institution;
- access to the system of monitoring the quality of the educational process, educational achievements of other students, activities of the educational institution;
- mastery of skills in working with information technology;
- design, compilation and processing of information using appropriate software.

Thus, as can be seen, this level of information competence is characterized by a different content level and a fundamentally different level of complexity compared to the previously discussed ones. To assess the student's organizational information competence in the process of mastering the educational material, in our opinion, it is recommended to use professional tasks and cases.

Based on the above, the monitoring tools in the process of mastering the educational material intended to assess the information competence of students of higher education institutions, in our opinion, should have the following structure:

1. General information competence (test tasks).
2. General educational information competence (test tasks, case study).
3. Organizational information competence (case study, professional tasks).

Since this structure of the monitoring tools for studying the information competence of students of higher education institutions is based on a competency-based approach, the monitoring developed on its basis will allow to assess not only the amount of information learned, but, above all, the student's ability to successfully cope with learning tasks.

It will allow to assess knowledge (cognitive component), skills (functional component) and attitudes (subjective position or personal attitude) both at one time and in dynamics. Based on the results of the monitoring, it will be possible to draw a conclusion about the level of information competence of a student of a higher education institution in order to identify the main difficulties and create training programs in the field of information technology relevant to students of higher education institutions.

In the future, the level of information competence revealed during the monitoring will also allow to indicate the academic compliance or non-

compliance of the respondent. The information competence of a student of a higher education institution must meet the requirements of the modern conditions of the educational space. If the information competence of a student of a higher education institution does not reach the level of general user information competence, this indicates a complete academic mismatch. If the respondent's information competence meets the requirements of the general user and general education levels, we can talk about his/her incomplete academic compliance. If the content of the information competence of a student of a higher education institution covers the entire list of learning activities, necessary skills and required knowledge related to all three levels of information competence, then this student is fully competent in the field of information technology and meets the requirements of the educational process.

The structure of the monitoring tools formulated by us can also become the basis for developing tools for assessing the information competence of teachers. To do this, instead of the level of organizational information competence in education, it will be necessary to formulate and develop a variable part to assess the level of subject and pedagogical information competence.

4. Conclusions

Due to wide areas of training, types of specialties and specializations, organizational, legal and economic differences in activities, a large number of system and application software products (both in-house and third-party) are used in educational institutions. These products are used to varying degrees in the implementation of the educational process, educational, scientific, organizational, design, technical, financial and other activities, along with the provision of networked computer interaction (access to networks).

The use of software in distance learning by educational institutions is characterized by a fairly wide range of software products. However, it should be noted that most of them are not compatible with each other both at the technological and informational levels. This leads to the fact that, in case of their further use, it will be quite difficult to ensure the exchange of data and information between educational institutions, as well as to create a common unified access to these resources.

The use of the latest technologies in educational institutions, including electronic ones implemented with the help of information technology, differs significantly from traditional forms. This is primarily due to a significant increase in the technological component of the educational process, namely the use of information and telecommunications equipment.

One of the significant indicators of the level of introduction of information technologies into the educational process, along with the process of mastering the educational material, is the provision of access to telecommunication networks for teachers and students.

The use of the latest technologies in educational institutions, including electronic ones implemented with the help of information technology, differs significantly from traditional forms. This is primarily due to a significant increase in the technological component in the implementation of the educational process, namely the use of information and telecommunications equipment, information technology, relevant software, and available network communications.

At the same time, the problem of using information technology in educational institutions is to some extent solved at the local level. Thus, more and more educational institutions are implementing programs on their own to improve the skills of their employees, especially in raising the level of mastery of information technologies.

So, in general, the formation of students' information and communicative competence in higher education institutions can be formulated as follows: to provide new additional opportunities for students of higher education institutions to be successful using the latest information technologies. The realization of these tasks should be carried out not by building rigid structures and systems, but by presenting new flexible opportunities for students to use e-learning.

The basis of e-learning is:

- information and communicative technologies;
- electronic information resources;
- organizational and methodological support.

At the same time, it should be noted that according to the indicators of the world practice of educational institutions, their ratio is currently distributed as follows: half are electronic resources, one third are organizational and methodological support, and the rest are technologies.

As for information resources aimed at providing e-learning, the vast majority of them are distance courses used in the educational process (this applies to distance, face-to-face, and combined forms of education).

Thus, the use of information technologies in the process of forming students' information and communicative competence is one of the main priorities of any modern institution. Comprehensive automation of the activities of educational institutions has become relevant and necessary since the active introduction of information technology in the learning process along with its organization.

