



**THEORETICAL AND PRACTICAL ASPECTS
OF THE DEVELOPMENT OF MODERN
SCIENTIFIC RESEARCH**

Scientific monograph

Part 2

Rīga, Latvia
2022

UDK 001(082)
Th310

Title: Theoretical and practical aspects of the development of modern scientific research

Subtitle: Scientific monograph

Scientific editor and project director: Anita Jankovska

Authors: Inna Honcharuk, Ihor Kupchuk, Ihor Kupchuk, Natalia Telekalo, Victor Mazur, Valentyna Prokopchuk, Hanna Pantsyreva, Kateryna Mazur, Oleksandr Tkachuk, Myroslava Mordvanyuk, Svitlana Lisina, Natalia Senchenko, Yuri Bandazheuski, Nataliia Dubovaya, Andrii Kurochkin, Roman Moskalenko, Yuliia Moskalenko, Olga Smorodska, Oksana Voloshyna, Hanna Ivaniuk, Yevhen Antypin, Andriy Maiovets, Roman Yatsiv

Publisher: Publishing House “Baltija Publishing”, Riga, Latvia

Available from: <http://www.baltijapublishing.lv/omp/index.php/bp/catalog/book/215>

Year of issue: 2022

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.

Theoretical and practical aspects of the development of modern scientific research: Scientific monograph. Part 2. Riga, Latvia: Baltija Publishing, 2022. 300 p.

ISBN: 978-9934-26-195-4

DOI: <https://doi.org/10.30525/978-9934-26-195-4>

The scientific monograph presents the theoretical and practical aspects of the development of modern scientific research. General questions of economics and enterprise management, regional economics, marketing, technical sciences, technology of food and light industry, and so on are considered. The publication is intended for scientists, educators, graduate and undergraduate students, as well as a general audience.

© Izdevniecība “Baltija Publishing”, 2022
© Authors of the articles, 2022

Table of Contents

CHAPTER «AGRICULTURAL SCIENCES»

Inna Honcharuk, Ihor Kupchuk

STUDY OF MECHANICAL-RHEOLOGICAL PARAMETERS
OF FEED GRAIN DURING TO THE IMPACT-CUTTING LOADING 1

Ihor Kupchuk, Natalia Telekalo

TECHNICAL AND TECHNOLOGICAL PREREQUISITES
FOR THE INTRODUCTION OF AUTONOMOUS
ENERGY SYSTEMS OF AGRO-INDUSTRIAL ENTERPRISES
USING RENEWABLE ENERGY SOURCES. 29

Victor Mazur, Valentyna Prokopchuk

RESEARCH OF ECOLOGICAL ASSESSMENT
OF MEDIUM-RATING AND MEDIUM-LATE-RATING
SOYBEAN VARIETIES. 63

Hanna Pantsyreva, Kateryna Mazur

RESEARCH OF EARLY RATING SOYBEAN VARIETIES
ON TECHNOLOGY AND AGROECOLOGICAL RESISTANCE. 84

Oleksandr Tkachuk, Myroslava Mordvanyuk

STUDY OF THE INFLUENCE OF UNFAVORABLE
VEGETATION CONDITIONS ON AGRO-ECOLOGICAL
RESISTANCE OF BEAN VARIETIES. 109

CHAPTER «SOCIAL COMMUNICATIONS»

Svitlana Lisina

UKRAINIAN REFERENCE EDITION
IN THE SYSTEM OF SOCIAL INTERCOURSE:
CONDITION AND PROSPECTS OF RESEARCH. 126

Natalia Senchenko

DIGITATING THE DOCUMENTARY HERITAGE
AS A WAY TO SAVE IT: A WORLD EXPERIENCE. 156

CHAPTER «MEDICAL SCIENCES»

Yuri Bandazheuski, Nataliia Dubovaya

GENETIC REGULATION OF THE METABOLISM
OF METHIONINE, HOMOCYSTEINE
AND VITAMINS B9, B12 IN CHILDREN LIVING NEAR
THE CHERNOBYL EXCLUSION ZONE 180

Andrii Kurochkin, Roman Moskalenko

DIAGNOSTIC VALUE OF LYMPH NODE CALCIFICATION
IN THYROID CANCER 194

Yuliia Moskalenko, Olga Smorodska

LUNG CANCER BIOMARKERS 212

CHAPTER «PEDAGOGICAL SCIENCES»

Oksana Voloshyna

FORMATION OF INFORMATION AND COMMUNICATIVE
COMPETENCE OF FUTURE AGRARIAN SPECIALISTS
IN HIGHER EDUCATION INSTITUTIONS 234

Hanna Ivaniuk, Yevhen Antypin

TEACHER TRAINING IN THE CONDITIONS
OF GLOBAL UNCERTAINTY CHANGES:
EDUCATIONAL REQUESTS AND CHALLENGES 260

CHAPTER «HISTORY OF ART»

Andriy Maiovets, Roman Yatsiv

MODERN UKRAINIAN CHILDREN'S EDITIONS 2000–2010:
IN GRAPHIC, ILLUSTRATIVE DESIGN
OF GRADUATES LVIV NATIONAL ACADEMY OF ARTS 281

CHAPTER «PEDAGOGICAL SCIENCES»

