

FORMATION OF COGNITIVE-TECHNOLOGICAL COMPETENCE AS A MECHANISM OF REALISATION OF RATIONAL COMPONENT IN TRAINING UNDERGRADUATE STUDENTS

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ABSTRACT

Aim. The purpose is to consider the theoretical and methodological foundations of the formation of cognitive-technological competence as a mechanism for implementing the rational component in the training of a history teacher, the essence of the concepts “rationality in education”, “rationality in science”, “cognitive-technological competence” is revealed”.

Methods. The theoretical method of forming cognitive-technological competence in the process of studying the history of Europe and America has been substantiated, developed and tested. The model includes the unity of methodological, content-technological and evaluation-resultative components.

Results. The analysis shows that focusing attention on the leading role of the teacher in the formation of the students’ mental activity requires the student to understand the logic and mechanisms of human mental development.

Conclusion. At the same time, a number of unresolved issues in the process of working with students were highlighted, in particular: the need for a broad discussion of the advantages and disadvantages of distance learning in the implementation of the rational component of undergraduate students, the development of students’ responsibility for learning, training on the development of cognitive and technological competence of students of the master’s degree in specialty 014.03 “Secondary education (history)” in the conditions of a pandemic.

Keywords: cognitive-technological competence, educational process, quality of education, educational environment, theoretical model

INTRODUCTION

Transformation processes that covered the entire social system of Ukraine at the dawn of the 21st century led to the conversion of the established educational model into the innovative one, which is rational-technological by its form and integrated by its content. The above-mentioned transformational processes also consolidated the efforts of the scientific and educational community around the problem

of increasing the competitiveness of the domestic system of science and higher education in the world, as well as actualisation of this system in social transformations.

However, focusing on European priorities for the quality of education, historically characterised by rationality, the vector of modern state strategy aimed at implementing the fundamental aspects of the *Nationalna doktryna rozvytky osvity v Ukraini 21st Century* [National Doctrine of Educational Development in the 21st Century] (Shkilnyy svit, 2002) encountered the problem of rootlessness in the national mentality of the culture of rational thinking, which complicated the declared process of educational integration.

Defining rationality as a socio-cultural, structural, and complex phenomenon, manifestations of which are reflected in the forms and ways of thinking, as well as in behaviour of the individual, we note that it is difficult to unify this concept in relation to the categories of “education” and “science”. The correlation of scientific and educational rationality allows us to reveal its system-forming determinants, to establish the plane of common ideas and problems, but does not refute their internal contradiction. Unlike scientific rationality, which is not reduced to the theories and hypotheses and does not solve any didactic problems, rationality in education, in addition to the content consistency also requires even rationalism of the form. Here we mean the techniques, methods, technologies, etc. which are used by the teacher to develop mechanisms, which help students acquire existing classical and modern knowledge and synthesise it into a holistic conceptual model of scientific cognition. This contradiction becomes especially noticeable in the post-industrial society, in which the state, refusing to fund basic research that does not directly affect the modernisation of the production process or lead to the creation of an innovative product, encourages university education to become a centre of basic science.

In this perspective, the change in the strategic imperative of education of the third millennium should be considered through the prism of the implementation of its three interdependent components: strengthening the value aspects of the scientific component of the higher education system; modernisation of the technological component of the arrangement of the learning process; updating the teaching methods of the disciplines in the cycle of professional training of the undergraduate students and approval of new principles of teaching and learning. The understanding of rationality in these components, although traced through the unity of the fundamental and applied components of their content, remains fundamentally different. However, the synergetic nature of the constructive contradictions that arise in the interaction of science and education in higher educational institutions determine the balance between these opposing models and thus create a new paradigm of higher education, where rationality is assigned a role of established links between types of knowledge and their educational adaptation potential. In this regard, we focus on modeling the technological component of the learning process of the modern higher educa-

tional institution as an effective mechanism for establishing a link between scientific knowledge and its educational and adaptive potential, which gives it a practical character and determines the axiological status against the paradigm of modern educational process.