References:

1. Voloshyna O.V., Kravchuk L.V. (2018) Aktualnist vyvchennia inozemnoi movy v umovakh hlobalizatsii osvithnoho prostoru [Actuality of study of foreign language is in the conditions of globalization of educational space]. *Aktualni problemy filolohii ta metodyky vykladannia inozemnykh mov u suchasnomu mitylinhvalnomu prostori (Ukraine, Vinnytsia, November 22, 2018)*, Vinnytsia, pp. 22–24. (in Ukrainian)
2. Voloshyna O.V., Popenko Y.V. (2020) Ihrovi metody, yak zasib vyvchennia inozemnoi movy [Playing methods, as a mean of study of foreign language]. *SworlJournal. Bolgariya*, no. 4, pp. 31–39.
3. Voloshyna O.V. (2018) Vykorystannia interaktyvnykh tekhnolohii dlia formuvannia estetychnoho smaku u studentiv VNZ z zasobamy inozemnykh mov [Use of interactive technologies for forming of aesthetically beautiful taste for the students of VNZ with facilities of foreign languages]. *Visnyk Chernihivskoho natsionalnoho pedahohichnoho universytetu. Serii: Pedahohichni nauky*, no. 151, pp. 30–33. (in Ukrainian)
4. Voloshyna O.V. (2020) Vykorystannia multymediinykh tekhnolohii u vyvchenni inozemnykh mov u zakladakh vyshchoi osvity [The use of multimedia technologies is in the study of foreign languages in establishments of higher education]. Proceedings of the *Aktualni pytannia teorii ta praktyky v haluzi prava, osvity, sotsialnykh ta povedinkovykh nauk (Ukraine, Chernigov, April 23-24, 2020)*, Chernigov, pp. 338–340. (in Ukrainian)
5. Voloshyna O.V. (2017) Inshomovna komunikatyvna kompetentnist studentiv-ahraryiv u nezalezhnii Ukraini [A foreign communicative competence of students-agrarians is in independent Ukraine]. *Zbirnyk naukovykh prats "Silske hospodarstvo ta lisivnytstvo"*, no. 6, pp. 204–212. (in Ukrainian)
6. Honcharuk I.V., Yurchuk N.P. (2018) Orhanizatsiia yedynoho elektronnoho naukovo-osvithnoho prostoru suchasnoho universytetu [Organization of a single electronic scientific and educational space of a modern university]. *Ekonomika. Finansy. Menedzhment: aktualni pytannia nauky i praktyky*, no. 12, pp. 75–87. (in Ukrainian)
7. Hrischenko I.V. (2017) Tsili ta zavdannia keis-metodu pry vykladanni kursu "Derzhavnyi finansovy kontrol" [Aims and tasks the method of keic at teaching of

course “State financial control”]. Proceedings of the *Dystantsiine navchannia yak suchasna osvitiia tekhnolohiia, (Ukraine, Vinnytsia, March 31, 2017)*, Vinnytsia: VTEI KNTEU, pp. 76–78. (in Ukrainian)

8. Hunko I.V., Voloshyna O.V. (2021) Praktychne zastosuvannia dilovoi hry pry vvychenni inozemnoi movy v umovakh navchalno-naukovo-vyrobnychoho kompleksu “Vseukrainskyi naukovo-navchalnyi konsortsium” [Practical application of business game in the study of a foreign language in the educational-scientific-industrial complex “All-Ukrainian scientific-educational consortium”]. *TekhnikaNaukovyi zhurnal “Innovatsiina pedahohika”*, no. 35, pp. 17–21. (in Ukrainian)

9. Dovhan L.I. (2009) Vykorystannia testiv u navchanni inozemnoi movy studentiv nemovnykh vyshchykh navchalnykh zakladiv [The use of tests is in the studies of foreign language of students of unlinguistic higher educational establishments]. *Visnyk Zhytomyrskoho derzhavnogo universytetu imeni Ivana Franka*, no. 44, pp. 22–25. (in Ukrainian)

10. Dovhan L.I. (2017) Innovatsiini tekhnolohii navchannia v osvitnomu protsesi vyshchoi shkoly [Innovative technologies of studies in the educational process of higher school]. *Rol innovatsii v transformatsii suchasnoi nauky*, no. 1, pp. 19. (in Ukrainian)

11. Dovhan L.I. (2010) Suchasnyi stan problemy formuvannia pedahohichnoi maisternosti vykladacha inozemnoi movy vyshchoho navchalnogo zakladu [Modern state of problem of forming of pedagogical trade of teacher of foreign language of higher educational establishment]. *Visnyk Zhytomyrskoho derzhavnogo universytetu imeni Ivana Franka*, no. 50, pp. 90–93. (in Ukrainian)