FORMATION OF INFORMATION AND COMMUNICATIVE COMPETENCE OF FUTURE AGRARIAN SPECIALISTS IN HIGHER EDUCATION INSTITUTIONS

Oksana Voloshyna¹

DOI: <https://doi.org/10.30525/978-9934-26-195-4-25>

Abstract. Nowadays, Ukraine's education system is experiencing global changes that require innovative approaches to the management of educational institutions. In addition, modern requirements for the management of educational institutions, the quality of the education system require a high level of professionalism from all participants of the educational process, especially future specialists. Current social processes taking place in our country have caused an urgent need to increase the level of information and communication competence of future specialists in agriculture, education and pedagogy, who will be able to perform their duties productively in unpredictable conditions, especially under quarantine restrictions caused by the COVID-19 pandemic. Application of modern computer technologies is one of the compulsory prerequisites for the use of information and communication competencies of future agrarian specialists in educational institutions. Educational interaction in blended learning can be implemented on the basis of Learning Management Systems (LMS) and Internet technologies. Their advantages include the focus on collaborative learning technologies, wide opportunities for communication (exchange of messages, chats, comments, etc.), exchange of files of various formats, etc. However, they have some drawbacks: teachers are often forced to work with a specific interface within a certain logic of the environment; creation of educational components of the educational environment is available mainly to the teacher, which

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

sometimes complicates joint work of the subjects of the learning process, i.e. there is no communication with the network community; operational load on the school server and problems with system administration. The reasons for the introduction of cloud technology into education in the process of formation of information and communication competence of future agrarian specialists are as follows: significant financial investments in the purchase and maintenance of equipment and software products; rather difficult adaptation of finished software products to the teaching process, and, as a consequence, only fragmentary use; the need to develop the information environment of educational institutions. The main benefits of common cloud storage in the formation of information and communication competence of future agrarian specialists are as follows: file exchange can be carried out in different directions: student – student, university – student, teacher – student; virtually no training is required to work with cloud storage; it supports different types of files that can be published on the Internet; it is possible to work with several files and folders at the same time; data on the local computer is automatically updated when you update the Internet; when multiple users work at the same time, the file update applies to all users. Therefore, information and communication competence is the ability and willingness to effectively use information and communication technologies within professional activities. Information and communication competence of the employee of the educational institution can be defined as the conscious, purposeful and effective use of knowledge, skills and labor actions in the field of computer science in the framework of one's professional activity, namely educational activities. Analysis of the required knowledge, skills and labor actions of employees of the educational institution has allowed us to identify the basic information and communication competencies for the management level: construction of information space at the educational institution, organization of communication channels and ways to protect information; ensuring openness and accessibility for all participants of the normative-legal sphere of management of educational institution; analysis, formation and presentation of information about the activities of the educational institution, its property status, income and expenses; creation and updating of databases of all participants of educational relations at the educational institution; creation and provision of a system for monitoring

the quality of the educational process, educational achievements of students, activities of the educational institution; possession of skills of work with electronic sources of normative-legal maintenance and systematization of normative-legal base of management of educational institution; design, compilation and processing of documentation using appropriate software.

1. Introduction

The issue of formation of information and communication competence of future agrarian specialists is an extremely important area researched by the scientists from many countries in the current conditions of the education and pedagogy development.

High level of relevance of this issue can be explained by the fact that productive and effective activities of the educational institution depend on the information and communication competence of future professionals. The study of the problem of formation of information and communication competence of future agrarian specialists has intensified due to the need and objectives of the state policy in education, which aims to ensure an appropriate level of the education modernization, improvement of management methods, and implementation in modern education and pedagogy.

Nowadays, Ukraine's education system is experiencing global changes that require innovative approaches to the management of educational institutions. In addition, modern requirements for the management of educational institutions, the quality of the education system require a high level of professionalism from all participants of the educational process, especially future professionals.

Current social processes taking place in our country have caused an urgent need to increase the level of information and communication competence of future specialists in agriculture, education and pedagogy, who will be able to perform their duties productively in unpredictable conditions, especially under quarantine restrictions caused by the COVID-19 pandemic. Examination of the scientific literature and regulations, works of scientists, which cover theoretical and practical aspects of information and communication competence of future agrarian specialists, has revealed that they insufficiently cover the

issues of the competence formation in accordance with the educational standards.

In modern difficult conditions of quarantine restrictions experienced both by Ukraine and the whole world, the transfer of all representatives of the educational process to distance learning, effective performance of duties by the heads of educational institutions require a certain level of professional training, specific professional competencies and quality of training future agrarian specialists. This type of professional activity is based on social and economic interactions with all other representatives of the educational process, formation of motivational incentives and changes in values. Formation of information and communication competence of future agrarian specialists by means of modern information technologies is characterized by certain differences in the performance of professional duties by the representatives of educational institutions, and it is in the field of work organization, culture, and appropriate management. In the personal aspect, information and communication competencies of future agrarian specialists are characterized by a number of differences and features, the quality of performance of duties that have a direct impact on the organization of work and achievement of goals at the educational institution.

2. Introduction of information and communication competencies in educational institutions

Application of modern computer technologies is one of the compulsory prerequisites for the use of information and communication competencies of future agrarian specialists in educational institutions. Computer technologies must contribute to the quality of teaching and learning, and the information society must use the benefits of computer technologies applying them as an innovative and experimental tool for upgrading education. Computer technologies have the potential to ensure flexibility of the educational process that meets social needs, as well as reduce the cost of education and increase the internal and external impact of the education system.

