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**DEVELOPMENT OF DIGITAL COMMUNICATION
COMPETENCE USING CLOUD TECHNOLOGIES**

**532.02 SCHOOL DIDACTICS
(BY EDUCATIONAL STEPS AND SUBJECTS)**

Summary of the doctoral thesis in Educational Sciences

CHISINAU, 2024

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LIST OF ABBREVIATIONS

CC	Communication competence
CCNVE	Communication competence in non-virtual environment
DC	Digital competence
DCC	Digital communication competence
ICT	Information and communication technologies
CT	Cloud technologies
DT	Digital technologies
TIC	Technologies of information communication
PMDDCCCT	Pedagogical model for developing students' digital communication competence using cloud technologies
CSPU	"Ion Creangă" State Pedagogical University of Chisinau
CSUH	Cahul State University "Bogdan Petriceicu Hasdeu"
CSU	Comrate State University
TSU	Tiraspol State University
FTS	Full-time section
PTS	Part-time section
EG	Experimental group
CG	Control group

CONCEPTUAL BENCHMARKS OF THE RESEARCH

Importance and significance of the study. Over the past few years, society has been undergoing radical change through a series of revolutionary processes associated with the digitization of all areas of human activity (including education); the shift of interpersonal, professional and educational communication to the online environment; the dominance of instant messaging and e-mail; the extensive use of social networks; the replacement of direct interactions between interlocutors by virtual ones; the changing style of communication and the emergence of the digital native generation.

These transformational processes have elucidated the need and importance of developing students' DC and DCC, two essential competences in the modern digital society, the high level of possession of which will ensure the individual's personal and professional fulfilment and development, competitiveness in the labour market, social inclusion, etc.

Description of the situation in the research area. The importance of DC and DCC in today's reality is reflected in the requirements and demands of both international [1, 2, 3] and national [4, 5, 6, 7, 8] education policies and the European Commission's initiatives [9, 10, 11].

Since 2018, the Romanian version [1] of the European Union's key competencies documents includes the phrase "digital competencies". In this context, DCC is a subset of DC that corresponds to the D2. Communication and Collaboration domain (D2) [2].

The need to leverage CT in Education is justified by the multiple benefits offered by these technologies to educational institutions, teachers and students, and their implementation in the DCC development process is motivated by various opportunities offered for interaction, communication, collaboration and sharing of digital content. The following scholars outlined these advantages in their work: Гизатулина О. И. [12]; Жамборов А. А., Алиева У. Г., Абиева М. М. [13]; Исмаилова Н. П., Рамазанова П. К. [14]; Манахова Е. Б. [15]; Назаренко Э. Г. [16]; Ходжаева Д. Ф. [17].

As a result of the literature review, as well as the requirements and demands of international and national educational policies, the following **findings** were observed: (a) it is crucial and necessary for each specialist to have a high level of DC and DCC; (b) the leveraging of CT in the process of developing DCC facilitates and streamlines this process; (c) there are no conceptual and praxeological benchmarks of DCC; (d) there is a lack of pedagogical models for DCC development using CT.

By contrast, considering these findings, there can be highlighted the following **contradictions**: (1) the current requirements regarding the level of DC possession and the actual level of its possession by learners; (2) the exponential growth of the role of DCC in the initial training of specialists and the lack of a

mechanism for the training and development of this competence; (3) the great opportunities offered by CT in Education and the lack of conceptual and praxeological benchmarks for their use in the process of developing DCC in future specialists.

The listed contradictions contributed to the formulation of the following **research problem**: identification of the theoretical and praxeological foundations of using cloud technologies, contributing to developing students' digital communication competence.

The focus of the research represents the development process of DCC using CT.

The aim of the research consists in the theoretical foundation, elaboration and experimental validation of the pedagogical model of DCC development using CT.

Research objectives: (1) theoretical-didactic grounding of the DCC concept and determination of effective CT for its development; (2) elaboration of the PMDDCCCT; (3) argumentation of the methodological landmarks of using the PMDDCCCT; (4) updating and expansion of the collection of theoretical and practical teaching materials of the TIC university course, focusing on DCC development; (5) validation by experiment of the effectiveness of the pedagogical model and the elaborated methodology.

The research hypothesis starts from the assumption that the DCC development process will be efficient when: (a) its structural elements (knowledge, capacities/abilities and attitudes), the instruments for measuring the level of possession of this competence, the pedagogical principles of its development, the factors that significantly influence the process of developing the given competence and the effective CT for developing and training the mentioned competence will be identified; (b) it will use a learner-centered and competency-based teaching approach implemented using interactive teaching-learning-assessment strategies and modern teaching methods supported by CT; (c) a PMDDCCCT will be developed; (d) the methodology of implementation of the PMDDCCCT will be designed.

Research methodology. The process of achieving the research objectives focused on the following research methods: (a) *theoretical methods*: documentation, scientific research, pedagogical design and modelling, scientific literature review, synthesis, comparison, generalisation, systematisation; (b) *experimental methods*: pedagogical experiment, questioning, observation, testing, analysis and evaluation; (c) *analytical methods*: statistical methods of collecting, grouping, processing and interpreting experimental data; quantitative and qualitative analysis of experimentally obtained results.

The scientific novelty of the research results consists of: (1) theoretical and didactic grounding of the fundamental concept expressed by synthesizing the notion of DCC and identifying its structural elements (knowledge,

capacities/abilities, attitudes), instruments for measuring the level of possession of this competence, pedagogical principles of its development, key influencing factors on the process of development of the given competence and effective CT for its growth and training; (2) elaboration of the PMDDCCCT; (3) elaboration of the methodology of implementation of the PMDDCCCT, based on the flipped learning model, interactive strategies, modern teaching methods, student-centered and oriented towards the DCC development.

The scientific problem solved consists of the optimization of the DCC development process by founding and implementing the PMDDCCCT.

The theoretical significance of the work is highlighted by the theoretical-didactic grounding of DCC development, the study of ways to use CT effectively in the process of developing this competence and the elaboration of a pedagogical model for its development through the use of CT, based on flipped learning, interactive strategies, and modern student-centered teaching methods.

The applied value of the work lies in the approbation and successful application of the PMDDCCCT. The pedagogical model developed can be used both in the initial training of specialists in various fields or in the training of master students in courses focused on the development of DC or CCNVE, and in the training process in middle and specialized educational institutions at the computer science disciplines or oriented to the development of CC.

The implementation of the scientific results was carried out within the framework of the pedagogical experiment, conducted on control and experimental groups, which included a total of 411 students, of which 327 students from the CSUH, 29 students from the CSPU, 38 students from the TSU and 17 students from the CSU.

The approval of the research results occurred by the research milestones. The main results of the research were presented, discussed and approved during the extended meeting of the Chair of Informatics and Information Technologies, the Guidance Commission and the Public Defence Commission of the Doctoral School "Sciences of Education" of the CSPU. An additional form of presentation of the research results involved participation in communications at international and national scientific conferences.

Publications on the thesis topic. Scientific and scientific-methodical results on the thesis topic are presented in: 6 scientific articles in national journals of categories B and C; 26 communications at scientific conferences.

THESIS CONTENT

The **Introduction** discusses the relevance and significance of the research topic; describes the situation in the research field by briefly presenting the existing approaches in the literature to the fundamental concepts of the research topic; formulates the research problem, object, aim, objectives and hypothesis of the

research; describes the research methodology, the scientific novelty of the results obtained, the theoretical importance and the applicative value of the work; presents the information about the implementation and approval of the research results.

Chapter 1. Theoretical and didactical fundamentals of the development of digital communication competence – are dedicated to summarizing the notion of DCC and elucidating its structural elements: knowledge, capacities/abilities and attitudes; identification of the domains of competence, the number of levels of DCC possession and the requirements for each of them; elaborating the instrumentation for measuring the level of DCC possession; elucidating the didactic principles of developing this competence and the factors that significantly influence the process of its efficient development; as well as justifying the necessity of exploiting CT in Education and identifying the opportunities offered by their use in the process of developing DCC.