Scientific discourse and the possibility of a deep understanding of the idea of applying a technological approach to optimisation of historical education quality in the higher educational institution distinguish this problem among other studies of higher school pedagogy. Historiography of the proposed scientific topic is generally represented by three semantic areas:

- Analysis of the basic aspects of higher education development in the context of globalisation and global challenges. Various aspects of this issue are researched by Mykola Zhuk (2008) (modern educational strategies in the context of globalisation), Natalia Vnukova (2010) (innovation potential of higher education in the global challenges of the 21st century), Volodymyr Kravets (2011) (paradoxes of pedagogical education in the epoch of civilisation changes), (development of transnational higher education in the context of globalisation of the education markets), Cheng-Huan Chen and Yong-Cih Yang (2019) (revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators) Tamara Bondar et al. (2020) (benchmarking of higher education tendencies in the EU and countries that are not EU members);
- formulation of conceptual bases and instructions of modernisation of higher education in Ukraine, search of ways to make better learning process in higher educational institutions. Among the researchers in this field we note Viktor Andrushchenko (2008) (Ukrainian education in the contradictions of development), Sergii D. Rudyshyn et al. (2020) (features of the Fundamentalisation of Education in Higher Educational Institutions of Ukraine in the Context of Sustainable Development), Volodymyr Zablotskyi et al. (2020) (improving the System of State Management of Educational Establishments at the Regional Level in Ukraine in The Process of Adaptation of European Experience) and etc.;
- A particular scientific, theoretical, and practical importance in the context of our study is attained in the works devoted to the analysis of applied aspects of the introduction of a technological approach to structuring the educational system of higher educational institutions and the study of the combination of traditional and innovative learning technologies in the context of general concepts of higher school pedagogy. Among them are the studies of Ilona Mikolaievna Dychkivska (2004) (innovative pedagogical technologies), Andrushchenko (2009) (conditions and directions of innovative development of higher education in Ukraine), Mihaela Voinea (2019) (development of competencies of the 21st century), Elena Ancuța Santi and Gabriel Gorghiu (2019) (use of innovative learning technologies to develop cognitive competence of students), Roman Sergeevich Nagovitsyn et al. (2020) (creative Pedagogical development of students Based on the Implementation of Didactic Games), Natalia Ignatenko (2020) (use of innovative tech-

nologies in history teaching) Timofij Desiatov (2020) (features of the technological approach at higher educational institution), Andriy Hrytsenko (2020) (use of multimedia technologies in the training of history teachers), Rosa Ines Rondinel Carrillo et al. (2020) (methods of preparation and implementation of educational projects), Keita Shinogaya (2021) (problematic questions as a factor in the development of students cognitive activity), Chalard Chantarasombat & Ekanun Sombatsakulkit (2021) (methods of developing critical thinking).

- As we see, the historiography of the proposed scientific topic is represented by a considerable amount of literature, and it remains in demand, as some of its content areas require deepening and rethinking, considering the requirements of the latest educational paradigm. Among the previously unresolved issues we single out the problem of realisation of the rational component in the training of undergraduate students in their study of historical disciplines at higher educational institutions, which determines the need to deepen the study of existing didactic innovations, clarify their classification and characterise the technological aspects of their application in higher education. Therefore, the *purpose of* this research is the intellectual evidence, creation, and experimental corroboration of the productiveness of the method of formation of cognitive-technological competence as a mechanism for implementing the rational component of history teacher training.

MATERIALS AND METHODS

To reach the top, the following *research methods were used*: *theoretical*—analysis, synthesis, generalisation, systematisation of sources on the research issue; *empirical*—used to monitor the learning process, data collection, processing of teacher surveys, questionnaires, student testing, ascertaining and formative pedagogical experiment; *mathematical and statistical* methods of data processing obtained in the process of experimental research: the statistical probability of changes on the degree of formation of cognitive-technological competence was determined by means of qualimetric calculation and statistical analysis was based on the Student's t-test method.