Educational interaction in blended learning can be implemented on the basis of Learning Management Systems (LMS) and Internet technologies.

When considering the first approach, it is appropriate to clarify the concept of “distance learning system”. The distance learning system is an information system based on which the processes of planning, conducting

and managing educational activities in the educational organization (for all forms of learning) are implemented. Examples of distance learning systems are “Moodle” (<http://moodle.org>), “Sakai” (<http://sakaiproject.org>) [1, p. 17; 5, p. 31; 6, p. 339; 7, p. 208].

The Moodle system is the main one in the process of implementing the system of means of forming information and communication competencies of future agrarian specialists in educational institutions. This system let us implement active pedagogical interaction and represent a wide range of tools that provide opportunities to create and place training courses in the system. Its advantages re s follows: focus on collaborative learning technologies, wide opportunities for communication (exchange of messages, chats, comments, etc.), exchange of files of various formats, etc.

However, they have got some drawbacks. Firstly, teachers are often forced to work with a specific interface, within a certain logic of the environment. Secondly, the creation of educational components of the educational environment is available mainly to the teacher, which complicates the cases of joint work of the subjects of the learning process, i.e., there is no communication with the network community. Thirdly, operational load (on the school server and problems with the system administration) is also of some concern.

These problems accompany the development of the second approach, namely the use of Internet technologies in the learning process. Internet technologies mean a fully automated environment in which the acquisition, further processing, storage, transmission and application of knowledge in the form of information with their subsequent impact on the object implemented on the Internet, and which includes machine and human (social) elements. Internet technologies are developing rapidly, since these are cloud technologies that are considered the most rational in terms of development of the Unified Information Educational Environment.

Cloud technologies mean cloud services as a functionally complete set of services provided by a cloud technology provider that has its own interface and the ability to be refined in the process of functioning without stopping users’ work.

Cloud technologies are characterized by:

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

– pooling of resources, i.e. dynamic redistribution of capacity (storage devices, RAM, network bandwidth, etc.), resource allocation between multiple data centers allow you to use 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 in the peak of requests, the list of services can be expanded or narrowed automatically, without additional interaction with the provider;

– accounting of consumption (payment upon use) [9, p. 77; 17, p. 445].

Cloud deployment models and service models are characterized as follows:

1. Deployment models:

– private cloud – private infrastructure that is controlled and operated for the benefit of one organization. It is characterized by self-managed private cloud management or outsourcing. There are different options for infrastructure: at the premises of the organization, an external provider, partly in the organization and partly at the provider;

– public cloud. IT infrastructure for the simultaneous use of services is provided by many companies. The owner is responsible for the management and maintenance of such a cloud. The owner is usually a commercial, scientific or governmental organization;

– community cloud. The use of possible resources by the consumer community, which shares the general principles (mission, regulations), both on the part of the consumer and the external provider. Such cloud infrastructure may be managed by the organizations themselves or by a third party;

– Hybrid cloud is a combination of several cloud structures associated with certain data transmission technologies. Used if the internal IT infrastructure of the educational institution is not able to cope with the current tasks [1, p. 17; 7, p. 208].

2. Services that provide technology:

– infrastructure as a service (IaaS). The main components of IaaS: hardware (these include servers, storage of all data, network equipment, client systems); system software and operating systems (these include resources for resource management, virtualization, automation); bridging

software. The examples are two major Amazon products: EC2 (Elastic Compute Cloud) and S3 (Simple Storage Service);

– platform as a service (PaaS). Presentation of an integrated platform for further development, support of web applications, testing in the form of services. Cloud infrastructure control, with the exception of user-developed programs, is the responsibility of the cloud provider. Examples of platforms: AppEngine from Google; Cloud Sites, Cloud Files and Cloud Servers from Mosso; Windows Azure from Microsoft;

– software as a service (SaaS). A model that allows the end user to use application software, often using an Internet browser. Examples: Google Apps, MobileMe (Apple), Azure (Microsoft) and LotusLive (IBM);

– workplace as a service (WaaS). Programs as a service (AaaS). Data as a Service (DaaS) – Equipment as a Service (HaaS) [5, p. 31; 6, p. 339].

The urgency of application of new information technologies in the process of formation of information and communicative competence of future agrarian specialists at the educational institutions is caused primarily by pedagogical needs to improve the effectiveness of training. Competent orientation of the learning process, where much more significance is given to practical skills, along with the increase in the dynamics of the educational process and role of distance learning technologies, as well as the global transition of information resources into virtual environments, encourages universities to adopt innovative models.

The reasons for the introduction of cloud technology into education in the process of formation of information and communication competence of future agrarian specialists are as follows:

– significant financial investments in the purchase and maintenance of equipment and software products;

– rather difficult adaptation of finished software products to the teaching process, and, as a consequence, only fragmentary use;

– the need to develop the information environment of educational institutions.

Currently, educational institutions are most active in using the service that provides SaaS technology. For example, Google (Google Apps for Education Edition) and Microsoft (Microsoft Live @ edu) offer free server solutions for integrated communications and collaboration.

Another option for using cloud services is to partially move learning management systems to the cloud (in case of inability to purchase equipment or software).