To synthesize the notion of DCC, the theoretical landmarks of the concepts: competence, communication, communication competence, digital competence, digital communication [30, 36, 46, 48, 52, 53, 57] were studied. Thus, DCC represents a set of knowledge, capacities/abilities and attitudes of safe, critical and responsible use of information and communication technologies, which can be activated and manifested in different contexts according to needs, desires or purposes to transmit/share knowledge and information, identifying and expressing intentions, needs, interests, opinions and feelings, both orally and in writing (listening, speaking, reading and writing), interaction and collaboration with others, effectively, appropriately and creatively [32, p. 130; 59, p. 184].

Following a review and synthesis of the scientific literature [1-3, 18-22], the structural elements of DCC have been identified (Table 1) [30, 31, 36, 46, 57, 59].

Table 1. Structural elements of the DCC

Knowledge	Capacities/Abilities	Attitudes
<ul style="list-style-type: none"> • ICT and CT concepts, • Classification of ICT and CT instruments; • The concept of <i>digital communication</i>; • Opportunities offered by digital communication (advantages/disadvantages); • The environment for digital communication; • Forms of digital communication: synchronous and asynchronous; 	<ul style="list-style-type: none"> • To identify, understand, express, create and interpret feelings, intentions, needs, interests, concepts, facts and opinions; • To use a wide range of DT in the process of digital interaction and communication; • To establish an efficient, appropriate and creative way connections with other people; 	<ul style="list-style-type: none"> • A positive attitude towards adopting a critical and constructive dialogue; • Interest in digital communication and interaction with other people; • Awareness of the positive impact of ICT tools on societal development; • Harnessing the benefits of implementing DT in education; • Willingness, interest, initiative and curiosity in using DT;

<ul style="list-style-type: none"> • The concept of <i>digital communication means</i>; • Synchronous and asynchronous digital communication tools; • Benefits and risks of various ICT tools for digital communication; • The concept of <i>netiquette</i>; • Code of good manners in the online environment; • Ways of protecting personal reputation in the online environment; • Concept of <i>digital identity</i>; • Ways of protecting personal data and privacy in the online environment; • Ways to secure personal accounts and profiles; • Recommendations for safe use of social media platforms; • The phenomenon of <i>cyberbullying</i> in digital communication; • Characteristics, environments and forms of manifestation, triggering reasons, types of discrimination and impact of the cyberbullying phenomenon; • Recommendations for preventing and combating cyberbullying; • E-mail service and electronic address book. 	<ul style="list-style-type: none"> • To share data, information and digital content through a variety of digital tools; • To engage and actively participate in social life through DT; • To use a variety of digital tools and technologies to collaborate with others, create and co-edit digital content; • To use knowledge and rules of behaviour to be respected during digital interaction and communication; • To respect the cultural, generational, religious, racial, sexual, etc. diversity that may be involved in the digital communication process; • To manage their own digital identities; • To apply different ways of protecting in the online environment of: own digital identities and own reputation, digital communication and collaboration processes, personal data and privacy; • To avoid, prevent and combat risks and threats to physical health and psychological wellbeing during online communication and collaboration (cyberbullying); • To use social media platforms safely and effectively. 	<ul style="list-style-type: none"> • Willingness to provide personal information; • Awareness of the risks of exposing personal identity in the online environment; • Exploiting the positive aspects offered by digital communication; • A critical and serious attitude towards the use of good manners in the online environment (netiquette); • Awareness of the importance of addressing cybersecurity subject; • Seriousness, interest and critical attitude towards existing cybersecurity methods and techniques; • Awareness of the risks and damage caused by the triggering of cyberbullying during digital communication; • Creativity and ingenuity in proposing their own solutions to prevent and combat cyberbullying; • Appreciation of the cultural, generational, religious, racial, sexual, etc. diversity that can be involved in the digital communication process; • Respect and appreciation of interlocutors;
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The research identified seven domains of the DCC (Figure 1), 6 of which are recommended by the European Digital Competence Framework for Citizens: DigComp 2.2 [2], and the 7th was added by the author due to the emergence of the

need to ensure the security of digital communication, collaboration and digital content sharing processes, as well as the vertiginous spread of the cyberbullying phenomenon [55, 56] in the online environment.



Fig. 1. DCC domains

These 7 domains have been structured into 8 levels of possession [32] defined by learning outcomes, organized in a Grid, which contains the unfolding description of knowledge, capacities/abilities and attitudes required for each level and descriptor. The 8 levels of DCC possession were referred to the European Digital Competence Framework for Citizens: DigComp 2.2 [2]. Each level represents a step forward for the learner in developing DCC according to his/her cognitive challenges, the complexity of the tasks he/she can perform and manage, and his/her autonomy in performing these tasks [59].

As a result of the research conducted, the didactic principles underpinning the DCC development process were identified [31, p. 112-114; 57, p. 140]: individualization of learning, accessibility, active and conscious participation, thorough appropriation, assurance of feedback, relational and partnership, communicative ambience, motivation for learning and communication, accountability, correlation, non-discrimination; and factors that significantly influence this process: blended learning, extensive and effective use of ICT and CT, frequent use of synchronous communication software, frequency of online interactions, continuous interaction with peers and learning community instructor, sense of belonging to the community, obtaining prompt feedback and its quality, etc.

The DCC development process includes extensive use of ICT, the scale of which is very diverse and involves owning expensive hardware and licensed software that requires procurement, maintenance and constant updating.

In this context, it is justified to use CT, both in the educational process and in the DCC development process. These technologies are (1) available available 24 hours, 7 days a week; (2) accessible from any digital device (desktop, laptop, tablet, smartphone) with an Internet connection; (3) do not require additional costs to procure, maintain and upgrade the services provided; (4) offer many free or low-cost solutions for education; (5) ensure intensification of communication and facilitation of collaboration through a broad set of tools; (6) reduce the digital divide of the actors of the educational process; (7) facilitate access to education for people with disabilities or mobility problems, part-time students, master students; (8) ensure individualization of the educational process, etc [41, 42, 47].

The research carried out has elucidated the actuality of the following **research problem**: identification of the theoretical and praxeological foundations of using cloud technologies, contributing to developing students' digital communication competence. To solve it, it is necessary: (a) to develop a PMDDCCCT; (b) to argue the theoretical and methodological milestones for the implementation of the pedagogical model developed in the TIC university course; (c) to update and expand the collection of theoretical and practical teaching materials of the TIC university course focusing on DCC development; (d) to validate through pedagogical experiment the effectiveness of the developed model and methodology.

Chapter 2. Pedagogical model and methodology for developing students' digital communication competence using cloud technologies. The core of this chapter consists of (1) presenting the set of effective CT for developing DCC and the correspondence between them and the 7 domains of the given competence, (2) elaborating and theoretically grounding the PMDDCCCT and the methodology for its implementation.

CT relevant for DCC development are [34, 37, 38, 45, 48, 49, 50, 54, 58]: e-mails, videoconferencing, LMS, forums, communication platforms for institutions, online interactive whiteboards, web platforms for speech development, instant messengers, express assessment applications, social networks, blogs, websites, mind maps, online document editors (text, spreadsheet, electronic presentations).

