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THE CULTURE OF LOGICAL THINKING WITHIN THE UNCERTAINTY: EXPERIENCE OF UKRAINIAN HIGHER EDUCATIONAL INSTITUTIONS

A CULTURA DO PENSAMENTO LÓGICO EM MEIO À INCERTEZA: A EXPERIÊNCIA DAS INSTITUIÇÕES DE ENSINO SUPERIOR UCRANIANAS

LA CULTURA DEL PENSAMIENTO LÓGICO EN MEDIO DE LA INCERTIDUMBRE: LA EXPERIENCIA DE LAS INSTITUCIONES DE EDUCACIÓN SUPERIOR UCRANIANAS

Oksana KHALABUZAR[1]
oksana.khalabuzar@gmail.com
Hanna ALIEKSIEIEVA[2]
alekseeva@ukr.net
Yelizaveta ISAKOVA[3]
isakova.yp@knutd.edu.ua
Svitlana DVORIANCHYKOVA[4]
dvoryanchykova.sy@knutd.edu.ua

[1] Ph.D. in Pedagogical Sciences, Associate Professor of the Department of Philology and Translation, Kyiv National University of Technologies and Design, Department of Philology and Translation, Kyiv, Ukraine.

[2] Ph.D. in Pedagogical Sciences, Department of Computer Technologies and Informatics, Berdyansk State Pedagogical University, Ukraine.

[3] Ph.D. in Philological Sciences, Associate Professor of the Department of Philology and Translation, Kyiv National University of Technologies and Design, Department of Philology and Translation, Kyiv, Ukraine.

[4] Ph.D. in Philological Sciences, Associate Professor of the Department of Philology and Translation, Kyiv National University of Technologies and Design, Department of Philology and Translation, Kyiv, Ukraine.

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ABSTRACT: This article describes one of the ways of the improvement of the higher education's system due to the challenges caused by the conditions of uncertainty: the distance learning, the digitalization of the professional training within the aspect of formation students' culture of logical thinking. The aim of our study is theoretical justification and experimental study of the development of variant technology, oriented to the formation of a culture of logical thinking of future specialists in modern education, using e-learning. For the realization of the research's goal it was used the complex of modern scientific methods: theoretical methods—analysis, synthesis, comparison; systematic-structural and problematic analysis; empirical methods: content-analysis of the official documents, methodical materials; statistical—for the work and evaluation of the experimental data of the research etc. As the result of our research there was created and implemented the special course "The formation of culture of logical thinking", oriented on the overcoming of the challenges of the uncertainty within Ukrainian higher education. The results of the analysis of research works which were focused on the formation of a culture of logical thinking of the personality, show that the stated goals were achieved.

KEYWORDS: Culture of logical thinking. E-learning. Uncertainty.

RESUMEN: *Este artigo descreve uma das formas de aprimoramento do sistema de ensino superior diante dos desafios impostos pela incerteza: o ensino a distância e a digitalização da formação profissional, com foco na formação da cultura do pensamento lógico dos estudantes. O objetivo deste estudo é a fundamentação teórica e o estudo experimental do desenvolvimento de uma tecnologia variante, voltada para a formação da cultura do pensamento lógico de futuros especialistas na educação moderna, utilizando o e-learning. Para atingir o objetivo da pesquisa, utilizou-se um conjunto de métodos científicos modernos: métodos teóricos — análise, síntese e comparação; análise sistêmico-estrutural e problemática; métodos empíricos: análise de conteúdo de documentos oficiais e materiais metodológicos; métodos estatísticos — para o trabalho e avaliação dos dados experimentais da pesquisa, etc. Como resultado da pesquisa, foi criado e implementado o curso específico "Formação da Cultura do Pensamento Lógico", voltado para a superação dos desafios da incerteza no ensino superior ucraniano. Os resultados da análise de trabalhos de pesquisa focados na formação da cultura do pensamento lógico da personalidade demonstram que os objetivos propostos foram alcançados.*