Researchers of the introduction of cloud technologies in education identify the following groups of benefits of their use, which are correlated with the reasons for their introduction:

- economic group. Cloud services provided to users are free or shareware. Licensed software costs are reduced. It is possible to effectively use the space of institutions;
- technical and technological group. These services have minimal hardware and software requirements. The services are accessed using a web browser with the Internet connection. Most cloud services do not require special knowledge when using them or there is minimal support for their use;
- didactic group. The range of such tools is quite wide, they provide educational interaction [3, p. 23; 4, p. 32].

Like other information technologies, cloud technologies have educational functions and capabilities. When identifying the didactic potential of cloud technologies, it is appropriate to consider possible applications in the educational process. Cloud operating systems and remote desktops can be used in the learning process, as well as cloud storage services that can be accessed through a browser. Based on the cloud operating system (Web OS), it is possible to perform documentation in educational institutions (software packages are integrated into it), prepare projects, etc., the process looks like 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>) and others.

Virtual desktops are almost different in appearance and functionality from traditional ones, but programs and files are located on the server, not on the local computer. Remote Desktop Connection is via a secure Internet connection. Remote Desktop may include: operating system, office software, archivers, antivirus software, utilities, etc. Cloud desktops are usually provided for a fee by different companies. The simplest option for using cloud technologies in the management of an educational institution is to work with cloud storage.

Thus, there can be identified the following advantages of using common cloud storage in the formation of information and communication competence of future agrarian specialists:

- file exchange can be carried out in different directions: student – student, university – student, teacher – student;
- virtually no training is required to work with cloud storage;
- support of different types of files, opportunity to publish them on the Internet;
- possibility to work simultaneously with several files and folders;
- data on the local computer is automatically updated when you update the Internet;
- when multiple users work at the same time, the file update applies to all users [2, p. 46; 3, p. 23; 4, p. 32].

Specification of the benefits of using cloud technologies for teachers and students is as follows:

1. For teachers:

- possibility of easy structuring and reliable storage of educational information and literature;
- ability to store regulatory and organizational information (programs, guidelines, hours of consultations, tasks, questions, etc.) and its online distribution;
- monitoring the performance of tasks by students, adding comments;
- possibility of individualization of student learning.

2. For students:

- constant access to educational resources on the course;
- no “clutter” of educational resources on the course due to the recommendations of the teacher;
- no problems of software compatibility and the need to purchase software products, including for individual training;
- constant access to your 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:

- exchange of information and documents between students and teachers, including, checking assignments, consulting on projects and essays;
- performance of practical tasks on processing of various information objects (text, tables, schemes) and joint group projects;

– discussion of educational issues in real time [1, p. 17; 5, p. 31; 6, p. 339; 7, p. 208].

Thus, the use of cloud technologies provides an opportunity to increase the communicativeness and interactivity of students' teamwork; gives them a choice of convenient time and place of study; control of knowledge in the form of the Internet; conducting on-line lectures and seminars, possibility of recording and deferred review; presentation of educational materials in various forms (graphic, sound, animated); making the lists of links to useful sources; virtual defense of reports, abstracts, coursework; providing video instructions.

It is important to use cloud technologies in practice-oriented learning with the use of cloud technology (Google Drive) in the framework of extracurricular independent work or joint projects in groups.

Thus, didactic benefits of cloud technologies include:

– the ability to store large amounts of data in various formats (audio, video, graphics, text, databases) and simplify the publication of materials, placing them online for quick access to it for both students and teachers;

– interactivity and continuity of the educational process, even in conditions of temporary and geographical separation of the subjects of study;

– group orientation (corporatism) – the ability to organize joint work of a large team (teachers and students);

– innovation and modification – expanding the boundaries of existing forms and methods of training and control, rapid inclusion of products in training, stimulating independent activity and reducing the cycle of obtaining a specific result;

– meta-subject – the possibility of integrating disciplines and generating universal meta-knowledge;

– informality and friendship – the opportunity to pay attention to the interests of students, their worldview and organize personality-oriented learning;

– development of critical thinking – improving the skills of comprehensive assessment and comparison of information;

– immersion of students in an environment where discussion is mandatory;

– development of decentralized models – participants in joint activities are not required to be present simultaneously, etc [5, p. 31; 7, p. 208].

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 perform didactic functions:

- educational function (information and reference, cognitive, i.e. the study and consolidation of new material, self-education, acquaintance with different points of view, obtaining information, etc.);
- developmental function (development of methods of mental activity related to searching, analysis, synthesis, abstraction, etc.; creative abilities);
- educating function (personal, moral qualities);
- motivating function (justification of the usefulness and necessity of studying a particular field through an adapted plot);
- individualization and differentiation of the process of learning material (providing tasks of varying complexity in the classroom and independent classes);
- controlling function (objectification, providing feedback, self-control);
- corrective function (for example, providing information technology consultations, training opportunities);
- diagnostic function (informing the teacher about learning outcomes, including the most common mistakes);
- automation of management processes (registration, storage of data on subjects of training) and processing of results of educational activity;
- modeling, imitation of real processes and phenomena;
- self-presentation function [6, p. 339; 7, p. 208].

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 practical training and self-training of students (increasing the share of independent student work that takes up to 60% of the total workload, practice-oriented learning).