The results of the study suggest that with its content, education is a moving social phenomenon that always responds to social realities and prospects for human development. However, the dynamics of educational changes are guided by internal rather than external factors. Influenced by tradition and stability, the pace of modernisation of the content component of the educational process does not always correspond to the pace of scientific progress, which often leads to the mismatch of the rational component of education to the challenges of civilisation and social requirements. Therefore, in the post-industrial era of the second half of the 20th century a gap

between education and new living conditions appeared. The gap can be interpreted as a crisis of inconsistency of the content of education with the needs of society.

Communicative revolution of recent decades, doubling the speed of information exchange and the pace of social change, not only exacerbated the crisis, but also led to the conceptualisation of the idea about the advancing character of education. According to this idea, a way out of the global crisis of post-industrial society is seen as the transformation of “information society” civilisation into “education society” civilisation, in which the law of advanced development of social intelligence and quality of educational systems is applied. In this regard, the launch of the mechanism of rationalisation of the educational system of higher educational institutions should take two interrelated stages: strengthening the combination of education and basic knowledge (for the domestic model of education the process of differentiation rather than integration of knowledge is more stable) and introduction of flexible innovative educational forms and technologies to assure individual development of undergraduate students and the competence component of their professional training.

Against the background of the devaluation of inner and outer priorities for the development of an established model of education, the conceptual ideas of advanced education have become a reference point for the Ukrainian strategy of changes in the higher education system of Ukraine. However, this process is evolutionary rather than radical. As a result, in the Ukrainian interpretation, this educational strategy has acquired the phenomenon of a transitional form of contradictory coexistence of two complexly combined models of learning—traditional and innovative with a pronounced bias towards traditionalism.

Such an approach, in our opinion, is stagnant. Conceptualising in radically different paradigmatic planes, traditional and innovative education has different goals and outlines different mechanisms for achieving them. The first (traditional) education is aimed at ensuring stability in society and formation of students’ skills of reproductive and executive character. The second (innovative) education, responding to the challenges of society, aims to prepare the individual for global civilisational changes by the development of various forms of thinking, the ability to be creative and cooperate with other people (Clarín, 1997). In this context, we agree with the opinion of Melanija Ovkentiïvna Auzina and Alla Mikolaïvna Vozna that the introduction of conceptual ideas of innovative education into the practice of higher education institutions is associated not only with the transformation of forms and methods of teaching, but also with the beginning of qualitatively new transformations of the whole pedagogical process with its motivational, semantic, procedural and other structural and system components (Auzina & Vozna, 2003).

Methodological understanding of the principles of modernisation of the learning environment of higher education establishments of Ukraine on the basis of innovative pedagogy is regulated by *Zakon Ukrainy Pro priorytetni napriamky innovat-*

siynoi diyalnosti v Ukraini Law of Ukraine [About the priority areas of innovative activity in Ukraine] (2012) and *Zakon Ukrainy Pro osvitu* [On Education] (2020).

From the above we can conclude that innovation in Ukrainian education is a natural phenomenon, dynamic in nature and modernising in form and content. Their implementation will eliminate the contradictions between the traditional model of learning and the challenges of the new social paradigm. However, the transition of innovation to the stage of stable functioning depends on how much the environment needs a new idea and how much it is ready to accept this idea. The latter directly depends on the awareness of the subjects of innovation and its conceptual characteristics.

At this stage, we note that in modern psychological and pedagogical discourse there is no established definition of the concept of “educational innovation”. Most researchers define this concept through the prism of its inherent features of duality—an interdependent combination of the idea and the process of its practical implementation. Grigoriy Oleksiiovych Syrotenko characterising “pedagogical innovation” as a new pedagogical product emphasises its ability to update pedagogical theory and practice by optimising the educational goal of society (Syrotenko, 2005). Tetiana Yarovenko talks about innovations in education as newly created (applied) and (or) improved competitive technologies or services; organisational and technical solutions of productive, administrative, commercial or other nature that significantly increase the quality, efficiency and effectiveness of the educational process in the educational institution (Yarovenko, 2012).