PALAVRAS-CHAVE *Cultura do pensamento lógico. Aprendizagem on-line. Incerteza.*

RESUMEN: *Este artículo describe una de las vías de mejora del sistema de educación superior ante los desafíos impuestos por la incertidumbre: la educación a distancia y la digitalización de la formación profesional, con énfasis en el desarrollo de la cultura del pensamiento lógico en los estudiantes. El objetivo del estudio es la fundamentación teórica y el análisis experimental del desarrollo de una tecnología variante orientada a la formación de la cultura del pensamiento lógico de futuros especialistas en la educación moderna mediante el e-learning. Para alcanzar dicho objetivo, se empleó un conjunto de métodos científicos contemporáneos: métodos teóricos —análisis, síntesis y comparación—; análisis sistémico-estructural y problemático; métodos empíricos —análisis de contenido de documentos oficiales y materiales metodológicos—; y métodos estadísticos para el procesamiento y la evaluación de los datos experimentales, entre otros. Como resultado, se creó e implementó el curso específico "Formación de la Cultura del Pensamiento Lógico", orientado a enfrentar los desafíos de la incertidumbre en la educación superior ucraniana. Los resultados del análisis de estudios centrados en la formación de la cultura del pensamiento lógico evidencian que los objetivos planteados fueron alcanzados.*

PALABRAS CLAVE: *Cultura del pensamiento lógico. Aprendizaje en línea. Incertidumbre.*

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INTRODUCTION

The reformation and improvement of the national educational system has as the reason the dynamic social and economic processes and informatization, requires the ceaseless renovation of the theoretical-methodological fundamentals of this field. In the face of uncertainty caused by global crises such as the covid-19 pandemic, economic and social challenges, the higher education system faces many challenges. We can mention among them the transition to distance learning which caused the problem of ensuring the students' engagement in the learning process through virtual platforms.

Besides, teachers needed additional financial aid for the training and educational courses for the facilitation of distance learning, including the upgrade of the digital skills.

Students who study at vocational and technical educational programs and specialties faced the reduced opportunities for practical learning. Due to the limits of face-to-face communication, the educational institutions had to deal with emotional strain and anxiety due to an uncertain future, adapting to new conditions and fear of losing opportunities. Besides, the lack of offline classes reduced social and intercultural interaction among students, having as the result reduced motivation.

Among the ways of solving the abundant problems of higher pedagogy which has to deal with the uncertainty caused by many hazardous factors, the most important one is the formation of the future teacher's personality which obtains the high level of logical thinking, which is necessary for the effective implementation of the latest innovative educational technologies into the education. However, the problem of forming professionals' culture of logical thinking during the process of professional training remains highly underdeveloped.

The great amount of the state programs and projects are dedicated to the problem of implementation of the informational technology into the educational sphere, which are oriented on providing conditions for effective implementation of modern computer technologies, improving the educational process and enhancing student training in higher educational institutions. These official documents prove that the training of highly qualified specialists for professional activity (within the conditions of development of modern informational technologies) is possible in case of the implementation of electronic education, communicational means and access to the informational-educational resources (Byvalkevych et al., 2020).

The analysis of the researched problem proves that in Ukraine it is still underdeveloped the problem of implementation of means of electronic education at high educational institutions. Especially it is actual within the aspect of the formation of culture of logical thinking. Therefore, the most burning problem is the development of variable technology, which would be focused on the formation of a culture of logical thinking of future professionals within the modern education on the example of the use of e-learning in higher education.

The model of forming the culture of logical thinking of future specialists has been previously described in published materials of scientific collections, so that, in order not to be repeated, we will rely on our previous research and publications (Khalabuzar, 2023).

The goal of our study is theoretical justification and experimental study of the development of variant technology, oriented to the formation of a culture of logical thinking of future specialists in modern education, using e-learning in higher education institutions.