The correspondence between the 7 descriptors of DCC and the CT used to form, develop and train them is shown in the following figure (Figure 2):

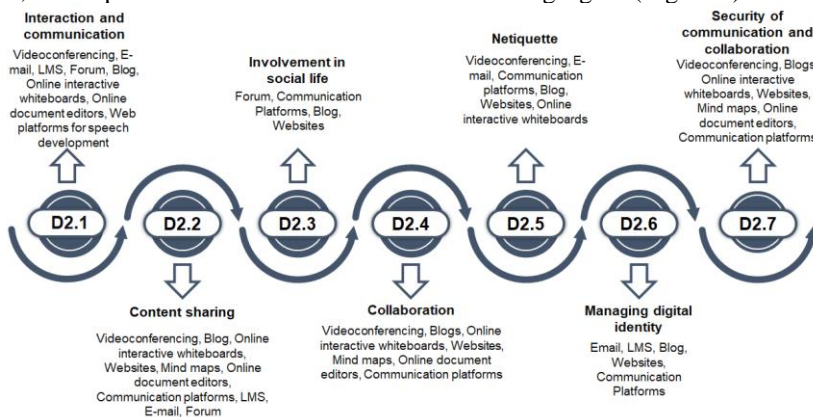


Fig. 2. Correspondence between DCC domains and CT

Elaboration of the pedagogical model for developing students' digital communication competence using cloud technologies

To accomplish the objective of the scientific research a PMDDCCCT was developed, as depicted in Figure 3. This model is being implemented in the TIC university course to foster the development of DCC in students using CT.

The advantages of the pedagogical model developed over other pedagogical models aimed at developing the competences of future specialists are: (a) the proposed aim - the development of DCC in students, a competence absolutely necessary for any modern specialist for competitiveness on the labour market, personal and professional fulfilment and development, social inclusion etc.; (b) the pedagogical principles on which the developed model is based constitute a combination of general didactic principles and specific principles of educational action of developing DCC; (c) the development of DCC in students is achieved by means of the latest, most effective and relevant ICT for digital communication - CT; (d) the form of instructional delivery involves blended learning based on the flipped learning model [61]; (e) the application of interactive strategies and modern student-centred teaching methods (flipped classroom, collective discussion, collaborative learning etc.) oriented towards the development of DCC; (f) implementation of various forms of interactive assessment carried out through different CT for testing and collaboration.

The PMDDCCCT includes the following characteristics:

1. ***The model's originality*** involves the development of DCC - an essential competence for the training of competent modern specialists - through the use of the most up-to-date information technologies - CT.
2. ***The model's realism*** is ensured, on the one hand, by the requirements and demands of national and international educational policy documents and, on the other hand, by CT that are suitable and accessible environments for both teacher and students.
3. ***The model's integrity*** of the model is expressed by explicitly ensuring the functionality of all components and stages of the educational process (design, teaching, learning, assessment, guidance etc.).
4. ***The model's plurivalence*** is evident from the positive action effect, it is related to the development of CCD and the improvement of other competencies: digital, social, learning, research etc.
5. ***The model's flexibility*** is ensured by the possibility to modifying the CT set to use the most innovative tools of this technology.
6. ***The model's transdisciplinarity*** is reflected in the fact that it can also be implemented in other university courses or in the initial training of specialists in different training fields.

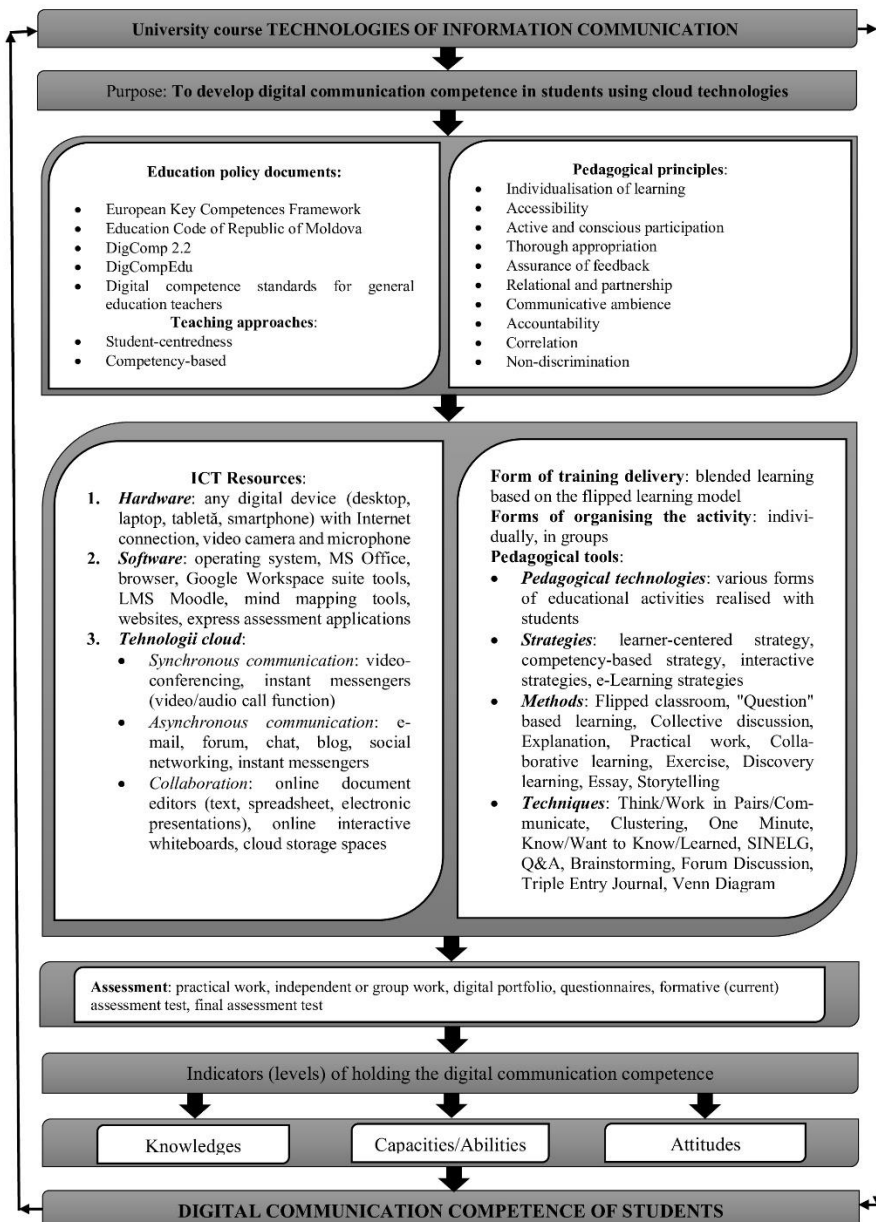


Fig. 3. PMDDCCCT

The educational objectives pursued when applying the pedagogical model developed are:

1. harnessing the potential of CT;
2. increasing the quality of initial training of future specialists in any field of training by using the most innovative information technologies - CT;
3. developing and perfecting the methodology of TIC course study for any field of training;
4. creating an accessible, varied, communicative, flexible and individualized learning environment so that students can control their learning and development of DCC;
5. ensuring free access (without the time and location restriction) to all educational resources of the TIC course;
6. optimise the DCC development process in future specialists in any training field.

Methodology for implementing the PMDDCCCT

The digital teaching aids used in the implementation of the PMDDCCCT are [34, 37, 38, 45, 48, 49, 50, 54, 58]: hardware (any digital device with Internet connection, video camera and microphone), software (operating system, MS Office, browser, Google Workspace suite tools, LMS Moodle, mind mapping tools, websites, express assessment applications), CT for synchronous communication (videoconferencing, instant messengers (video/audio call function)), CT for asynchronous communication (e-mail, forum, chat, blog, social networking, instant messengers), CT for collaboration (online document editors (text, spreadsheet, electronic presentations), online interactive whiteboards, cloud storage spaces).

The developed model is implemented in the TIC university course, where as a form of learning delivery is used blended learning based on the *flipped learning* model [61].

Based on the pedagogical model developed and used in the formative experiment, the pedagogical toolkit involves innovative teaching strategies (learner-centered strategy, competency-based strategy, interactive strategies, e-Learning strategies) learner-centered teaching methods and pedagogical techniques, which, appropriately combined with various CT, have contributed to the optimization of the DCC development process and to the increase of the level of DCC possession.