In addition to the highlighted advantages, it is necessary to name possible difficulties in the application of cloud technologies. It is necessary to take into account possible problems: technical (lack or low speed of the Internet), competence and motivation (difficulties for teachers and lack of understanding of the feasibility of using such services), content (mismatch between educational needs and content of resources), methodological and organizational. This also includes restrictions on the functional properties of the software (against local counterparts), lack of regulatory framework

for the use of cloud technologies in education in general. Attachment to a service provider is also a risk [5, p. 31; 7, p. 208].

Thus, in the process of forming information and communication competence of future specialists in the agrarian sector, the use of cloud technologies is possible, due to groups of advantages (economic, technical, technological and didactic).

Improving the learning process by means of cloud technologies is based on their didactic capabilities (the ability to store large amounts of data of different formats, simplify the publication of materials, post them online; group orientation; innovation and modifiability; meta-subjectivity; informality and friendliness; possibility to develop critical thinking; decentralized models, their didactic functions (educational, informational, cognitive, developmental, educating, motivating, functions of individualization and differentiation of the process of learning material, controlling, correcting, diagnostic, self-presentation), taking into account possible and motivational, methodological and organizational ones.

In recent years, many positive steps have been taken in our country regarding the introduction and productive use of information technology at educational institutions [1, p. 17; 7, p. 208].

First of all, it concerns the normative legal support. 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, which regulate the use and development of information technology in educational institutions, were adopted [5, p. 31; 7, p. 208].

An important role in the introduction of information technology in educational activities was played by the Law of Ukraine “On the National Informatization Program”, according to which several projects on informatization of educational institutions were implemented.

The Program for the Development of the Distance Learning System was of great importance for choosing the direction and implementation of tasks for the development of electronic (distance) learning in our country.

Due to the wide areas of training, types of specialties and specializations, organizational, legal and economic differences in educational institutions, a large number of programs are used, which are both systemic and applied (own developments of employees or other developers). These products are used to some extent in the educational process, educational, scientific, organizational,

design, technical, financial and other activities, together with the provision of networked interaction of computers (network access) [2, p. 46].

According to statistics, the total number of computers available at the educational institutions is 95-100 thousand units, the vast majority of which (80 thousand) are at the educational institutions of III-IV level of accreditation.

Software products used in the educational process can be divided into three main groups:

- software used to organize and manage the learning process (“Dean’s Office”);
- software used to organize the learning process of distance learning (Distance Learning System);
- software used to organize and control knowledge and assess learning success (Testing system).

As for educational institutions that use management systems at educational institutions, only 19% of them have their own software development, the rest of educational institutions use software development of third-party manufacturers. At the same time, only 9% of educational institutions use their own distance learning organization platform, and most of them use distance learning platforms of the recognized manufacturers, namely: 35% of educational institutions use the Moodle open source platform, 6% of educational institutions use distance learning system “PROMETHEUS”, and others use 20 third-party software products [2, p. 46; 3, p. 23; 4, p. 32].

Slightly more distribution is observed when analyzing data on the use of software products for testing systems in educational institutions. Thus, software products for testing systems are available in 63% of educational institutions, among them:

- 19% are individual developments;
- 22% of educational institutions use the Moodle platform;
- 4% use the platform “Prometheus”;
- other educational institutions use 26 programs from other manufacturers.

These results indicate that 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 they are mostly incompatible with each other both at the technological and information level. As a result,

if they continue to be used, it will be difficult to ensure the exchange of data and information between educational institutions, as well as to create a common unified access to these resources [9, p. 77; 17, p. 445].

One of the important indicators of the level of introduction of information technologies in the educational process, together with the process of managing an educational institution is the provision of teachers and students' access to telecommunications networks.

Analysis of the data shows that each educational institution has a local network (about 830 thousand computers of educational institutions are connected to this network). Absolutely all educational institutions are connected to the Internet. The average number of e-mail users per educational institution is 980.

According to the practice of educational institutions, the creation of e-learning materials requires a high level of qualification of developers, along with significant financial costs. Thus, the average cost of creating an e-course can be 5-50 thousand US dollars, and the term of their creation is on average 6-8 months.

To ensure the appropriate level of quality of the educational process, educational institutions incur such costs, when the process of developing information resources is carried out at the expense of their own capabilities (including financial). However, under conditions of insufficient funding for educational institutions, more of these resources are created by teachers, scientific and technical staff, engineers and students.

In the vast majority of educational institutions, the accumulators of the developed information resources are electronic libraries, where they are mostly formed, in the form of files of various formats.

According to the gained experience, the management of most educational institutions has a positive attitude to the development of information resources in electronic form, with the possibility of their further application in practice.

However, different educational institutions ambiguously assess the degree of importance of creating certain information resources. Thus, educational institutions in the eastern region of our country give greater preference to the development and use of electronic textbooks for distance learning courses. At the same time, educational institutions in other regions of our country are developing information resources more evenly. For comparison, the ratio of

the number of e-textbooks available to distance learning courses varies from 1 to 3, and only in the western region this ratio is less than 1, i.e. distance learning courses have been developed 2 times more than e-textbooks.

In addition, it should be noted that at the state level much attention is paid to this problem. Thus, in recent years the State Budget has financed the creation of:

- electronic textbooks;
- bank of certified distance learning courses for educational institutions;
- distance learning courses for educational institutions;
- electronic library of the educational institution;
- complex of the system of archiving and storage of content of electronic scientific library;
- subscriber wireless access of the educational institution to information resources.