METHODOLOGY

For the realization of the research's goal it was used the complex of modern scientific methods: theoretical methods—analysis, synthesis, comparison—for the studying of the philosophical, psychological-pedagogical, and methodical resources; official documents, experience of teaching at high educational institutions and determination of the most productive approaches to the formation of the future teacher's culture of logical thinking; implementation of means of electronic education within the educational institutions; systematic-structural and problematic analysis of the process of future teacher's professional training; modelling of the process of formation of future teacher's culture of logical thinking; empirical methods: content-analysis of the official documents, methodical materials—for the considering of the real condition of the professional training of future teachers (in the context of the formation of their logical thinking); self-evaluation and experts' evaluation, surveys of teachers and students of high educational institutions—for the determination of levels of the formed culture of logical thinking; pedagogical experiment of ascertaining, forming and control types—for the checking of the effectiveness of technology of formation culture of logical thinking of future teachers; statistical—for the work and evaluation of the experimental data of the research.

The conducted analysis of scientific research works devoted to the understanding of technologies of professional training within modern pedagogical science (Helker et al., 2025) allows us to consider the variable technology of formation future teachers' culture of logical thinking as a set of ways and means of realization of the educational process, as a systematic way of organizing the teachers' and students' activities. Due to this systematic organizing it is possible to realize the educational goal, which could be achieved with the help of combination of organizational forms, methods and means of professional training of future teachers (Vovk, 2020).

Unfortunately, despite the recognition of the priority of formation and development of future teachers' professional-pedagogical culture and pedagogical thinking during the process of professional training, a considerable number of works which were devoted to the problem of formation and development of logical thinking of the personality, small attention was paid

to the study of ways of formation of future teachers' culture of logical thinking, including the implementation of information technologies. Critical thinking is in short, self-directed, self--disciplined, self-monitored and self-corrective thinking … It entails effective communication and problem-solving abilities (Kolstø et al., 2024).

RESULTS AND DISCUSSION

The main results of the experimental study were revealed and published in our publications, including scientific articles, monographs, educational-methodical textbooks, which were approved by the Ministry of Education and Science of Ukraine (Khalabuzar, 2022; Khalabuzar & Shymanovych, 2024).

At various stages of experimental work there were 252 students of Berdiansk State Pedagogical University involved. According to the results of the initial diagnostics, which was focused on identifying the level of logical skills of future teachers:

> For professional and academic work we are usually required to present our reasoning using formal structures such as essays or reports with recommendations this required additional skills such as knowing how: to select and structure reasons to support a conclusions; present an argument in a consistent way; use logical order; use language effectively to present the line of reasoning. (Nichkalo, 2021, n.p)

There were identified experimental groups: E1 (100 participants) and E2 (100 participants). The control group consisted of 58 students. The realization of the created and developed technology was ensured by a coordinated combination of traditional organizational forms and methods of future teacher's professional training, and non-traditional, active ones, as well as by means of a complex of various learning tools (multimedia, special didactic materials).

On our opinion, structurally, the technology of formation of the future teacher's culture of logical thinking consists of the following components:

1. Motivational component: diagnosis of the level of formation of the culture of logical thinking of students, motivation of forming a culture of logical thinking, explaining ways of educational and cognitive activity;
2. 2Content-procedural component: formation of culture of logical thinking of future teachers during the process of professional training;
3. 3Analytical-reflexive component: control of students' knowledge and skills, self-control.

At the first stage—motivational stage, there were carried out the primary diagnostics of the level of development of the culture of logical thinking of students (future teachers) and the diagnostics of the motivation of self-improvement of thinking activity

At the second—content-technological stage, there was implemented a special course "Forming a culture of logical thinking of the teacher". The main tasks were development of students' motivation for self-improvement in the context of thinking activity in general and logical thinking in particular; formation of knowledge regarding the essence of the teacher's logical thinking culture; development of logical skills; development of a stable reflexive position (Ipizar et al., 2022).

At the third, the reflexive and creative stage, there was an attempt to consolidate logical skills, to increase motivation and reflexive position (Hacioğlu & Gülhan, 2021).