Thus far, the set of teaching methods used in the DCC development process includes both modern instructional methods (Flipped Classroom, "Question" Based Learning, Collaborative Learning, Discovery Learning, Collective Discussion) and traditional methods supported by cloud technologies (Explanation, Exercise, Practical Work) [43].

The *flipped classroom* method has affirmed itself as an effective solution for interactive, flexible and individualized delivery of the theoretical material of the university TIC course through various CT [23, p. 135-136; 60, p. 72]. The implementation of this method in the DCC development process offered the

opportunity to maintain continuous interaction/communication between the actors of the educational process, to combine and use different CT for digital communication, to ensure flexibility and comfort in the development process of the mentioned competence, to develop collaborative (group) learning capacities as well as individual learning capacities etc.

"*Question*" based learning has been used by the author in seminar classes to synchronously (orally) or asynchronously (via "express" assessment applications) check students' understanding of theoretical material proposed by the professor and studied by students outside of auditorium classes [33].

The Collaborative learning method was implemented in the group interactive learning activities focused on DCC development, and carried out in both seminar and laboratory classes. The collaboration allowed students with different levels of training to combine their efforts to solve complex tasks and increase affective-social relationships in each academic group [33]. Applying this method facilitates maintaining continuous interaction between teacher and students, stimulates the training of collaboration and innovative thinking, builds a mutual understanding of knowledge, enriches the student's views, opinions and actions, develops interpersonal relationships and DCC etc [24, 33].

Discovery learning has contributed to the improvement of the skills in reflecting, expressing, arguing and supporting one's views, effecting reasoning, searching and formulating hypotheses, experimenting, researching, arguing and conceptualizing opinions, thus catalyzing the development of DCC [33].

To clarify notions, the author used the *Collective discussion* method. This method helps to systematise and consolidate ideas; influences attitudes, convictions and behaviour; solves theoretical/practical problems; fosters the formation of cooperation/collaboration capacities/abilities; facilitates the transfer of information in new contexts; stimulates creativity, critical thinking, discursive reflection, and objectivity. Consequently, the method significantly influences the development of DCC through synchronous digital communication [33].

The pedagogical techniques applied in the formative experiment process of developing DCC using CT are: think/work in pairs/communicate, clustering, one minute, know/would like to know/learned, SINELG, questions and answers, brainstorming, forum discussion, triple entry journal, Venn diagram [24-29, 33, 40].

The overwhelming evolution and rapid expansion of ICT, specifically CT, in all fields of human activity has driven the digitisation of education, diversification and improvement of technologies and means of education. Teaching approaches used for developing DCC in students should be learner-centred and competence-based; be implemented through interactive teaching-learning-assessment strategies and modern teaching methods supported by CT; should take into account the opportunities offered by the implementation of CT both in education and in the DCC

development process, and the specificity of the university course in which this competence is developed.

In this context, the following research results can be mentioned: (1) the most effective CT for DCC training and development were identified and their correspondence to the 7 areas of the mentioned competence was established; (2) the PMDDCCCT was developed; (3) was developed and substantiated (theoretically and practically) the methodology for implementation of the developed model by applying blended learning based on flipped learning, interactive strategies and modern student-centered and DCC development-oriented teaching methods; (4) the collection of theoretical and practical teaching materials of the TIC university course focusing on DCC development was updated and expanded.

The outcomes acquired provide an opportunity to solve the research problem and to achieve the proposed objectives to develop DCC in students using CT.

Chapter 3. Experimental approaches on the efficiency of the pedagogical model and the methodology developed contains detailed descriptions of the stages of the pedagogical experiment and the statistical analysis of the results obtained using IBM SPSS Statistics software. The parametric t-Student test and the non-parametric Mann-Whitney U test were applied to demonstrate the research hypotheses. The effect produced by the implementation of the pedagogical model and the developed methodology was reported by calculating the effect size.

The objectives of the pedagogical experiment conducted as part of the research are: (1) to determine the initial level of ICT training of the students involved in the research sample at the time of the initiation of the experimental investigation; (2) to establish methodological benchmarks for the DCC development in students using CT in the TIC university course; (3) to update and expand the collection of teaching materials, theoretical and practical, of the TIC university course, focusing on the DCC development; (4) to organise interactive, communicative and collaborative educational activities aimed at developing this competence; (5) to create a communicative, varied, flexible, individualised and accessible digital learning environment; (6) to ensure access and availability of educational materials and all CT used in the DCC development process through the electronic course available on the institutional Moodle platform of the CSUH (<https://e-learning.usch.md/>); (7) to record the effectiveness of interactive teaching strategies and pedagogical methods/techniques used in developing this competence; (8) to elaborate and validate of the DCC assessment toolkit; (9) to measure the final level of DCC holding among the students involved in the research sample; (10) to collect, statistically process and interpret investigation data; (11) to formulate the final conclusions, following statistical analysis of the data recorded by the students in the experimental group compared with the results of the students in the control group.

During the pedagogical experiment, the following variables were distinguished:

- ***Independent variables:*** (1) content – includes the topics covered in the TIC university course, which are the same for both groups (experimental and control); (2) the students' level of preparation – implies respecting the following common conditions for both groups (experimental and control): the students belong to the same year of study (first year), are from the same form of education and have the same level (initial) of ICT preparation; (3) the technical and material basis – involves ensuring the following joint technical requirements for both groups (experimental and control): (a) the direct contact hours of the TIC university course (theory, seminar, laboratory) are carried out in classrooms equipped with similar digital devices (desktop, laptop) with Internet connection, interactive whiteboards or multimedia projectors; (b) the evaluation of students at each stage of the pedagogical experiment unfolded is carried out using the same control and measurement materials (tests, questionnaires).
- ***Factor variables:*** (1) Methodology of DCC development using CT – implies compliance with the requirement that in the experimental group, the training is carried out in strict accordance with the PMDDCCCT developed; (2) the teacher – ensures compliance with the condition that in the experimental group, all lessons are carried out by the teacher according to the methodology developed by the research author. In the control group, the lessons are carried out according to the modular curriculum of the TIC university course using traditional strategies, methods and tasks.
- ***Dependent variables:*** students' performance during the class and level of DCC holding.

The pedagogical experiment was conducted over two academic years: 2020-2021 and 2021-2022 and included **411** subjects, of which - 327 students from the CSUH, 29 students from the CSPU, 38 students from the TSU, 17 students from the CSU.

This pedagogical experiment was carried out in three stages: ascertainment, formation, control and validation. During its development, particular attention was given, to the collection of quantitative and qualitative data concerning the level of DCC development in students.

Objectives of the ascertainment experiment aimed at: (1) to determine the initial level of ICT training of the students involved in the research sample at the time of the initiation of the experimental investigation; (2) to establish methodological benchmarks for the DCC development in students using CT in the TIC university course.

The ascertainment experiment was initiated with the random selection of subjects and the formation of the experimental and control groups. The experimental

group consisted of subjects who would undergo the experimental intervention, and the control group included those subjects who would not undergo.

The independent variable of the student's level of preparation was kept under control when forming the samples. To ensure the validity of the experiment, the following conditions were met: (1) the students in the experimental and control groups belong to the same year of study (first year); (2) they are from the same form of education (full-time or part-time); (3) they have the same level of ICT preparation.

Thus, the experimental group included 224 students and the control group - 187 students (Table 2).

