ENTREPRENEURSHIP EDUCATION WITH THE USE OF A CLOUD-ORIENTED EDUCATIONAL ENVIRONMENT

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ABSTRACT

The built factor-criterion model for the development of ICT competencies of teachers and pupils in the framework of entrepreneurship education, which takes into account the framework recommendations of UNESCO, allowed determining the effectiveness of the methodology for designing a cloud-oriented educational environment. The justified model involves the use of six main factors (understanding the role and educational policy of use, basic knowledge, the use of a cloud-oriented educational environment in a teacher's professional activity, the ability to collaborate and self-educate, the use of basic services, the use of various forms of educational activity), three criteria (technological literacy, deepening knowledge, ICT creativity) and related indicators. To test the use of a cloud-oriented educational environment, the semantic differential method should be used.

Keywords: Entrepreneurship Education, Cloud-Oriented Educational Environment, Ict Creativity, Semantic Differential Method, Professional Activity.

JEL Classifications: M5, Q2.

INTRODUCTION

The dynamics of changes in the modern world, the informational "explosion", and the development of the global information infrastructure—all these factors determine the need for innovative changes aimed at modernizing education.

It is impossible to imagine a modern school without computer equipment, multimedia devices, and Internet access. However, the rapid development of technology, the lack of funding for updating the material and technical base of educational institutions hinder the systematic updating of software in general educational institutions (GEI), the introduction of the latest developments in the educational process, the availability of educational materials for pupils regardless of time and place of their stay.

The advantages of cloud computing, such as ubiquitous access to services, can become a factor in the gradual departure from the provision of information services and the placement of various data on the computers of educational institutions. Increasingly, services will be provided to pupils and teachers by means of the Internet, which they will receive for free or for a small fee, while such services are more affordable, reliable, and personalized.

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Most educational services will be provided from the "clouds" and educational institutions do not have to spend large sums of energy, maintain their own servers and expensive equipment, which are not always used at full capacity.

The purpose of the work is to theoretically justify and design a cloud-oriented educational environment of a general educational institution and to develop a methodological system for designing such an environment at the level of a manager, administrator of a cloud-oriented educational environment (COEE), subject teacher, and pupil.

The goal of creating COEE is to achieve certain didactic goals, fulfil pedagogical tasks, unite subjects and objects of the educational process for effective cooperation, focused on improving the quality of pupils' learning outcomes using cloud services.

REVIEW OF PREVIOUS STUDIES

A theoretical analysis of the scientific works of leading scientists in the field of education, the study of the experience of using ICT in the educational process and managerial activity indicates the presence of contradictions between:

- The growing influence of ICT on the development of general educational institutions and the lag in theoretical and methodological research on their systematic use in the educational process (Luo et al., 2017).
- The significant didactic potential of the cloud-oriented educational environment and the lack of theoretically substantiated models and effective methods for its use in general educational institutions (Hilorme et al., 2019; Tetiana et al., 2019).
- The increasing demands of society for the organization of the educational process of the GEI and the low level of use of information and communication technologies (ICT) (Machado et al., 2018).
- The presence of a significant amount of programmatic, educational, methodological, and didactic support for the educational process and the lack of universal access to it (Drobyazko et al., 2019; Durmanov et al., 2019).
- The significant technological potential of a cloud-oriented educational environment and low educational mobility of participants in the educational process (Yang et al., 2018).
- The intensive development of ICT and the speed of updating of the content of curricula, in particular in computer science, which ensure the formation of non-competence of pupils for educational communication, cooperation, cooperative work (Raspopovic et al., 2017).

Thus, the problem of scientific and theoretical justification and development of a cloud-oriented educational environment of the GEI, which takes into account the practical needs of teachers and the requirements of society for the organization of the educational process, is not fully resolved, and this, in turn, negatively affects the level of development of IC-competencies of the educational process subjects and their educational mobility.

METHODOLOGY

To solve certain problems, a number of empirical and psychosemantic methods were used: pedagogical questioning, expert survey, semantic differential method, conversations with teachers and pupils; direct, indirect observation of the processes of designing and using a cloud-oriented educational environment in order to improve methods and determine the level of IC-competencies of education subjects, a pedagogical experiment, structural, process, and

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technological modeling; statistical methods: descriptive statistics, verification of statistical hypotheses for data processing obtained during the study, factor-criterion analysis of data to confirm the effectiveness of design methods, the use of a cloud-oriented educational environment of a general educational institution.