Motives for forming a culture of logical thinking can be divided into their own personalities, which prominently emphasize the needs of a certain individual for their future life, and social motives aimed at achievements that will be of importance to the state. In order to identify the main motives, a survey of students of the 1st year of Berdyansk State Pedagogical University was conducted. The proposed questionnaire contained 10 options of continuation (which can be defined as motives) for the statement "Due to the formed culture of logical thinking I…":

4. I will be able to develop professional thinking
5. I can become a more experienced specialist
6. I will be able to analyze works of art
7. I can reasonably justify my thoughts
8. I will be able to defend my point of view
9. I can make correct assumptions
10. I will be able to achieve material independence
11. I will be able to develop my own abilities
12. I can consciously analyze reality
13. I can fulfil the curriculum

According to the survey and obtained data (shown in Table 1 and Figure 1), it was shown that the motives for forming a culture of logical thinking do not correspond to the potential of the culture of logical thinking, students are unaware of the benefits of a high level of culture of logical thinking.

The formation of motivation (during the process of implementation of technology of formation student's culture of logical thinking) was provided with the help of firm diagnostics

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of the level of culture of logical thinking, with the help of argument which proved the necessity of formation culture of logical thinking: “Brainstorming is probably the best known of all the techniques available for creative problem solving” (Kolstø et al., 2024, p. n.p) with the help of orientation on the creative tasks’ solving, with the help of direction of the educational activity, with the direct dialogue with the teacher; considering the structure and technology of learning new material. Considering the importance of the choice of Table 1: Students’ Motives for Forming a Culture of Logical Thinking, the chosen approaches, pedagogical means, strategies, tasks and methods of formation culture of logical thinking (depending on the level of the formed logical thinking), we name our developed pedagogical technology as the “variable technology”.

Table 1

Students’ motives for forming a culture of logical thinking

Motive Number	Motive Description	Percentage of Students (%)
1	Develop professional thinking	15
2	Become a more experienced specialist	12
3	Analyze works of art	8
4	Reasonably justify my thoughts	20
5	Defend my point of view	18
6	Make correct assumptions	10
7	Achieve material independence	5
8	Develop my own abilities	7
9	Consciously analyze reality	3
10	Fulfill the curriculum	2

Note. Elaborated by authors (2025).

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Figure 1
Students' expectations about the personal meaning of the culture of logical thinking

Note. Elaborated by authors (2025).

The quantitative and qualitative indicators obtained at this stage of the experiment made it possible to conclude that there is the low level of logical thinking culture of future teachers, which is revealed in: the non-determined motivation for the self-development and self-improvement (82% of participants have the non-determined motivation, 7% – negative); the fact that participants didn't know about the essence of pedagogical and logical thinking, about the culture of logical thinking (91% of participants); it was also proved by the low level of the logical skills (76% of participants); there was the shown non-stable reflexive position (98% of participants).

Thus, the forming methods had to provide the positive dynamics of all components of the culture of logical thinking of future teachers. We have outlined a program of formative experiment for each group: group E1 – traditional training + special course + creative tasks; group E2 – traditional training + shortened special course + tasks with algorithms. Differentiation in mastering the special course was in the process of mastering Module III, the content of which was devoted to the disclosure of components of the culture of logical thinking, and functioning occurred in the form of components of the technology of forming the culture of logical thinking of future teachers.

The experimental groups (E1 [100 persons] and E2 [100 persons]) were created based on diagnostics, which was oriented on the degree of detection of mastery of logical skills, knowledge of future specialists. The control group consisted of 200 people. We have outlined a program of forming experiments for each of the groups: Group E1 – traditional training + special course + creative tasks; Group E2 – traditional training + shortened special course + tasks with algorithms. Differentiation in mastering the special course was in the process of