Table 2. Distribution of the number of students involved in the pedagogical experiment

Academic year	Study section	Experimental group (number of students, institution)	Control group (number of students, institution)
2020-2021	FTS	53, CSUH	109 = 25, CSUH + 29, CSPU + 38, TSU + 17, CSU
	PTS	84, CSUH	22, CSUH
2021-2022	FTS	50, CSUH	35, CSUH
	PTS	37, CSUH	21, CSUH
Total		224	187

At the stage of the ascertainment experiment, the research hypotheses were defined as follows:

H_0 – null hypothesis: *there are no significant differences between the results (grades/levels) of the experimental group and the results (grades/levels) of the control group,*

H_1 – research hypothesis: *there are significant differences between the results (grades/levels) of the experimental group and the results (grades/levels) of the control group.*

For the initial data collection were developed and applied the following control and measurement tools: basic - initial assessment test (for investigating the actual situation regarding the level of DC holding); additional: questionnaire for identifying communication competence [35, p. 90; 44], self-identification questionnaire of DCC level [32].

Student marks from the initial assessment test were converted into levels of DCC holding. To statistically analyze the data collected from the initial assessment (both the test and the questionnaires), were applied two independent sample tests: parametric t-Student (*Independent-Samples T-Test*) and non-parametric Mann-Whitney (U).

The results provided by SPSS Statistics following the application of the t-Student and Mann-Whitney (U) tests are presented in the following table (Table 3).

Table 3. Results of t-Student and Mann-Whiney (U) tests. Ascertainment stage

Academic year	Study section	The analysed aspect	Statistical test results						
			t-Student				Mann-Whitney U		
			Levene's test		t-Student test		U	Z	p
			F	p	t	p			
2020-2021	FTS	Grade	3,690	0,057	1,348	0,179	2532,000	-1,273	0,203
		Level	2,277	0,133	1,508	0,133	2434,500	-1,655	0,098
	PTS	Grade	0,003	0,953	-1,556	0,123	681,500	-1,889	0,059
		Level	0,202	0,654	-1,541	0,126	722,000	-1,613	0,107
2021-2022	FTS	Grade	1,822	0,181	1,279	0,205	681,000	-1,732	0,083
		Level	5,925	0,017	1,334	0,186	717,500	-1,430	0,153
	PTS	Grade	0,047	0,828	0,224	0,823	378,500	-0,163	0,871
		Level	0,009	0,926	1,515	0,135	301,500	-1,449	0,147

Analysing the data in Table 3, for the parametric t-Student test, it can be seen that for each academic year and study section, the t -value is less than $t_{cr} \approx 2,000$, for a significance threshold $p > 0,05$. As for the non-parametric Mann-Whitney (U) test, applied to confirm the results of the t-Student test, it can be seen from Table 3 that, for each academic year and study section, it was achieved a significance threshold $p > 0,05$, and the Z result of this test is less than the critical value 1,96.

This fact allows us to conclude that, at the ascertainment stage of the pedagogical experiment, is **confirmed the null hypothesis** H_0 – *there are no significant differences between the results (grades/levels) obtained by the subjects of the experimental group and the control group.*

The formative experiment ran during the 2020-2021 and 2021-2022 academic years. At this stage of the pedagogical experiment, ensuring compliance with the requirements (common to both samples) for the control of the independent variables: content and the technical and material basis.

For the experimental group the factor variables were also kept under control: the methodology of DCC development using CT and the teacher.

In the control group, the lessons were carried out according to the modular curriculum of the TIC university course using traditional strategies, methods and tasks.

Thus, the experimental group included **224** students of the CSUH, cycle I - license, both the full-time section (**53** students in 2020-2021 and **50** students in 2021-2022) and the part-time section (**84** students in 2020-2021 and **37** students in 2021-2022).

The formative experiment aimed to implement the PMDDCCCT and to determine its efficiency.

The objectives of the formative experiment are: (1) to update and expand the collection of theoretical and practical teaching materials of the TIC university

course, focusing on the DCC development; (2) to organise interactive, communicative and collaborative educational activities aimed at developing this competence; (3) to create a communicative, varied, flexible, individualised and accessible digital learning environment; (4) to ensure access and availability of educational materials and all CT used in the DCC development process through the electronic course available on the institutional Moodle platform of the CSUH; (5) to record the effectiveness of interactive teaching strategies and pedagogical methods/techniques used in DCC development process; (6) to elaborate and validate of the assessment toolkit for this competence.

As a result of the analysis of the curriculum of the TIC university course, focused on the development of DC employing educational strategies and traditional methods, i.e. without the valorization of CT, both the curriculum of this course and the electronic course placed on the Moodle institutional platform of the CSUH were reconceptualized [51]. The new curriculum has approximately the same objectives and contents, but innovative educational tools and strategies (methods and techniques) focused on harnessing CT. The developed e-course has been structured into 12 modules; each module associated with a content unit. A content unit consisted of the theoretical material required for study in the pre-class activities stage of the Flipped Class method; interactive practical tasks and activities, carried out in the classroom, designed to involve the student in consolidating and applying the theory (concepts) studied, developing and training acquired DC and DCC, and forming appropriate attitudes.

Regarding the seminar lessons, the following *methods* were applied: Flipped classroom, "Question" based learning, Exercise, Collective discussion, Explanation, Collaborative learning, and the *techniques*: Question and answer, One minute, Think/Work in pairs/Communicate, Clustering, SINELG, Brainstorming, Know/Want to know/Learned, Forum discussion, Triple entry journal, Structured inductive discovery learning, Deductive discovery learning, Venn diagram..

In terms of the laboratory lessons, the following *methods* were used: Essay, Storytelling, Exercise, Practical Work, Collaborative Learning, Collective Discussion, and the *techniques*: Practical Work and Electronic Presentation..

All these methods contributed to the development of students' capacities to: express their ideas and opinions clearly, logically and constructively, take action, use learning outcomes, communicate and collaborate with others online, share digital content, actively engage in social life through CT, respect netiquette, create and manage multiple digital identities, ensure the security of communication - collaboration - sharing processes online. All the methods and techniques applied were focused on the development of DCC, particularly for all seven domains of this competence, described in the DCC Levels Grid.

The use of the institutional Moodle platform of the CSUH, as well as the CT, offered students several opportunities, among which can be mentioned: access

to educational materials anytime, anywhere and from any digital device with Internet connection; maintaining continuous interaction with the teacher; opportune discussion of questions, uncertainties and problems arising in the training process; application of theory in practice; group solving of complex problems etc [51].

The measurement and control instruments used at this stage included: the digital portfolio [39] (with the help of which the author assessed the interactive tasks and practical work done by the students during the study of the course) and the formative (current) assessment test. The given test was also applied to the students in the control group, and the results (grades) obtained on it were converted into levels of DCC holding.

Data collected after the administration of the formative (current) assessment test were entered into the database created using IBM SPSS Statistics 26 software. The statistical analysis began with the calculation of basic statistical indicators for each group involved in the experiment (Table 4):

Table 4. Basic statistical indicators - formative evaluation

The analysed aspect	Academic year	Study section	Group type	Number of students	Means	Standard deviation	Standard error
Grades	2020-2021	FTS	EG	53	7,38283	0,998686	0,137180
			CG	109	6,24495	1,085285	0,103951
		PTS	EG	84	7,67006	0,993844	0,108437
			CG	22	6,88818	0,994421	0,212011
	2021-2022	FTS	EG	50	7,65880	0,819180	0,115850
			CG	35	7,00000	1,084652	0,183340
		PTS	EG	37	8,25378	0,877858	0,144319
			CG	21	7,43143	1,115358	0,243391
Levels	2020-2021	FTS	EG	53	4,91	1,079	0,148
			CG	109	3,72	1,096	0,105
		PTS	EG	84	5,21	1,087	0,119
			CG	22	4,45	0,912	0,194
	2021-2022	FTS	EG	50	5,48	0,863	0,122
			CG	35	5,00	1,085	0,183
		PTS	EG	37	5,73	0,932	0,153
			CG	21	4,81	1,123	0,245

The results provided by SPSS Statistics following the application of the t-Student and Mann-Whitney (U) tests are presented in the following table (Table 5).