Application of innovative technologies in educational institutions, including electronic ones, implemented with the help of information technology, differs significantly from traditional forms. This applies, first of all, to a significant increase in the technological component in the implementation of the educational process, namely: the use of information and telecommunication equipment, information technology, relevant software, existing network communications.

At the same time, the problem of using information technology in educational institutions is being addressed to some extent at the local level. Thus, more educational institutions are implementing their own programs to improve the skills of their employees, especially in improving the level of information technology.

Thus, in general, the principle of application of information technology in educational institutions can be formulated as follows: provide new additional opportunities for employees of educational institutions to be successful, using the latest information technology. Implementation of these tasks should not be carried out by building rigid structures and systems, but using the method of presenting new flexible opportunities for employees to use e-learning. The basis of e-learning is formed by:

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

At the same time, it should be noted that indicators of the world practice of educational institutions distribute their ratio as follows: half of them are electronic resources, a third is organizational and methodological support, the rest is technology.

With regard to information resources aimed at providing e-learning, the vast majority of them are distance learning courses that are used in the learning process (this applies to distance, full-time, and blended learning).

However, according to the practical experience, most distance learning courses are products that are technologically impossible to be combined with other courses that have been developed on other platforms. Basically, the developers of the courses are teachers of educational institutions that develop courses independently, for personal needs. Due to this, the vast majority of developed courses are related to economic, financial and humanitarian areas, as the implementation of these courses requires less training, time and financial resources.

Thus, the use of information technology in the management of educational institutions is one of the main priorities of any modern institution. Complex automation of educational institutions has become relevant and necessary since the active introduction of information technology in the learning process together with its organization.

3. Information and communication competencies in the process of improving the training of future professionals

The content of qualification requirements for employees of educational institutions, including information and communication competence, should be most fully reflected in the relevant professional standard. Many international organizations, such as the European Union, the Council of Europe, UNESCO, the European School Heads Association (ESHA), and the National Association of Secondary School, the USA), are working to establish professional standards and requirements for information and communication competence in educational institutions (NASSP), European Qualification Network for Effective School Leadership, which includes 29 countries of the European Union.

In the United States, the National Educational Technology Standards (NETS • A) have set requirements for the National Educational Technology Standards and Performance Indicators for Administrators.

In recent years, our country has also developed and implemented professional standards governing the requirements for qualifications required for employees to carry out a certain type of professional activity. However, due to the specifics of the professional activities of employees of educational institutions, the existing monitoring tools need to be modernized. Competence is a dynamic stable personal structure that enables to implement the competencies related to a certain type of activity with maximum efficiency.

Therefore, information and communication competence is the ability and willingness to effectively use information and communication technologies within professional activities. We defined information and communication competence of the employee of the educational institution as the conscious, purposeful and effective use of knowledge, skills and labor actions in the field of computer science in the framework of one's professional activity, namely educational activities.

Professional activity of an employee of the educational institution is ensured through the fulfilment of four generalized labor functions:

- educational activities of the educational institution;
- development of the educational institution;
- resource management of the educational institution;
- introduction of the educational institution in relations with public authorities, local governments, public and other organizations.

In each generalized job function of the employee of the educational institution there are similar required skills (to apply information and communication technologies) and required knowledge (modern information and communication technologies used in the activities of the educational institution). The basis of these skills and knowledge is formed by the general user information competence, which is the basis of information competence of the employee of the educational institution.

General user information competence can be defined as:

- the use of techniques and compliance with the rules of work and safety with the means of information technology, troubleshooting, covering the cost of consumables;
- observance of ethical and legal norms of the use of information technologies;
- audio-video text communication;

- skills of searching on the Internet and databases;
- systematic use of existing skills in everyday and professional context.

This level of information and communication competence, in fact, requires minimum knowledge and skills of the use of information technology required by a specialist regardless of his field of professional activity. However, since this is an educational space, it should also be emphasized that an employee of the educational institution should have general pedagogical information competence.

The general pedagogical component should include:

- pedagogical activity in the information environment;
- organization of the educational process;
- preparation and holding of speeches, discussions, group activities, consultations with computer support and in the telecommunication environment;
- use of tools for the activity design;
- visual communication – the use of visual objects in the communication process, including conceptual, organizational and other diagrams, video editing;
- forecasting, designing and relative assessment of individual progress of employees and students;
- assessing the quality of digital educational resources (sources, tools) in relation to the given educational objectives of their use;
- accounting of public information space;
- support for the formation and use of the general user component in the work of employees and students.

Due to the fact that general user and general pedagogical information competence is a necessary condition for the implementation of labor functions both by the heads of educational institutions and teachers, to assess these two levels of information competence there can be used a single monitoring toolkit (e.g. Testing) or its invariant part.

Possession of general user and general pedagogical competencies by an employee of the educational institution also ensures more effective implementation of necessary skills of effective communication. A number of generalized job functions of an employee of the educational institution include knowledge and skills required for organizing oral and written communication with the subjects of the external environment (social partners, public authorities, other educational organizations), negotiation.

Although it may be enough to have a sufficient level of general and pedagogical informational competencies to ensure these specific aspects of communication, monitoring may include special business cases aimed at assessing the readiness and ability to use information and communication technologies in interaction with participants in educational relations, social partners and public authorities.