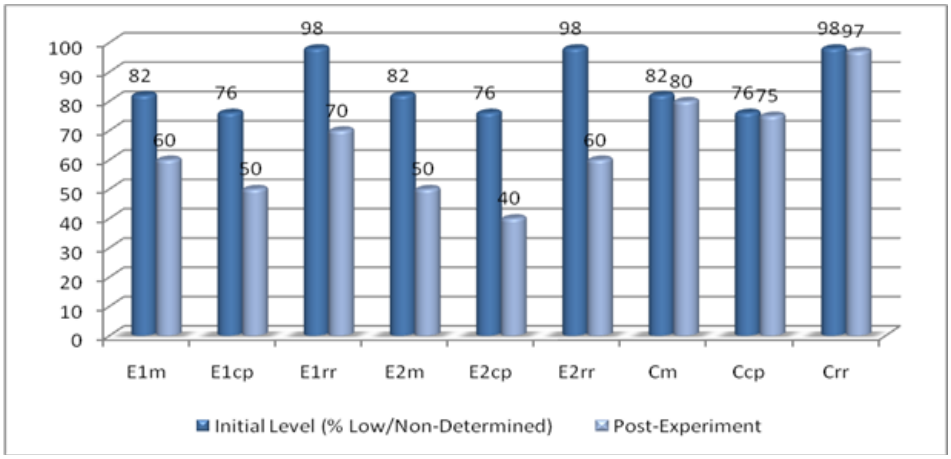
mastering Module III. The results of the formative experiment are summarized in Table 2 and illustrated in Figure 2.

Table 2
Experimental results by group

Group	Component	Initial Level (% Low/ Non-Determined)	Post-Experiment
E1 (100)	Motivational	82	60
	Content-Procedural	76	50
	Result-Reflexive	98	70
E2 (100)	Motivational	82	50
	Content-Procedural	76	40
	Result-Reflexive	98	60
Control (200)	Motivational	82	80
	Content-Procedural	76	75
	Result-Reflexive	98	97

Note. Elaborated by authors (2025).

Figure 2
Comparative Results of Experimental and Control Groups



Note. Elaborated by authors (2025).

Within the experimental groups we implemented tasks which were created with the consideration of the experiment's program. The peculiarities of students were also considered. The students' peculiarities required the differentiation in mastering components of culture of logical thinking. Thus, the formation of the motivational component within Group 1 demanded the support of the interest in mastering logical thinking. Students of Group 2 required the work which was oriented on the formation of positive motivation as the basis for the

formation of the culture of logical thinking. The content-procedural component within Group 1 required the basis logical knowledge and skills. A great amount of attention was given to mastering logical operations at the reproductive level.

Within Group 2 the attention was given to the much wider spectrum of logical knowledge. This provided creative, logical thinking and the work at the higher, reconstructive, creative level. The appropriate attention was given to such forms of thinking as: judgements, conclusions, mastering logical operations at the reconstructive level. The work was assisted by the developed algorithms and charts. The result-reflexive component within Group E1 was assisted by the activity which was oriented on the mastering reflexive skills for the self-correction, organization of the activity, independent work with task, and self-education. Within Group 2 the work was oriented to the students' training, on the students' self-evaluation, on the creation of the program which was oriented to the formation of culture of logical thinking, and on the formation of positive motivation. Group E1 was more promising in the context of formation of logical thinking, that's why it was necessary to choose the appropriate and complex material; the chosen tasks had the creative, developing character. This provided not only the training but also, they provide an increase in students' knowledge of Logics. The students strengthened their level of culture of logical thinking; they gained the ability to implement the received knowledge and skill during the solution of the non-standard situations, to enrich their motivational sphere, to activate the cognitive interest with the help of the interesting forms of work; to form the ability to work independently. Besides, the students were proposed the full special course "The formation of culture of logical thinking". The content of the course was the basis knowledge on Logics, logical operations and skills, the notion of culture of logical thinking and its meaning within modern conditions of society's informatization. The course was suggested to students and was conducted in 2024 and was upgraded in 2025. The designed course included three modules:

Module I "The problems of the professional-pedagogical training", which reveals the essence of the professional-pedagogical training of the future specialists; there are revealed certain lacks the education, considering the modern requirements of the society.