Table 5. Results of t-Student and Mann-Whitney (U) tests. Formation stage

Academic year	Study section	The analysed aspect	Statistical test results						
			t-Student				Mann-Whitney U		
			Levene's test		t-Student test				
			F	p	t	p	U	Z	p
2020-2021	FTS	Grade	1,069	0,303	6,423	0,000	1289,000	-5,710	0,000
		Level	0,663	0,417	6,467	0,000	1350,000	-5,652	0,000
	PTS	Grade	0,302	0,584	3,284	0,001	538,000	-3,007	0,003
		Level	0,526	0,470	3,009	0,003	564,000	-2,913	0,004
2021-2022	FTS	Grade	0,775	0,381	3,190	0,002	552,500	-2,951	0,003
		Level	0,248	0,620	2,269	0,026	638,500	-2,224	0,026
	PTS	Grade	1,019	0,317	3,105	0,003	222,000	-2,694	0,007
		Level	0,449	0,506	3,352	0,001	210,500	-3,022	0,003

Analysing the data in Table 5, for the parametric t-Student test, it can be seen that, for each academic year and study section, the t-value is greater than $t_{cr} \approx 2,000$, for a significance threshold $p < 0,05$. As for the non-parametric Mann-Whitney (U) test, applied to confirm the results of the t-Student test, it can be seen from Table 5 that, for each academic year and study section, was obtained a significance threshold $p < 0,05$, and the Z result of this test is greater than the critical value 1,96.

To conclude, at the formation stage of the pedagogical experiment, *the research hypothesis H_1 is confirmed* – there are significant differences between the results (grades/levels) of the experimental group and the results (grades/levels) of the control group.

The objectives of the control experiment and validation of the research findings are: (1) to measure the final level of DCC holding among the students involved in the research sample; (2) to collect, statistical process and interpret of investigation data; (3) to formulate the final conclusions, following statistical analysis of the data recorded by the students in the experimental group compared with the results of the students in the control group.

The experimental validation of the developed pedagogical model and methodology for developing DCC in students using CT is supported by the results of the final testing of the students involved in the research sample and the comparison of these results.

Therefore, the students in both groups (experimental and control) were given: the final assessment test, questionnaire for identifying communication competence, and self-identification questionnaire of DCC level.

As a result, after collecting the student's results (grades) from the final assessment test and the scores from the two questionnaires, these results (grades and scores) were converted into levels of DCC holding.

Firstly, basic statistical indicators were calculated for each group involved in the experiment (Table 6).

Table 6. Basic statistical indicators - final evaluation

The analysed aspect	Academic year	Study section	Group type	Number of students	Means	Standard deviation	Standard error
Grades	2020-2021	FTS	EG	53	7,90245	1,247228	0,171320
			CG	109	5,82055	1,010307	0,099643
		PTS	EG	84	7,45048	1,196772	0,130578
			CG	22	6,35682	1,306494	0,278546
	2021-2022	FTS	EG	50	7,71120	1,087361	0,153776
			CG	35	7,08457	0,985851	0,166639
		PTS	EG	37	8,41378	0,918342	0,150974
			CG	21	7,13476	1,025254	0,223729
Levels	2020-2021	FTS	EG	53	5,43	1,394	0,191
			CG	109	3,30	1,059	0,101
		PTS	EG	84	5,02	1,261	0,138
			CG	22	3,91	1,411	0,301
	2021-2022	FTS	EG	50	5,26	1,209	0,171
			CG	35	4,60	0,976	0,165
		PTS	EG	37	5,97	1,166	0,192
			CG	21	4,62	1,161	0,253

The results provided by SPSS Statistics following the application of the t-Student and Mann-Whitney (U) tests are presented in the following table (Table 7).

Table 7. Results of t-Student and Mann-Whitney (U) tests. Control and validation stage

Academic year	Study section	The analysed aspect	Statistical test results						
			t-Student				Mann-Whitney U		
			Levene's test		t-Student test				
			F	p	t	p	U	Z	p
2020-2021	FTS	Grade	2,597	0,109	11,182	0,000	632,500	-8,054	0,000
		Level	4,718	0,031	9,837	0,000	707,500	-7,955	0,000
	PTS	Grade	0,380	0,539	3,744	0,000	501,500	-3,292	0,001
		Level	0,728	0,395	3,601	0,000	512,000	-3,294	0,001
2021-2022	FTS	Grade	0,425	0,516	2,716	0,008	555,500	-2,853	0,004
		Level	0,652	0,422	2,675	0,009	570,500	-2,820	0,005
	PTS	Grade	0,594	0,444	4,887	0,000	139,500	-4,029	0,000
		Level	0,143	0,707	4,256	0,000	170,500	-3,625	0,000

Analysing the data in this table, for the parametric t-Student test, it can be seen that, for each academic year and study section, the t-value is greater than $t_{cr} \approx 2,000$, for a significance threshold $p < 0,05$. As for the non-parametric Mann-Whitney (U) test, applied to confirm the results of the t-Student test, it can be seen from Table 7 that, for each academic year and study section, was obtained a significance threshold $p < 0,05$, and the Z result of this test is greater than the critical value 1,96.

To conclude, at the control and validation stage of the pedagogical experiment, *the research hypothesis H_1 is confirmed – there are significant differences between the results (grades/levels) of the experimental group and the results (grades/levels) of the control group.*

To demonstrate that the significant difference between the results (grades/levels) obtained by the students of the experimental group and the results (grades/levels) obtained by the students of the control group is not accidental, was calculated the effect size - a required statistical indicator that assesses the magnitude of the difference between the levels of the independent variables concerning the dependent variables, thus representing the strength of the relationship between the research variables.

Thus, the effect size calculated for the final assessment test is shown in the following table (Table 8):

Table 8. Effect size - final assessment test/final level

Dependent variable	Academic year	Study section	Statistical test	Indicator		Effect size interpretation
				<i>d</i>	<i>r</i>	
Performance	2020-2021	FTS	t-Student	<i>d</i>	1,88	Very strong
				<i>r</i>	0,74	Very strong
		Mann-Whiney U	<i>r</i>	0,63	Strong	
			PTS	t-Student	<i>d</i>	0,91
	<i>r</i>	0,41			Medium	
	Mann-Whiney U	<i>r</i>	0,32	Medium		
		2021-2022	FTS	t-Student	<i>d</i>	0,61
	<i>r</i>				0,29	Medium
Mann-Whiney U	<i>r</i>		0,31	Medium		
	PTS		t-Student	<i>d</i>	1,36	Very strong
<i>r</i>		0,57		Strong		
Mann-Whiney U	<i>r</i>	0,53	Strong			
	Level of	2020-2021	FTS	t-Student	<i>d</i>	2,31
<i>r</i>					0,88	Very strong
Mann-Whiney U				<i>r</i>	0,63	Strong

		PTS	t-Student	<i>d</i>	0,87	Strong
				<i>r</i>	0,4	Medium
			Mann-Whiney U	<i>r</i>	0,32	Medium
	2021-2022	FTS	t-Student	<i>d</i>	0,6	Medium
				<i>r</i>	0,29	Medium
			Mann-Whiney U	<i>r</i>	0,31	Medium
		PTS	t-Student	<i>d</i>	1,18	Very strong
				<i>r</i>	0,51	Strong
			Mann-Whiney U	<i>r</i>	0,48	Strong

Analyzing the results of the t-Student and Mann-Whitney U tests, presented in Table 8, we can conclude that the effect produced, as a result of the implementation of the developed pedagogical model and the proposed methodology, on the performance and DCC holding levels of the students in the experimental group is **very strong** based on the size of Cohen's *d* indicator and **strong** based on *r* indicator.