Since professional activity of an employee of the educational institution has primarily managerial specifics, it is necessary to clarify the third level of information and communication competence, i.e. management. To determine the competencies that are part of managerial information competence in education, it is necessary to refer to the head's professional standard.

The required knowledge, skills and labor actions of the employee of the educational institution, which are part of the managerial information competence, can be characterized as follows:

1. Management of educational institution, Dean's office, department:

– necessary knowledge (modern approaches, methods, technologies and tools for monitoring and evaluation of educational achievements of employees and students, activities of educational institutions, including independent assessment of the quality of educational activities and student training);

2. Resource management at the educational institution:

– labor actions (ensuring the formation of internal information space, effective communication channels and knowledge exchange system at the educational institution in order to achieve educational results; monitoring, analysis, evaluation and control of efficiency and effectiveness of the educational institution's resources, organization of reports for stakeholders on the efficiency and effectiveness of resource management of the educational institution, adjusting the implementation of the process of resource management of the educational institution);

– necessary knowledge and skills (principles and methods of building information space at the educational institution, technology of communication channels at the educational institution and methods of information protection; basics of office work; methods of monitoring and analysis of necessary resources, rules of formation and timely submission of complete and reliable information about activities of the educational

institution, its property status, income and expenses, methods of monitoring the status and efficiency of resources of the educational institution, rules of inspections and documentary audits);

3. Representation of the educational institution in relations with public authorities, local governments, public and other organizations:

– required knowledge (ensuring openness and accessibility for all participants of educational relations to information on the structure and content of activities, criteria and performance indicators of the governing bodies of the educational institution, aimed at ensuring efficiency of the educational process and growth of educational outcomes).

Analysis of the specified necessary knowledge, skills and labor actions has allowed us to allocate basic competences for a managerial level of information competences:

– construction of information space in the educational institution, organization of communication channels and ways to protect information;

– ensuring openness and accessibility for all participants of educational normative-legal sphere of management of educational institution;

– analysis, formation and presentation of information about the activities of the educational institution, its property status, income and expenses;

– creation and updating of databases of all participants in educational relations at the educational institution;

– creation and provision of a system for monitoring the quality of the educational process, educational achievements of students, activities of the educational institution;

– possession of skills required for work with electronic sources of normative-legal maintenance and systematization of normative-legal base of the educational institution management;

– design, compilation and processing of documentation using appropriate software.

Thus, it can be stated that this level of information competence is characterized by a different level of content and a fundamentally different level of complexity compared to those previously considered. In our opinion, it is recommended to use professional tasks and cases to assess managerial information competence in education.

Based on the above-mentioned, monitoring tools in the system of additional vocational education designed to assess information competence

of employees of educational institutions, in our opinion, should have the following structure:

1. General user information competence (test assignments).
2. General pedagogical information competence (test assignments, case).
3. Management information competence (case, professional tasks).

Since this structure of monitoring tools for researching information competence of students – employees of educational institutions is based on the competence approach, the monitoring developed on its basis will assess not only the amount of information learned, but first of all the ability to successfully cope with professional problems.

It will enable to assess knowledge (cognitive component), skills (functional component) and attitudes (subjective position or personal attitude) both once and in dynamics. Based on the monitoring results, it will be possible to draw a conclusion about the level of information competence of the employee of the educational institution in order to identify the main difficulties and create training programs in the field of information technology relevant to employees of educational institutions.

In the future, the level of information and communication competence identified during monitoring will also indicate a job adequacy or non-compliance of the respondent. Information and communication competence of the employee of the educational institution must meet the requirements of the modern educational space.

If the information and communication competence of the employee of the educational institution does not reach the level of general information competence, it indicates that the employee completely does not meet job requirements. If the information and communication competence of the respondent meets the requirements of the general user and general pedagogical levels, we can talk about his incomplete job compliance.

If the content of employee's information and communication competence of the educational institution covers the entire list of work activities, required skills and necessary knowledge related to all three levels of information competence, this employee is fully competent in the field of information technology and fits the position.

The structure of the monitoring tools formulated by us can also become the basis for the development of tools for assessing the information competencies of teachers. For this purpose, instead of the level of managerial

information competence in education, it will be necessary to formulate and develop a variable part to assess the level of specific pedagogical information competence.

4. Conclusions

In recent years, due to the rapid development of market and democratic relations in our country, the education system has undergone structural changes, as a result the problem of forming information and communication competence of future professionals has become of great practical relevance.

In Ukraine, current social processes have caused an urgent need to increase the level of information and communication competence of future specialists in agriculture, education and pedagogy, who will be able to perform their duties productively in unpredictable conditions, especially under COVID-19 pandemic.

The need to improve managerial culture of the head of the educational institution obliges him to reach new and higher levels of professionalism. Successful development of managerial culture implies that there is an effective personal and professional development of the head of the educational institution; he achieves self-realization in professional activities, masters professional skills.

The ways of improvement of information and communication competence should be considered as a process, the structure of which is the relationship of basic elements: goals and content, methods and tools, as well as the results achieved. The goals of the development of information and communication competence of the employee of the educational institution are the expected changes in the minds and behavior of teachers and students in the course of activities made under the influence of specially organized activities as well as intellectual, organizational, administrative and educational plans.