Module II "The Logics" which reveals the essence of the science of Logics in the historical aspect. It gives a description of the Logic's importance; it shows its object and basis categories; it also underlines the importance of the logical skills within the educational process at the high educational pedagogical institution. There are described the conditions of the formation of logical skills.

Module III "The components of the culture of logical thinking" which reveals three components of the culture of logical thinking: motivational, content-procedural, analytical-reflexive.

Each module contains lectures, seminars, creative tasks, individual tasks, which were oriented to the development of the logical skills of the future specialists; tasks for the individual work which were oriented to increase the level of logical thinking. The seminars contain practical tasks, which included discussion of questions, preparation of reports, presentations, discussions, work with online resources etc. During the work there were strengthened theoretical knowledge; there were created appropriate conditions for the formation of culture of logical thinking; there were implemented appropriate ways of formation of culture of logical thinking and its components; the practical lessons were conducted with the help of non-standard forms of work (discussions, brainstorming, case-study, conversations, role games, reports, presentations etc.). Each module was supplied with a list of references. All kinds of work were checked and estimated by the teacher; this allowed us to state the range of each student according to the results of his work at each seminar.

The special course "The formation of culture of logical thinking" contained 36 hours: 18 hours were used for the lectures and 18 hours were used on seminars.

The students of Group E2 did not have the well-formed skills to analyze, to synthesize, and to generalize. In their educational-cognitive activity students had the law level of the motives for the formation of culture of logical thinking. The tasks weren't complicated or difficult; they had many tooltips, hints, algorithms.

Such organization of experimental work had as the goal the revealing and checking of the effectiveness of the variable technology of formation of culture of logical thinking. During the forming experiment we looked for various forms of organization of the educational-cognitive activity of the students; we checked the effectiveness of the pedagogical conditions for logical thinking. Our students had the opportunity of individual or group consulting with the teacher. The determined components of the formation of culture of logical thinking (motivational, content-procedural, result-reflexive) were realized systematically during the process of the organization of the students' activity, which was oriented on the formation of the culture of logical thinking.

During the process of experimental teaching, we have found adequate and effective methods, interactive online resources and effective approaches and forms of control. During the implementation of the developed variable technology, we checked the effectiveness of the components' functioning. It was revealed that students improved their indexes and this proves the effectiveness of the proposed program which was oriented on the formation of culture of logical thinking within the conditions of the uncertainty.

Besides, it was proved that the effectiveness of the educational experimental program was increased due to the implementation of computer-oriented methods. The essential part was given to the electronic educational resources which exist within different spheres of

society, including the sphere of education, which implements the online resources during the training of the future specialists.

The implementation of electronic educational resources was revealed in the world and national scientific research; it was considered as the subject of the international and national scientific-practical and scientific-methodical conferences. The convenience and ease of implementation of electronic educational resources, the availability of tools for searching, analyzing, generalizing information content and its further use, accessibility, the opportunity to create electronic educational resources to support the students' own professional activity, proves the expediency of using them within the educational process of professional training of future specialists with the high level of culture of logical thinking.

It should be mentioned that the realization of the innovative approaches sometimes is slowed down by the inert ion of the educational system which has the monopoly role in the context of the determination and checking of the education's results. With the help of revolutionary changes within the sphere of ICT we can realize new forms of educational activity; we deal with the dynamics of requirements to the specialists' competencies, including the high level of culture of logical thinking (Serbova et al., 2019).

This demands the new e-learning models which should overcome the gap between traditional education models and the need for information and knowledge society. We need to be able to offer conceptually new solutions for new tasks, types and conditions of learning activities within the uncertainty.

With the aim of the intensification of the formation of the culture of logical thinking we have created, developed and placed on the Internet the interactive informational downloadable resources which include various useful information on formation of the critical thinking skills in the context of the formation culture of the logical thinking within the uncertainty (English Lab with OKSA, 2024).