Therefore, the pedagogical experiment carried out by the author: (1) contributed to validate the efficiency of the PMDDCCCT and the developed methodology which involves the use of the most innovative CT for digital communication and harnesses modern didactic strategies and interactive teaching methods; (2) allowed the identification of the direct dependence between the pedagogical tools applied (CT, strategies, methods and techniques) and the increase in DCC holding levels; (3) permitted the finding of significant differences in the level of holding this competence in the students of the experimental group compared to the students of the control group by recording a high number of students with high final levels of DCC holding (experimental group - on average 78% and control group - on average 38%); (4) contributed to achieving the proposed goal of fully solving the research problem: identification of the theoretical and praxeological foundations of using cloud technologies, contributing to developing students' digital communication competence.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

The theoretical and experimental research carried out aimed at developing and validating a PMDDCCCT.

The vertiginous development of ICT, mainly CT, has considerably changed the style, forms, environment and frequency of human communication, transforming DCC into an essential and necessary competence for any modern professional, the high level of possession of which will ensure competitiveness in the labour market, personal and professional fulfilment and development, social inclusion, etc.

The main results of the research can be summarised in the following **general conclusions**:

1. the theoretical-didactic grounding of the fundamental concept of the research was expressed by synthesizing the notion of DCC and identifying: (a) its structural elements (knowledge, capacities/abilities, attitudes), (b) measurement tools for the level of holding this competence, (c) the pedagogical principles for its development, (d) the factors that significantly influence the development process of the given competence, (e) the effective CT for its development and training;
2. to raise the level of DCC holding in students, the PMDDCCCT was developed. This model has the following characteristics: originality, realism, integrity, plurivalence, flexibility, transdisciplinarity;
3. the methodology of implementation of the pedagogical model developed includes:
 - innovative strategies and learner-centred teaching methods geared towards developing DCC have contributed to increasing the level of holding this competence;
 - modern digital teaching aids (hardware and software) and CT (for synchronous or asynchronous communication and collaboration) effective for DCC development and training;
 - modern forms of training delivery (blended learning based on the flipped learning model) that facilitated the delivery of theoretical teaching materials and provided the opportunity for efficient use of classroom time to carry out various dynamic and interactive activities focused on developing DCC;
 - forms of active-participatory arrangement of the educational process, through communicative and collaborative activities carried out in groups and/or individually;
 - interactive formative and final assessments were carried out through various digital testing systems, which provided the opportunity for timely intervention in the teaching approach;
4. based on the pedagogical model developed, updated and expanded the collection of theoretical and practical teaching materials of the TIC university course, with a focus on DCC development, by redefining: the forms of delivery of the theoretical material; the format of this material (videos, interactive presentations, mind maps, etc.); the e-course created on the institutional Moodle platform; the interactive, communicative and collaborative activities; the practical work and the set of individual or collaborative (group) tasks; the interactive assessment tests (formative and final);
5. the pedagogical experiment carried out over two years of study (2020-2021 and 2021-2022) has made it possible, based on the statistical analysis carried out, to summarise the following conclusions:

- the effectiveness of the PMDDCCCT was demonstrated by recording much higher results in the students of the experimental group compared to the students of the control group;
 - it has been shown that the implementation of the developed pedagogical model has significantly contributed to a trend of double increase in the number of students with high final levels of DCC holding (experimental group - on average 78% and control group - on average 38%);
 - the direct dependence between the pedagogical tools applied (CT, strategies, methods and techniques) and the increase of the level of holding DCC has been identified;
6. the research objectives have been achieved, thus contributing to the **full solution of the research problem** which lies in the *optimization of the DCC development process by substantiating and implementing the pedagogical model of DCC development in students using CT.*

The solving of the research problem and the achievement of the proposed objectives are confirmed by the results obtained, which have been published in the papers [30-61] and provide an opportunity to streamline the process of developing DCC in the initial training of specialists in various fields of vocational training through the qualitative use of CT.

Limitations of the results obtained. Although the results of the pedagogical experiment conducted fully confirm the research hypothesis and demonstrate the effectiveness of the PMDDCCCT and the methodology developed, several limitations have been identified: (1) given the speed of evolution of ICT (including CT), the pedagogical model developed will need to be reviewed at least once every 5 years; (2) the pedagogical model developed was tested and validated only on students; (3) CT were used only for the development of DCC.

As discussed above, the following **practical recommendations** can be proposed:

1. taking into account the requirements and demands of national and international educational policy documents that highlight the need and importance of developing DCC in the initial training of specialists in various fields, we propose the implementation of the model and methodology developed in the teaching of different university courses, especially those focused on the development of CC;
2. adapting the pedagogical model developed for the development of DCC to other age categories (adults, people of third age, etc.) as well as for the training of this competence in school pupils;
3. harnessing CT in the development of other dimensions of the DC (e.g. digital content creation, problem solving, security);
4. continuous updating of the proposed set of CT in order to use the most performant and efficient technologies for digital communication.

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ADNOTARE

POPOVICI Iona

DEZVOLTAREA COMPETENȚEI DE COMUNICARE DIGITALĂ PRIN UTILIZAREA TEHNOLOGIILOR CLOUD

Teză de doctor în științe ale educației. Chișinău, 2024

Structura tezei: introducere, trei capitole, concluzii generale și recomandări, bibliografie din 241 titluri, 19 anexe, 121 de pagini de text de bază, 20 de figuri, 29 tabele. Rezultatele obținute sunt publicate în 32 de lucrări științifice.

Cuvinte-cheie: competență, comunicare, competență de comunicare, comunicare digitală, competență digitală, competență de comunicare digitală, tehnologii cloud, tehnologii informaționale și de comunicație.

Domeniul de studiu: Științe ale Educației. Didactica școlară (pe trepte și discipline de învățământ).

Scopul cercetării: fundamentarea teoretică, elaborarea și validarea experimentală a modelului pedagogic de dezvoltare a competenței de comunicare digitală prin utilizarea tehnologiilor cloud.

Obiectivele cercetării: (1) fundamentarea teoretico-didactică a conceptului „competența de comunicare digitală”; (2) elaborarea modelului pedagogic de dezvoltare a competenței de comunicare digitală prin utilizarea tehnologiilor cloud; (3) argumentarea reperelor metodologice de utilizare a modelului pedagogic de dezvoltare a competenței de comunicare digitală prin utilizarea tehnologiilor cloud; (4) actualizarea și extinderea colecției de materiale didactice, teoretice și practice, ale cursului universitar Tehnologia de Comunicare Informațională, cu axare pe dezvoltarea competenței de comunicare digitală; (5) validarea prin experiment a eficienței modelului pedagogic și a metodologiei elaborate.

Noutatea și originalitatea științifică a cercetării constă în (1) fundamentarea teoretico-didactică a conceptului de bază exprimată prin sintetizarea noțiunii de competență de comunicare digitală și identificarea elementelor ei structurale (cunoștințe, capacități/abilități, atitudini), instrumentarului de măsurare a nivelului de deținere a acestei competențe, principiilor pedagogice de dezvoltare a ei, factorilor de influență semnificativă asupra procesului de dezvoltare a competenței date și a tehnologiilor cloud eficiente pentru dezvoltarea și antrenarea ei; (2) elaborarea modelului pedagogic de dezvoltare a competenței de comunicare digitală prin utilizarea tehnologiilor cloud; (3) elaborarea metodologiei de implementare a modelului pedagogic de dezvoltare a competenței de comunicare digitală prin utilizarea tehnologiilor cloud fundamentată pe modelul învățării inversate, strategii interactive, metode didactice moderne, centrate pe student și orientate spre dezvoltarea competenței de comunicare digitală.

Rezultatul obținut, care contribuie la soluționarea unei probleme științifice importante, constă în identificarea bazelor teoretico-praxiologice, elaborarea și validarea modelului pedagogic de dezvoltare a competenței de comunicare digitală la studenți prin tehnologii cloud, în vederea optimizării procesului de dezvoltare a competenței de comunicare digitală.