RESULTS AND DISCUSSIONS

Given the recommendations of UNESCO related to the professional development of teachers and the acquisition of skills in an ICT-rich educational environment, according to the framework of IC-competency, six factors, three criteria, and a number of indicators were developed to determine the level of development of IC-competency of subject teachers in a cloud-oriented educational environment of a general educational institution.

Each factor has to be revealed through a series of criteria that correspond to the three main ones of the IC-competency framework developed by UNESCO. The formation of each criterion is determined by a number of indicators covering the process of teaching practice, that is, the use of COEE services in the teacher's activities. The criteria, factors, and indicators for determining the level of development of IT-competency have been considered in detail.

The criterion *"Technological literacy"* is a parameter that determines the widespread use of the latest technology by pupils and teachers to ensure the educational process, in particular by introducing COEE in the system of general secondary education. It reflects the acquisition by pupils, heads of general educational institutions, and subject teachers of the ability to use ICT to organize learning, maintain personal development, develop pupils' competitiveness, ensure the availability of high-quality resources for pupils of various categories, and improve the level of life skills and abilities. Teachers should be aware of and be able to correlate the use of ICT with the corresponding components of curricula, which leads to the improvement, development of skills in applying innovative technologies to enhance the cognitive activity of pupils and helps to form technological literacy in a relevant learning context.

The criterion *"Deepening knowledge"* is a parameter that determines the increasing ability of teachers to apply knowledge and skills for personal development by performing complex practical tasks in interaction, communication, and cooperation in COEE. It reveals the ability of teachers to assist pupils in the in-depth mastery of the content of academic subjects, the application of acquired knowledge to solve complex problems in real life, provide for training in cooperation, which is based on the implementation of tasks and the implementation of various projects; the in-depth study of the subject and application of acquired knowledge, finding answers to complex daily questions and developing strategies for solving problems.

The teacher should formulate the tasks and guide the process of obtaining knowledge and skills by pupils when learning and understanding the world, manage data, structure tasks, combine universal and special software, EOP, use network and Internet resources, provide access to interaction with other teachers, be able to apply ICT to create and monitor individual and group plans for pupil's projects, improve professional skills, and apply ICT, in particular COEE, for a particular subject area.

The *"ICT creativity"* criterion is a parameter that determines the development of the ability of pupils and teachers to innovate, the creation of new knowledge and the receipt of appropriate returns from them in interaction, communication, and cooperation in COEE. It determines the level of ability of teachers to help pupils and teaching employees, improve the quality of educational services, participate in the development of school curricula, solve

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educational and social problems, interact, collaborate, experiment, think critically and apply creative approaches, assess existing knowledge, their strengths and weaknesses, track progress in academic achievement, build on successes and draw conclusions from failures that they will need to learn throughout life and the valuable integration into the information society.

The content of the development factors of IC-competency of COEE entities has been detailed. The first factor is *"Understanding the role and educational policies of using COEE"* (Table 1).

Table 1
FACTOR 1 "UNDERSTANDING THE ROLE AND EDUCATIONAL POLICIES OF USING COEE" (AUTHOR'S STUDY)

Criteria	Indicators
Technological literacy	1.1.1. Level of use of COEE at school
	1.1.2. Using COEE to achieve the goal of general secondary education
Deepening of knowledge	1.1.3. Positive aspects of COEE for the school
	1.1.4. Policy for implementing COEE in the school's educational process
	1.1.5. Changes in pedagogical practice and methods of using COEE
ICT creativity	1.1.6. COEE's role in school development
	1.1.7. COEE's role in improving the quality of educational services in the general secondary education system

Subjects should know and understand the ICT innovation development trends, their role in the development of a specific individual and a general educational institution as a whole, the possibilities of COEE application and use both in GEI and in the general secondary education system, forecast development prospects, determine positive aspects of use, changes in teaching practice and working methods using COEE, and understand the role of COEE in improving the quality of educational services in the system of general secondary education. The question of students' understanding of the role of ICT in school development has been considered to a lesser extent. However, the importance of the informatization of processes in a certain way applies to them in some way. Now it is important to develop students' ability to determine the capabilities of ICT for self-organization of learning, increase knowledge, and determine the need for ICT for self-development.

The second factor is *"Basic knowledge about COEE"* (Table 2).