Thus, the content-procedural component of the technology contained (offline an online): the system of knowledge (knowledge about the basis of logics, knowledge about the ways of activity); the system of skills which should be mastered by the student during the process of formation of culture of logical thinking. We think that for mastering culture of logical thinking the future pedagogue must obtain theoretical knowledge; knowledge-values (which determine the personality's attitude to the surrounding environment); knowledge-ways (which provide the formation of logical skills and performing of certain operations). That's why during the realization of the competence component of technology we tried to combine all the mentioned types of knowledge. The realization of the content-procedural component of technology of formation of culture of logical thinking required the mastering of such categories: logical laws (identity, contradiction, exclusion of the third, sufficient reason), forms of thinking

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(concepts, judgments, and conclusions), logical operations (analysis, synthesis, abstraction, and comparison) (Khalabuzar & Shymanovych, 2024).

The formation of reflexive position within the conditions of uncertainty (in the context of formation of culture of logical thinking) of the students we connected with: the attitude (motivation) of the personality to the process of studying which is revealed in the interest to the content of knowledge; to the process of studying with the desire to reveal the essence of the phenomena and interconnection of different notions, which will provide the activation of the cognitive activity; with the degree of skills' formation; with the ability to analyze own mistakes consciously (Anggraen et al., 2023).

There were developed and conducted reflexive trainings which had as the aim the development of the reflective position of future teachers, consolidating logical skills, enhancing motivation for the self-improvement of thinking activity. In addition, at this stage, the program of students' pedagogical practice was adjusted according to the plan of formation of the components of the culture of logical thinking. Thus, within the simulated professional activity there were developed special tasks which had to ensure the development of relevant logical knowledge and skills, strengthening of the reflective position.

Analysis of the results of the control section revealed that there were qualitative positive changes in the students of the experimental groups. The level of culture of logical thinking of students of the experimental group E2 has changed qualitatively. Above all, they have mastered the ability to analyze pedagogical phenomena, to compare, to ask questions, to generalize, to draw conclusions. The level of independence during cognitive activity has increased. Some positive motivation for forming a culture of logical thinking is noted. Some students found a stable reflexive stance.

According to the results of the control diagnostics of the levels of development of the culture of logical thinking of students of pedagogical specialties of experimental and control groups, the data are obtained, which testify to the effectiveness of the developed pedagogical technology. This is manifested in: the dominance of positive intrinsic motivation for self-development, self-improvement of thinking activity and logical thinking (93% of respondents); formation of professional knowledge on the essence of pedagogical thinking and the culture of logical thinking of the teacher (95% of students); mastering logical skills (64%); stability of the reflexive position (57% of respondents).

In groups E1 and E2, after a pedagogical experiment, a large majority of students are characterized by a high and medium level of formation of a culture of logical thinking, which is reflected in the improvement of logical knowledge and skills, in the strengthening of motivational and reflexive positions (Table 3). The Control group C1 has not displayed significant changes in their knowledge.

Table 3
Dynamics of indicators of culture of logical thinking of future teachers of experimental and control groups before and after the forming experiment %

The level of culture of logical thinking	Amount of students								
	Experimental group						Control group		
	Ascertaining experiment (EGae)		Experiment (EGe)		Growth (EGg)		Ascertaining (CGae)	Experiment (CGe)	Growth (CGg)
	E1	E2	E1	E2	E1	E2	C1	C1	C1
Low	30,2	27,6	8,3	10,2	-21,9	-17,4	28,3	25,0	-3,3
Middle	64,6	61,2	69,8	74,7	5,2	13,5	60,0	61,7	1,7
High	5,2	11,2	21,9	15,3	16,7	10,7	11,7	13,3	1,6

Note. Elaborated by authors (2025).

It should be mentioned that increasing of the marked indexes within the experimental groups. The significant increase of students with the high level of culture of logical thinking was spotted within Group E1. Meanwhile the number of students with low level of logical thinking has not changed significantly within the control groups. The implementation of the statistics of criteria $\chi 2$ revealed the important and significant differences among the experimental and control groups in the contexts of the indexes of formation of culture of logical thinking.