Considering pedagogical innovations in psychological-pedagogical and organisational-managerial aspects.

From this we can conclude that not all reforms in education can be considered as innovations, but only those that provoke systemic changes in the goals and results of education (through the modernisation of its content) and changes in ways to achieve its results (through learning technologies). Any innovation is the result of a progressive process of finding innovative ideas and creating (developing) new products (concepts, theories, systems, models, methods, etc.) in pedagogical theory and practice. In the aspect of undergraduate students training, the didactic component of this process is embodied in the technological potential of teaching methods.

Evolving from “pedagogical technique” (set of techniques and teaching aids) to “pedagogical process” (system of pre-designed educational actions), pedagogical technologies for more than a century of its existence determined the general strategy of development of a common state educational space and determined branch features of system invariant description of activities of all subjects of the educational process. In scientific quest of Svitlana Vitvytska and Dychkivska this strategy of technologising education has been characterised through the prism of three options of its existence: scientific (technology as part of teaching science or science that explores

the most efficient ways of learning); procedural-descriptive (technology is a description, an algorithm of the educational process); procedural-effective (technology is a real learning process). The first corresponds to the concept of “educational technology”, the second—“pedagogical technology”, the last—“learning technology” (Dychkivska, 2004; Vitvytska 2003).

Moving in the direction from general to specific, in this study we will focus on the third—procedural and effective version of the technological approach to education and consider the mechanisms of implementation of its rational component in the study of historical disciplines in higher educational institution.

Conducted historiographical analysis (Desiatov, 2020; Dychkivska, 2004; Ignatenko, 2020; Nagovitsyn, et al. 2020) demonstrates that modern pedagogical science presented a vast variety of educational technologies (instructional technology), which differ among themselves in goals, hierarchy, predictability, conceptual provisions of content, implementation mechanisms, etc. Pedagogical skill is to use them correctly, accurately determining their potential in accordance with the specifics of the discipline, the content of educational material, features of intellectual and psycho-emotional development of subjects in learning process. In this case, the procedural-effective modeling of historical education in higher education should begin with a descriptor of the specifics of historical knowledge as a cross-cutting educational universe, which determines the strategy of forming the subject environment and the choice of the most effective learning technologies.

According to long-established tradition, philosophy of education identifies two main sources of historical cognition: feeling and thinking. The first source of its level, without which it is impossible to form any knowledge is perceptual knowledge (“perceptual experience”), whereby there is fixation of certain properties and characteristics of things by human senses things according to their internal capabilities. Perceptual cognition is not perfect (changeable, not stable, relative) and cannot create knowledge alone (so to see a thing does not mean to know or understand it). Its shortcomings are compensated by rational-logical (abstract) thinking, which finds expression in concepts, judgments, and inferences. Being conscious, stable, and orderly, rational-logical thinking can separate the essential from the accidental but at the same time distance itself from the existing reality. Because of this, its categorical characteristics cannot be directly applied to real things, events, and phenomena. To achieve the strength of knowledge (which implies the ability to apply them in practice) a synthesis of feelings and thinking is required, a natural manifestation of which is judgment and belief.

The process of historical cognition takes place according to the general logic of knowledge formation and moves in a spiral in the direction from knowledge of historical fact (theoretical (rational) level of cognition) to awareness of it as a part of one’s own life (empirical (sensory) level of cognition). At the theoretical level, students are concerned with revealing the meanings of historical facts,

at the empirical level — with the formation of a sense of belonging to them, because without the inner spiritual creativity history simply does not exist. In this way, looking for answers to the basic questions of personal identity: “Who am I?”, “What is my name?” the individual cultural and historical consciousness of the subject is formed, his historical memory develops, historical experiences are layered, which together form a personal code of spiritual identification of the individual (Ignatenko, 2020).