12. Kovalova K.V. (2013) Komunikativna kompetentnist inzheneriv- ahrarnykyv: sutnist ta strukturni komponenty [Communicative competence of agricultural engineers: essence and structural components]. *Pedahohichni nauky: zb. nauk. pr.*, no. 113, pp. 99–106. (in Ukrainian)

13. Kovalova K.V. (2017) Osobystisno-oriientovane navchannia, yak skladova protsesu fakhovoi pidhotovky spetsialistiv inzhenerynoho profilii [Personality-oriented learning as a component of the process of professional training of engineering specialists]. *Tekhnika, enerhetyka, transport APK*, no. 4, pp. 46–50. (in Ukrainian)

14. Kravets R.A. (2013) Kulturna kompetentnist ta mizhkulturna komunikatsiia u profesiinii pidhotovtsi maibutnikh ahrarnykyv [A cultural competence and communication is in professional preparation of future squirearchies]. *Zbirnyk naukovykh prats Khmelnytskoho instytutu sotsialnykh tekhnolohii Universytetu Ukraina*, no. 1, pp. 112–115. (in Ukrainian)

15. Kravets R.A. (2017) Pedahohichna tekhnolohiia formuvannia polikulturnoi kompetentnosti maibutnikh fakhivtsiv ahrarnoi haluzi na zaniattiakh inozemnoi movy [Pedagogical technology of forming of political and cultural competence of future specialists of agrarian industry is on employments of foreign language]. *Molodyi vchenyi*, no. 1, pp. 444–447. (in Ukrainian)

16. Kravets R.A. (2017) Vprovadzhennia interaktyvnykh metodiv navchannia u polikulturnii osviti maibutnikh fakhivtsiv ahrarnoi haluzi na zaniattiakh inozemnoi movy [Introduction of interactive methods of studies in cultural education of

future specialists of agrarian industry is on employments of foreign language]. *Liudynoznavchi studii. Pedahohika*, no. 4, pp. 135–145. (in Ukrainian)

17. Kravets R.A. (2013) Kulturolohichna paradyhma osvity u profesiinii pidhotovtsi maibutnoho fakhivtsia ahrarnoi haluzi [A cultural paradigm of education is in professional preparation of future specialist of agrarian industry]. *Naukovi zapysky Vinnytskoho derzhavnogo pedahohichnoho universytetu imeni Mykhaila Kotsiubynskoho. Serii: Pedahohika i psykholohi*, no. 39, pp. 187–192. (in Ukrainian)

18. Kravets R.A. (2020) Pedahohichne proektuvannya tekhnolohii formuvannya polikulturnoi kompetentnosti maibutnykh fakhivtsiv ahrarnoi haluzi [Pedagogical planning of technology of forming of cultural competence of future specialists of agrarian industry]. *Aktualni problemy filolohii i profesiinoi pidhotovky fakhivtsiv u polikulturnomu prostori*, no. 3, pp. 209–212. (in Ukrainian)

19. Kravets R.A. (2015) Praktychna realizatsiia spetsyfichnykh pryntsypiv polikulturnoi osvity maibutnykh fakhivtsiv ahrarnoi haluzi na zaniattiakh z inozemnoi movy [Practical realization of specific principles of cultural education of future specialists of agrarian industry is on employments from a foreign language]. *Pedahohika i psykholohiia profesiinoi osvity*, no. 4-5, pp. 26–38. (in Ukrainian)

20. Kravets R.A. (2013) Strukturni komponenty polikulturnoi kompetentnosti maibutnykh fakhivtsiv ahrarnoi haluzi [Structural components of political and cultural competence of future specialists of agrarian industry]. *Neperervna profesiina osvita: teoriia i praktyka*, no. 1-2, pp. 80–86. (in Ukrainian)

21. Kravets R.A. (2016) Typy komunikatyvnykh sytuatsii u konteksti polikulturnoi osvity maibutnykh fakhivtsiv ahrarnoi haluzi na zaniattiakh z inozemnoi movy [Types of communicative situations in the context of cultural education of future specialists of agrarian industry on employments from a foreign language]. *Zbirnyk naukovykh prats "Pedahohichni nauky"*, no. 71, pp. 102–106. (in Ukrainian)

22. Kravets R.A., Romanyshyna L.M. (2013) Linhvokrainoznavchyi pidkhdid do vykladannia inozemnoi movy v ahrarnomu VNZ [The linguistic and national going is near teaching of foreign language in agrarian Higher educational establishment]. *Naukovi zapysky [Vinnytskoho natsionalnoho ahrarnoho universytetu]. Serii: Sotsialno-humanitarni nauky*, no. 2, pp. 154–166. (in Ukrainian)

23. Bakhmat N., Maksymchuk B., Voloshyna O., Kuzmenko V., Matviichuk T. (2019) Designing Cloud-oriented University Environment in Teacher Training of Future Physical. Education Teachers. *Journal of Physical Education and Sport*, vol. 19 (Supplement issue 4). art 192, pp. 1323–1332.