Subjects should be able to use COEE components during the educational process, both in the classroom and after-school hours within the subject taught by a particular teacher, to develop and improve COEE skills, to communicate with students during their learning activities, to check their homework, to track, evaluate, and report on student learning achievements, to ensure learning mobility, and universal access to learning materials.

The third factor is *"Use of COEE in professional activity"* (Table 3).

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Table 2 FACTOR 2 BASIC KNOWLEDGE ABOUT COEE (AUTHOR'S STUDY)	
Criteria	**Indicators**
Technological literacy	1.2.1. The amount of use of COEE to work with students within the subject you are teaching
	1.2.2. The amount of use of COEE to communicate with students when teaching a subject
	1.2.3. The extent of use of COEE for student collaboration when teaching a subject
	1.2.4. The extent of use of COEE for student cooperation when teaching a subject
	1.2.5. The amount of use of COEE to verify students' homework
	1.2.6. The extent of use of COEE to track, evaluate, and report on student achievement
	1.2.7. The extent of use of COEE to prepare a report on student achievement

Table 3 FACTOR 3 USE OF COEE IN PROFESSIONAL ACTIVITY (AUTHOR'S STUDY)	
Criteria	**Indicators**
Deepening of knowledge	1.3.1. The extent of use of COEE in teacher's professional activity
	1.3.2.The extent of use of COEE to enhance student learning activities
	1.3.3.The extent of use of COEE to organize collaboration with colleagues
	1.3.4.The extent of use of COEE to organize collaboration with methodological teachers' associations
	1.3.5.The extent of use of COEE to share experiences with other teachers
ICT creativity	1.3.6.The extent of use of COEE in the development of lessons
	1.3.7. The extent of use of COEE in the development of didactic tasks

Subjects should be able to use the components of COEE in the professional activity, when developing lessons, organizing cooperation with students in lessons, in extracurricular activities, for exchanging pedagogical experience with other teachers, for collaborating with methodological associations of subject teachers, for selecting pedagogically considered services for activating cognitive student activities, for communication, cooperation and cooperation with colleagues on student learning activities, professional self-realization.

The fourth factor is the *"Ability to collaborate and self-educate in COEE"* (Table 4).

Table 4 FACTOR 4 ABILITY TO COLLABORATE AND SELF-EDUCATE IN COEE (AUTHOR'S STUDY)	
Criteria	**Indicators**
Deepening of knowledge	1.4.1.The extent of use of COEE to improve communication skills among students
	1.4.2.The extent of use of COEE to help students find ideas and data
	1.4.3.The extent of use of COEE to enable students to share experiences
ICT creativity	1.4.4.The extent of use of COEE for students' self-education

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Subjects should use COEE components to improve communication skills on learning activities, personal development, to assist in finding ideas and various data, for the exchange of pedagogical experience, for self-education, cooperation in order to develop their own abilities, for deepening knowledge on a specific subject, and to organize the educational process.

The fifth factor is *"Use of the basic services of COEE"* (Table 5).

Table 5
FACTOR 5. USE OF BASIC SERVICES (AUTHOR'S STUDY)

Criteria	Indicators
Technological literacy	1.5.1. The extent of use of Word Online text editor
	1.5.2. The extent of use of Outlook Online e-mail
	1.5.3. The extent of use of Excel Online spreadsheet processor
	1.5.4. The extent of use of the Lync conference system
	1.5.5 The extent of use of PowerPoint Online presentations
	1.5.6. The extent of use of OneDrive Online
	1.5.7. The extent of use of OneNote Online
	I.5.8. The extent of use of Excel forms for testing
	1.5.9. The extent of use of the Yammer social network for communication
ICT creativity	1.5.10. The extent of use of additional services during the educational activities of students in COEE

Subjects must be able to use the basic services of COEE: Word word processor, Outlook e-mail, Excel spreadsheet processor, Lync conference system, PowerPoint presentation development tool, OneDrive virtual storage, OneNote e-notepad, Excel test forms, internal (external) social Yammer network for communication, student learning organization. The same abilities should be formed in students, which will ensure the active use of the designed COEE in the classroom and after school hours. The student's lack of ability to use the basic COEE services makes learning mobility impossible.

The sixth factor is the *"Use of COEE for various forms of the educational activity"* (Table 6).