The considered ratio of cognitive levels testifies to the leading role of mental activity of the subject of training in creation of knowledge and in the conscious organisation of his own cognitive actions. Without such activity it is impossible to constructively build intellectual formations and correct them. However, incompleteness of historical knowledge caused by a temporal dynamic of historical science leads to the following: to study history at the level of theory is difficult, however, to grasp and understand the logic of its processes is necessary. The task is not easy, especially when it comes to teaching a generation of children addicted to the Internet and modern technologies, whose intelligence is high, and the outlook is partly superficial and situational (because they do not see the point in unmotivated theoretical education).

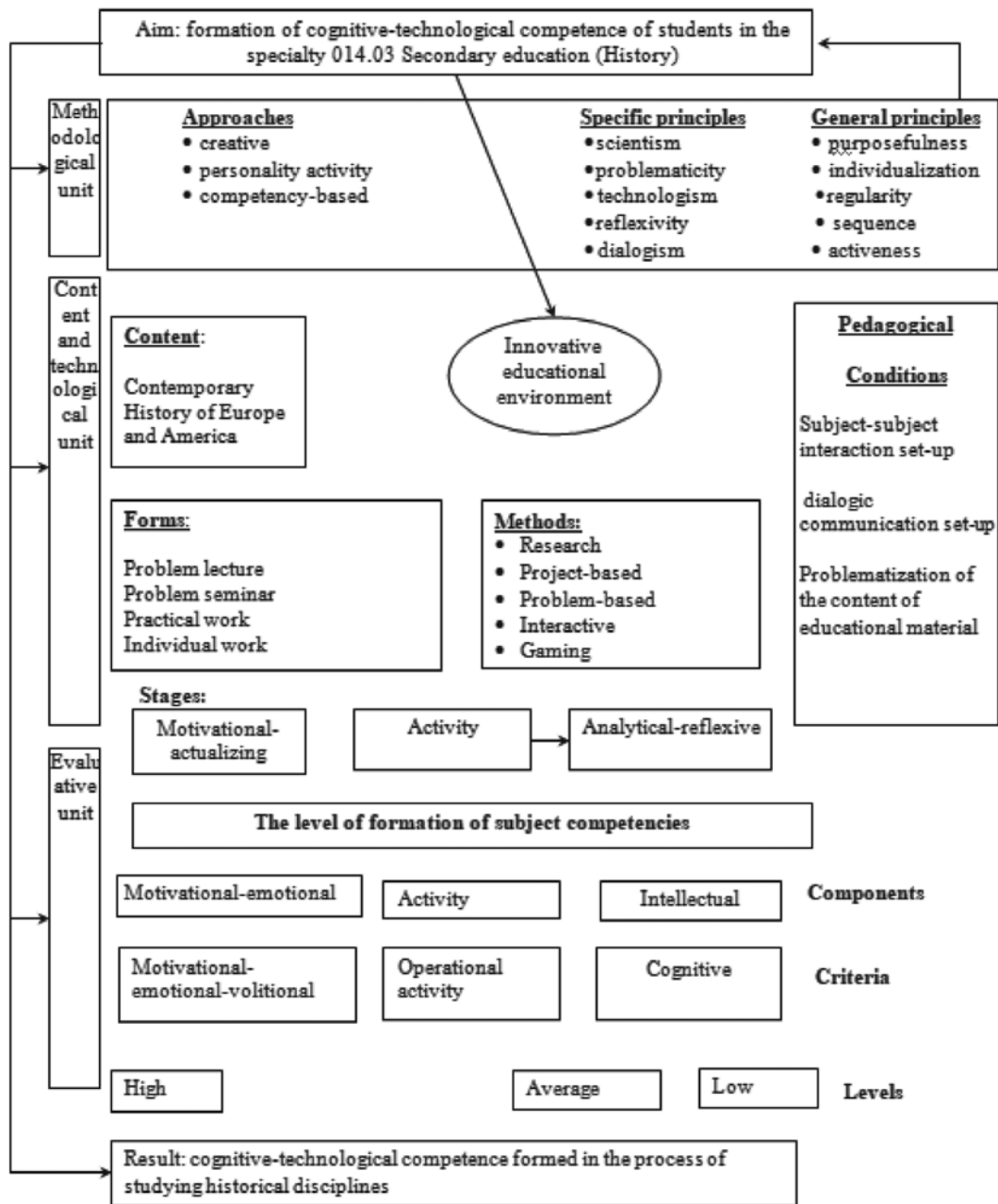
Sharing the opinion of the latter, we believe that the modernisation of the educational model of higher educational institution should be carried out by modifying the content rather than changing the form.