The content of information and communication competence can be considered as a measure of formation of personality of the employee of the educational institution, and it is determined by the following criteria:

– breadth and depth of human assimilation of both general knowledge in various fields and professional (managerial) theoretical and methodological provisions;

– a degree of orientation in the rules, norms, ideals and values of society and the degree of their guidance in actions and deeds, as well as the level of individual qualities acquired on their basis;

– a developed ability to creatively assimilate existing experience in management and reproduce the best examples of professional consciousness and behavior.

The process of improving information and communication competence of the employee of the educational institution can be organized at different levels, namely:

– the first level – societal, which involves the development of information and communication competence in the context of general trends in the educational process at the global and domestic levels. Criteria for the formation of information and communication competence at this stage are general cultural features inherent in each socially active subject: the development of worldview, sense of national self-determination, patriotism, humanity, sensitivity, etc.;

– the second level – institutional, which forms goals and solves specific tasks for the training of specialists for realization of information and communication competence in various fields, in particular in the system of university and postgraduate education;

– the third level – professional, which develops information and communication competencies in terms of individual social groups (professional teams, institutions). At this level, the employee of the educational institution develops such qualities as collectivism, responsibility, interest, practical performing of management functions for organizing, planning, coordinating, delegating, assessing the situation, making management decisions, etc. in the framework of the interaction of professionals and beginners, taking into account individual psychological and personal characteristics. The examples of such interaction are mentoring, communication and learning in the process of professional activity;

– the fourth level – intrapersonal, the level of self-education and self-learning, which manifests itself as the person's self-influence in various life and professional circumstances. At this level, the realized talents and abilities of the individual, his motives, interests and volitional skills are of special significance.

References:

1. Voloshyna O., Bilous O. (2020) Some aspects of the essence of intercultural communicative competence with the future specialist of higher education. *Visnyk Zhytomyrskoho derzhavnogo universytetu imeni Ivana Franka. Pedagogichni nauky*, no. 3(102), pp. 15–26.
2. Voloshyna O. V., Ivashchenko A. V., Vlasenko I. V. (2018) Navchalnyi posibnyk dlia studentiv, mahistriv spetsialnosti «Turyzm» [Train aid for students, master's degrees of speciality, «Tourism»]. *Recreational and tourism activity and its modern aspects of development University of Tourism and Foreign Languages in Warsaw*, 409 p.
3. 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 multylinhvalnomu prostori (Ukraine, Vinnytsia, November 22, 2018)*, Vinnytsia, pp. 22–24.
4. Voloshyna O. V., Popenko Y. V. (2020) Ihrovi metody, yak zasib vyvchennia inozemnoi movy [Playing methods, as a mean of study of foreign language]. *WorldJournal*. Bolgariya, no. 4, pp. 31–39.
5. 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 pedagogichnoho universytetu. Serii: Pedagogichni nauky*, no. 151, pp. 30–33.
6. 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.
7. 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.
8. 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.
9. Hrischenko I. V. (2017) Tsili ta zavdannia keis-metodu pry vykladanni kursu «Derzhavnyi finansovyi kontrol» [Aims and tasks the method of keic at teaching of course «State financial control»]. *Proceedings of the Dystantsiine navchannia yak suchasna osvitnia tekhnolohiia, (Ukraine, Vinnytsia, March 31, 2017)*, Vinnytsia: VTEI KNTEU, pp. 76–78.
10. Hunko I. V., Voloshyna O. V. (2021) Praktychne zastosuvannia dilovoi hry pry vyvchenni 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.

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

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

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

14. Kovalova K. V. (2013) Komunikatyvna 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.

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

16. Kravets R. A. (2013) Kulturna kompetentnist ta mizhkulturna komunikatsiia u profesiinii pidhotovtsi maibutnykh 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.

17. Kravets R. A. (2017) Pedahohichna tekhnolohiia formuvannia polikulturnoi kompetentnosti maibutnykh 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.

18. Kravets R. A. (2017) Vprovadzhenia interaktyvnykh metodiv navchannia u polikulturnii osviti maibutnykh 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.

19. 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 derzhavnoho pedahohichnoho universytetu imeni Mykhaila Kotsiubynskoho. Serii: Pedahohika i psykholohi*, no. 39, pp. 187–192.

20. Kravets R. A. (2020) Pedahohichne proektuvannia tekhnolohii formuvannia polikulturnoi kompetentnosti maibutnikh 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.

21. Kravets R. A. (2015) Praktychna realizatsiia spetsyfichnykh pryntsyypiv polikulturnoi osvity maibutnikh 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.

22. Kravets R. A. (2013) Strukturni komponenty polikulturnoi kompetentnosti maibutnikh 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.

23. Kravets R. A. (2016) Typy komunikatyvnykh sytuatsii u konteksti polikulturnoi osvity maibutnikh 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.

24. Kravets R. A., Romanyshyna L. M. (2013) Lihvokrainoznavchyi pidkhid 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]. Seriia: Sotsialno-humanitarni nauky*, no. 2, pp. 154–166.

25. Telekalo N. V. (2018) Innovatsii v nautsi ta osviti: vyklyky suchasnosti [Innovations in science and education: modern challenges]. *Innovatsii v nautsi ta osviti: vyklyky suchasnosti: zb. nauk. ese uchasnykiv stazhuvannia dlia osvitan, Warsaw*, pp. 169–171.