Table 6
FACTOR 6. USE OF COEE FOR VARIOUS FORMS OF THE EDUCATIONAL ACTIVITY (AUTHOR'S STUDY)

Criteria	Indicators
Deepening of knowledge	1.6.1.The extent of use of COEE to work with the class
	1.6.2 The extent of use of COEE for the organization of personalized training
	1.6.3 The extent of use of COEE for small group work
	1.6.4 The extent of use of COEE for project work
	1.6.5.The extent of use of COEE for the preparation for the Olympics
	1.6.6.The extent of use of COEE for the preparation for competition works
	1.6.7.The extent of use of COEE to enhance learning activities
	1.6.8. The extent of use of COEE for the independent preparation of students for lessons
	1.6.9. The extent of use of COEE for teamwork
	1.6.10. The extent of use of COEE for on-line communication training

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Subjects should be able to use COEE for working with the class, for organizing personalized training, working in small groups, in projects, preparing students for olympiads, preparing competitive works, enhancing educational activities, independent preparation of students for lessons, teamwork, and educational online communication.

To determine the level of ICT competency of students in general educational institutions, which design a cloud-oriented educational environment, criteria and indicators should be laid down that correspond to general approaches to teachers. The student as a personality is still being formed, therefore, the factor-criterion model in a simplified form is considered. To compare the results of the development of the IC competency of teachers and students in the COEE design process, four main factors are established, namely: understanding the role and educational policy of using COEE, basic knowledge about COEE, using basic services of COEE, and using various forms of educational activity.

Thus, the factor-criterion model can become an effective tool in determining the level of development of the IC competency of the education subjects in the design process of the COEE of GEI, which will provide effective technological support at the stage of its implementation.

RECOMMENDATIONS

Contradictions of modern education can be resolved provided the development and implementation of a scientifically sound methodology for designing and using COEE in the educational process.

The main stages of design of COEE have been identified: problem-educational; meaningful; conceptual; component assessment; design and modeling; experimental-correction; evaluation and generalizing.

Among the didactic features of COEE design, the requirements for the material and technical base of a general educational institution, requirements for a repository of educational materials, forms of using COEE for educational purposes, the activities of teachers, students, and administrators, are highlighted. There are a number of sanitary and hygienic requirements and technical features that must be taken into account when designing COEE and observed by the participants in the educational process in order to effectively use COEE and preserve the health of students.

CONCLUSIONS

The concept of design research is based on the understanding of a cloud-oriented educational environment as an artificially constructed system, which with the help of cloud services provides educational mobility, group collaboration of teachers and students for the effective, safe achievement of didactic goals and the development of IC competency.

Taking into account the characteristics of each participant in the educational process as a complex dynamic system, the development of which is determined by the internal conditions contained in the individual and external factors of influence, is the basis for the effective use of the COEE of the general educational institution. A system of individual typological characteristics of the subjects has an important influence on the design process of COEE. Therefore, the students were classified according to the following characteristics: educational potential, degree of education, age characteristics, forms of training, place of study, didactic goal, number of students, time of the study, and duration of training. As well as teachers were

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classified according to the method of interaction (actively positive, functionally professional, neutral indifferent, situational, hidden negative) and the use of innovations (innovative positive, stable positive, situational positive, neutral, hidden negative, demonstratively negative).

The modern pedagogical community is increasingly interacting with information technology, in particular cloud-oriented ones, which creates the conditions for the continuous development of the IC competency of subjects of educational activity. Implementation of COEE encourages teachers to clarify the possibilities of using ICT in the educational process, develops the ability to collaborate and self-educate.

To ensure productive collaboration, communication, and cooperative learning activities for teachers and students, COEE must be effective. The main methods for determining the effectiveness of the methodological system for designing and using COEE include the semantic differential method and factor-criterion model for determining the level of IC competency of teachers and students, based on UNESCO recommendations. The developed factor-criterion model for determining the level of IC competency of teachers and students makes it possible to evaluate the effectiveness of the COEE design methodology of a general educational institution. This model can be integrated with the core framework of IC competency developed by UNESCO.

The application of the semantic differential method to assess the relationship of education subjects to the designed COEE provided an opportunity to evaluate the effectiveness, dynamics of use, the functioning of the designed model from the perspective of students, teachers, and experts.

The semantic differential method will help determine the consistency of subjects' perceptions of the mobility of learning, collaboration, cooperation, communication, and attitude to cloud services in order to achieve didactic goals.

The design of a cloud-based educational environment is a fairly new phenomenon, so the scientific community has not fully explored it. The design procedure of the GEI's COEE is based on general scientific, specific approaches and principles, taking into account the characteristics of teaching schoolchildren, the latest conditions for the use of didactics and teaching methods.

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