Taking the established forms of learning for granted (because nothing better has been invented yet), we note that pedagogy has already proposed a wide variety of didactic technologies that allow us to overcome specific learning difficulties (such as low cognitive activity, development of subject or professional competencies etc). The only problem is that they are not always adapted to the realities of education in Ukraine.

Synthesis of research on a given direction (Andrushchenko, 2009; Hrytsenko, 2020; Ignatenko, 2020; Nagovitsyn, 2020 et al.) points to the search of didactic approaches that could transform teaching in a clear, technically perfect process with effective and predicted result. Considering didactic technologies as its component, able to maximise all its inherent laws and patterns, while ensuring the achievement of specific educational results, scientists emphasise the uncertainty of the criteria for characterising their essential features, and thus — variability in approaches to their application in solving certain didactic problems. In view of this, we offer our own theoretical model of the appealing of a rational approach to the formation of cognitive-technological competence of a bachelor, tested on the basis of the educational discipline Modern history of the countries of Europe and America, which is studied by students of the Faculty of History, specialty 014.03 Secondary Education (History) at the Ternopil National Pedagogical University named after Volodymyr Hnatiuk (Ternopil, Ukraine) (Figure 1).

Figure 1

Theoretical model of implementing a rational component in training undergraduate



Source. Own research.

The *methodological unit* on the example of the discipline “Contemporary History of Europe and America” presents methodological approaches and principles of formation of cognitive-technological competence of students majoring in 014.03 Secondary Education (History)—elements that perform a regulatory function and determine the tactics of experimental methodology. The *content-technological unit* of the model presents the content (Contemporary History of Europe and America), pedagogical

conditions and appropriate mechanisms for their implementation (interdependence of methods, forms and means of learning), which are provided by forms (individual, group, etc.), methods (problem, developmental, interactive learning), tools (maps, schemes, diagrams, charts, tables, etc.), which are designed to repeat, systematise and generalise knowledge of historical facts, concepts, connections; textual tools to improve practical skills and abilities (mainly documents, textbooks, fragments of research and journalism, etc.); videos, paintings, photographs and reproductions of paintings and sculptures to solve problems under current and experimental programs; computer programs; multimedia resources).

The pedagogical conditions for the realisation of the methodology of the model implementation were determined: subject-subject interaction, clearly planned dialogic communication and semantic problematisation. Consideration of the outlined pedagogical conditions corresponds to the functioning of the internal mechanisms of the innovative educational environment and allows to maximise the cognitive-technological potential of the content of education.

The central place in the model is occupied by problem situations and problem tasks, developed according to three criteria according to the components of the problem: motivational-emotional (motivational and emotional tasks); intellectual (algorithmic and problem tasks); activity (communicative, reflective tasks). Problem tasks are aimed at forming in the subjects of educational activity the ability to master the “reflected” content of the subject. Problem tasks assume the use of cognitive methods and independent search for yet unknown means of solving problems, resolving contradictions between acquired knowledge and task requirements, help identify new elements of knowledge, contribute to students’ ability to operate the new elements of knowledge, and thus expand students’ capabilities in solving new, more complex problems, using the means of self-education. The stages of formation of cognitive-technological competence of students in the process of studying historical disciplines (motivational-actualising, activity, analytical-reflexive) are determined. Each of these stages assumed the implementation of pedagogical conditions, the introduction of special forms, tools and technologies of education, had its purpose, objectives and focus on the result—the positive dynamics of creativity of high school students. The result of the model is causally related to the object—the formation of cognitive-technological competence in the study of historical disciplines. Certain criteria, indicators and diagnostic tools were developed to determine the result and they are presented in the *evaluative unit*.