The specially organized work of students, which was directed on the development of the culture of logical thinking, has found the reflection in the change of quality of education of the future teachers. Conversations with students, students' surveys proved the rapid increase of students' educational success of students of Group E1 and certain success of students of Group E2. The pedagogues underlined that within the Group E2 there were used algorithms, hints, which helped students to master their new knowledge and skills during the disciplines of the humanitarian cycle (English language, Ukrainian language, Culture, Ethics, Philosophy, Literature, etc.). The algorithms were sent through the online resources, mobile applications or they were suggested in the published variant.

Thus, as the result of the variable technology of formation of culture of logical thinking of the future teachers during the process of professional training, we can state that it took place the increasing of quality of students' education (within the experimental groups). Meanwhile, within the control groups the quality of received knowledge didn't improve so rapidly the positive motivation, formation of necessary logical skills influenced positively on the efficiency of the educational process.

This is the practice of digitalization of the process of education which is oriented on the formation of logical skills of the future teachers. Within our university we have created

the project-center “Ars Docendi & Interdisciplinarity” (23 meeting/92 academic hours), which works for the upgrade of teachers and students of Ukraine.

CONCLUSION

The results of the analysis of research works which were focused on the formation of a culture of logical thinking of the personality (in the context of the conditions of uncertainty), show that the stated goals were achieved: there were developed theoretical statements and practical solutions that allow to implement effectively the wide range of educational tasks within the existing organizational-pedagogical educational model.

At the same time, there are number of researches which deal with the problems of technologies’ integration, individualization of the learning process, development of methods of using specific technologies in the educational process, improvement of the means of creation of various electronic educational resources in order to form logical knowledge and skills of future specialists within the conditions of uncertainty, which include: the lack of communication, lack of the digital skills, requirement to adaptation to new conditions, lack of training courses for teachers and workshops for the students, who want to improve the culture of logical thinking.

The conducted research shows that the developed and tested variable technology of forming the culture of logical thinking of the future teacher is effective even in the conditions of uncertainty. The process of implementation of variable technology involves mastering the developed special course “Forming a culture of logical thinking”, which reveals the content components, categorical apparatus of culture of logical thinking, etc. The developed special course provided the intensification of the realization of the variable technology of formation culture of logical thinking, which provides the ability of the future pedagogue to maintain the logics of the material, to state the logical chains, to use the logical operations, skills and to use methods of scientific thinking; to classify, to generalize, to make conclusions, to implement and to apply the received knowledge within further professional activity.

The efficiency of application of the complex of the developed tasks is proved; adherence to the individual pace of students’ learning of the components of the culture of logical thinking, considering their cognitive activity, motivation and the degree of development of the reflective position. The importance of a coordinated combination of traditional organizational forms, methods (lectures, seminars) and professional training and active teaching methods (problematic lecture, debate, brainstorming, etc.) is emphasized; the importance of use of multimedia learning tools (online information resources) was underlined.

The Online information resources (which were developed and hosted on the Internet) doubled the effective students' learning, facilitated the perception and increased the level of the culture of logical thinking. The website provided an opportunity for additional remote interactive work, survey, and control of students' knowledge. This allowed us to organize and to realize the discussions about the essence of the teacher's logical thinking culture, the participation in discussing the problems of forming logical skills and self-diagnosis of the level of logical thinking culture.

The developed and conducted reflexive trainings provided the development of the reflexive position of future teachers; they provided the consolidation of logical skills, the enhancement of motivation for self-improvement of thinking activity. The program of pedagogical practice of students was strengthened due to the actualization of components of culture of logical thinking within the modelled professional activity.

The experimental research conducted is not final in context of the problem of forming the culture of logical thinking of future specialists. The created Module for the program "Ars DOCENDI" "Digital educational content", oriented on the formation of culture logical thinking, received positive reviews from the participants (students and teachers of Ukraine). Further research will be devoted to the aspect of organizing team (collective) work which would be focused on the formation of culture of logical thinking during the conducting collective projects.

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