24. Voloshyna O.V. (2021) Complex coordination application for interactive methods while teaching foreign languages. *Modern engineering and innovative technologies*, issue 15, part 6, pp. 17–28.

25. Hunko I.V., Voloshyna O.V. (2021) Zastosuvannia keis-metodu v protsesi vykladannia inozemnoi movy v umovakh navchalno-naukovo-vyrobnychoho kompleksu "Vseukrainskyi naukovo-navchalnyi konsortsium" [Application of the case method in the process of teaching a foreign language in the conditions of the educational, scientific and industrial complex "All-Ukrainian scientific-educational consortium"]. *TekhnikaNaukovyi zhurnal "Innovatsiina pedahohika"*, no. 32, pp. 75–79. (in Ukrainian)

26. Voloshyna O.V. (2021) Application of modern pedagogical technologies when teaching a foreign language in the non-linguistic higher education institution. *Development of s/Scientific, technological and innovation space in Ukraine and EU countries: Collective monograph. 1 st ed. Riga, Latvia: "Baltija Publishing"*, pp. 124–144.
27. Voloshyna O.V. (2022) Formation of information and communicative competence of future agrarian specialists in higher education institutions. *Theoretical and practical aspects of the development of modern scientific research: Scientific monograph. Part 2. Riga, Latvia: Baltija Publishing*, pp. 234–259. DOI: <https://doi.org/10.30525/978-9934-26-195-4-25>
28. Kovalova K. (2022) Communicative competence and pedagogical conditions of its formation of future specialists of agrarian sector. *Modernization of research area: national prospects and European practices: Scientific monograph. Riga, Latvia: Baltija Publishing*, pp. 560–580. DOI: <https://doi.org/10.30525/978-9934-26-221-0-22>
29. Mushyrovskaya N., Kholod I., Neher O., Zozulia I., Pavliuk I. (2022, Julio-Septiembre) Fundamental cognitive-semantic theories in linguistics. *Eduweb*, vol. 16, issue 3, pp. 261–273. DOI: <https://doi.org/10.46502/issn.1856-7576/2022.16.03.19>.
30. Kapranov A. (2013) Beginner Students' Speech Fluency in a Second Language Compared Across Two Contexts of Acquisition. In E. Piechurska-Kuciel & E. Szymańska-Czaplak (Eds.), *Language in Cognition and Affect*. Berlin, Heidelberg: Springer, pp. 81–94.
31. Kapranov O. (2020) Framing the identity of an ideal primary school teacher of English. *English Studies at NBU*, 6(1), 95–110. DOI: <https://doi.org/10.33919/esnbu.20.1.4>
32. Kapranov O. (2020) English goes digital: Framing pre-service teachers' perceptions of a learning management system in their EFL studies. *ExELL: Explorations in English Language and Linguistics*, 8(1), 47–67.
33. Kapranov Y., Cherkhava O., Gromova V., & Reshetnyk O. (2021) Methodological procedure of diagnosing behavioural stereotypes resilience of different language cultures representatives. *Amazonia Investiga*, 10(39), 186–193.
34. Dzhezdzhula O.M. (2015) *Suchasni osvritni tekhnolohii u profesiinii pidhotovtsi fakhivtsiv ahrarnoho profilu* [Modern educational technologies in the professional training of agricultural professionals]. Vinnitsa: Nilan-LTD, 214 p. (in Ukrainian)
35. Bielkin I.V. (2013) Vykorystannia innovatsii u navchalnomu protsesi vyshchoi shkoly [The use of innovations in the educational process of a higher school]. *Suchasni informatsiini tekhnolohii ta innovatsiini metodyky navchannia u pidhotovtsi fakhivtsiv*, no. 35, pp. 158–163. (in Ukrainian)
36. Liashko O., Kapranov Y., Cherkhava O., Nasalevych T., & Riabukha T. (2021) Methodological algorithm for interpreting intertextuality within the orthodox sermon (case study of the english orthodox sermon fragment). *Amazonia Investiga*, 10(43), 123–132. DOI: <https://doi.org/10.34069/AI/2021.43.07.12>