Semnificația teoretică este reliefată prin fundamentarea teoretico-didactică a dezvoltării competenței de comunicare digitală, studierea modalităților de utilizare eficientă a tehnologiilor cloud în procesul de dezvoltare a acestei competențe și elaborarea unui model pedagogic de dezvoltare a ei prin utilizarea tehnologiilor cloud, fundamentat pe învățarea inversată, strategii interactive și metode didactice moderne, centrate pe student.

Valoarea aplicativă a lucrării constă în posibilitatea utilizării modelului pedagogic elaborat atât în cadrul formării inițiale a specialiștilor din diverse domenii sau în instruirea masteranzilor, la cursurile axate pe dezvoltarea competenței digitale sau competenței de comunicare, cât și în procesul de instruire în instituțiile de învățământ mediu și de specialitate la discipline informatice sau orientate spre dezvoltarea competenței de comunicare.

Implementarea rezultatelor științifice a fost realizată în cadrul experimentului pedagogic implementat în baza eșantionului experimental ce a inclus studenți de la Universitatea de Stat „B. P. Hasdeu” din Cahul. Rezultatele teoretice și practice au fost publicate în reviste de categorie și prezentate la conferințe științifice internaționale și naționale.

АННОТАЦИЯ

ПОПОВИЧ Илона
РАЗВИТИЕ ЦИФРОВОЙ КОММУНИКАТИВНОЙ КОМПЕТЕНЦИИ ПОСРЕДСТВОМ
ИСПОЛЬЗОВАНИЯ ОБЛАЧНЫХ ТЕХНОЛОГИЙ
Диссертация доктора педагогических наук. Кишинэу, 2024

Структура диссертации: введение, три главы, общие выводы и рекомендации, библиографический список из 241 наименований, 19 приложений, 121 страницы базового текста, 20 рисунков, 29 таблиц. По материалам диссертационного исследования опубликовано 32 печатные работы.

Ключевые слова: компетенция, коммуникация, коммуникативная компетенция, цифровая коммуникация, цифровая компетенция, цифровая коммуникационная компетенция, облачные технологии, информационно-коммуникационные технологии.

Область исследования: Науки об образовании. Школьное образование (по ступеням и учебным дисциплинам)

Цель исследования: теоретическое обоснование, разработка и экспериментальная проверка педагогической модели развития цифровой коммуникативной компетенции посредством использования облачных технологий.

Задачи исследования: (1) теоретико-дидактическое обоснование концепции "цифровая коммуникативная компетенция"; (2) разработка педагогической модели развития цифровой коммуникативной компетенции посредством использования облачных технологий; (3) аргументация методических ориентиров использования педагогической модели развития цифровой коммуникативной компетенции посредством использования облачных технологий; (4) обновление и расширение коллекции теоретических и практических учебных материалов университетского курса "Информационные коммуникационные технологии", ориентированных на развитие цифровой коммуникативной компетенции; (5) экспериментальная проверка эффективности педагогической модели и разработанной методики.

Новизна и научная оригинальность исследования заключаются в (1) теоретическом и дидактическом обосновании базовой концепции, выражающейся в синтезе понятия цифровой коммуникативной компетенции и выделении ее структурных элементов (знаний, умений/навыков, установок), инструментов измерения уровня владения данной компетенцией, педагогических принципов ее развития, факторов значимого влияния на процесс развития данной компетенции и эффективных облачных технологий для ее развития; (2) разработка педагогической модели развития цифровой коммуникативной компетенции посредством использования облачных технологий; (3) разработка методики реализации педагогической модели развития цифровой коммуникативной компетенции посредством использования облачных технологий на основе модели инвертированного обучения, интерактивных стратегиях и современных методах обучения, ориентированных на студента.

Полученный результат, способствующий решению важной научной проблемы, заключается в выявлении теоретико-практикологических основ, разработке и обосновании педагогической модели развития цифровой коммуникативной компетенции студентов посредством облачных технологий с целью оптимизации процесса формирования цифровой коммуникативной компетенции.

Теоретическая значимость исследования заключается в теоретико-дидактическом обосновании развития цифровой коммуникативной компетенции, исследовании путей эффективного использования облачных технологий в процессе развития данной компетенции и разработке педагогической модели ее развития посредством использования облачных технологий, основанной на инвертированном обучении, интерактивных стратегиях и современных методах обучения, ориентированных на студента.

Практическая значимость исследования заключается в возможности использования разработанной педагогической модели как при начальной подготовке специалистов различного профиля или при обучении магистрантов, в курсах, ориентированных на развитие цифровой или коммуникативной компетенции, так и в учебном процессе в средних и специальных учебных заведениях по компьютерным дисциплинам или ориентированных на развитие коммуникативной компетенции.

Внедрение результатов исследования осуществлялось в рамках педагогического эксперимента, реализованного на основе экспериментальной выборки, в которую вошли студенты Кагульского государственного университета "B. P. Hasdeu". Теоретические и практические результаты опубликованы в рецензируемых журналах и представлены на международных и национальных научных конференциях.

ANNOTATION

POPOVICI Iona DEVELOPMENT OF DIGITAL COMMUNICATION COMPETENCE USING CLOUD TECHNOLOGIES

Doctoral thesis in education sciences. Chisinau, 2024

Thesis structure: introduction, three chapters, general conclusions and recommendations, bibliography of 241 titles, 19 appendices, 121 pages of basic text, 20 figures, and 29 tables. The results are published in 32 scientific papers.

Keywords: competence, communication, communication competence, digital communication, digital competence, digital communication competence, cloud technologies, information and communication technologies.

Field of study: Sciences of Education. School Didactics (by educational steps and subjects).

Research aim: theoretical foundation, development, and experimental validation of the PMDDCCCT.

Research objectives: (1) theoretical-didactic grounding of the concept of “digital communication competence”; (2) elaboration of the PMDDCCCT; (3) argumentation of the methodological milestones for the use of the PMDDCCCT; (4) updating and expansion of the collection of theoretical and practical teaching materials of the TIC university course, focusing on the development of DCC; (5) experimental validation of the effectiveness of the pedagogical model and the elaborated methodology.

The novelty and scientific originality of the research lies in (1) the theoretical and didactic foundation of the basic concept expressed by synthesizing the notion of DCC and identifying its structural elements (knowledge, capacities/abilities, attitudes), the instruments for measuring the level of possession of this competence, the pedagogical principles of its development, the factors of significant influence on the process of development of the given competence and the effective CT for its development and training; (2) elaboration of the PMDDCCCT; (3) development of the methodology of implementation of the PMDDCCCT based on flipped learning, interactive strategies, modern teaching methods which are student-centered and DCC development-oriented.

The result obtained, which contributes to the solution of an important scientific problem, consists in identifying the theoretical and praxeological bases, developing and validating the PMDDCCCT, in order to optimize the process of developing DCC.

Theoretical significance of the study is highlighted by the theoretical-didactic grounding of the development of DCC, the study of the ways of effective use of CT in the process of development of this competence and the elaboration of a pedagogical model of its development using cloud technologies, based on flipped learning, interactive strategies, and modern student-centered teaching methods.

Practical significance of the study lies in the possibility of using the developed pedagogical model both in the initial training of specialists in various fields or in the training of master's students, in courses focused on the development of DCC, as well as in the training process in secondary and specialized educational institutions at the informatics disciplines or oriented towards the development of CC.

The implementation of the scientific results was carried out within the pedagogical experiment implemented on the basis of the experimental groups that included students from CSUH. Theoretical and practical results were published in peer-reviewed journals and presented at international and national scientific conferences.

POPOVICI ILONA

**DEVELOPMENT OF DIGITAL COMMUNICATION COMPETENCE
USING CLOUD TECHNOLOGIES**

**532.02 SCHOOL DIDACTICS
(BY EDUCATIONAL STEPS AND SUBJECTS)**

Summary of the doctoral thesis in Educational Sciences

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