Aimed at solving a specific didactic problem in a certain educational environment, this educational model allows you to create a technological map of the lesson with an emphasis on its procedural and activity component and realise the goal.

An experimental study of the effectiveness of the model of implementing a rational component in training undergraduate students was conducted in 2021-2022 on the basis of the Faculty of History of Ternopil National Pedagogical University named

after Volodymyr Hnatyuk. The experiment involved 127 fourth-year students majoring in 014.03 “Secondary Education (History)” and 2 University teachers (a teacher of theory and methods of teaching history and a teacher of Contemporary History in Europe and America).

The undergraduate students were split into two groups: experimental (EG) and control (CG). To reach the goals the following complex methods of investigation were used: analysis of psychological, pedagogical, and methodological literature, educational process modeling, educational process observation, diagnostic tasks, tests, methods of mathematical statistics for quantitative and qualitative analysis of the results and the proof of their authenticity.

RESULTS AND DISCUSSION

The purpose of experimental training was to create a method of activating and intensifying the learning of historical disciplines and testing the method’s effectiveness. We based the program of experimental training on the assumption that the activity and motivation of students in the process of studying history will increase under the conditions of: teaching the subject based on a combination of problem, personal and competence approaches using creative and analytical activities; observance of general didactic (purposefulness, individualisation, systematicity, sequence, activity) and specific (scientific, problematic, technological, reflective, dialogical) principles; application of methods and techniques of problem, research, project, and interactive training; stimulation of intellectual activity, involving a complex of problem tasks; organisation of independent research activities aimed at the formation of basic and subject competencies; realisation of interdisciplinary connections (history of Ukraine, world history, political science, jurisprudence, culturology, sociology, etc.); giving priority to work with historical documents.

The process of formation of cognitive-technological competence included three stages: initial (motivational-actualising), basic (formative) and final (analytical-reflexive).

The first stage—motivational-actualising—provided students acquaintance with the features of cognitive-technological competence, its role for further professional activity, the formation of a stable motivation to learn through motivational and emotional tasks. During the second stage—formative—there was a development of operational structures that constitute the essence of cognitive-technological competence (independent transfer of previously acquired knowledge and skills into a new situation, vision of new problems in familiar circumstances), understanding the essence of learning problems by solving algorithmic, problem and communicative tasks. The work at the third stage—analytical-reflexive—was aimed at students’ awareness of the mechanism of practical activity during the generali-

sation and systematisation of acquired knowledge, skills and experience of creative activity in the process of solving communicative and reflective tasks. In the process of experimental training, frontal, group, and individual forms of activity were used to increase the effectiveness of mastering the content of Contemporary History of Europe and America. Prominent place was given to independent work of students with historical documents (search for the necessary information to solve problems; structuring, interpretation, and exchange of the information between participants of the educational process and most importantly practical application of the acquired knowledge to create a product).

A special place in the method of formation of cognitive-technological competence in the process of studying the history of Europe and America has been given to a set of problem tasks, which aims to form critical thinking and involves students to create a product (oral (story, substantiation, discussion, storytelling), written (composition, essay, interview, script, plan), visual (collage, timeline, infographics, video, presentation), game (dramatisation, competition, quiz, quest)).

The solution of problem tasks has been done according to the stages: a) actualisation of basic knowledge (facts, key concepts, namely initial data necessary for perception and understanding of the content of the creative task and creative approach to their application); b) search and awareness of connections between facts, tendencies, meanings, phenomena of the past; c) formulation of assumptions (hypotheses), (modelling, construction of a historical situation); d) determination of ways to solve the problem (assessment of the availability of basic data for solving the problem, determination of directions for finding the necessary information); e) invention of an algorithm for solving problems; f) creative application of the algorithm; g) verification of the provability of arguments and self-assessment of the results; h) the choice of a method to present the results (creative product).

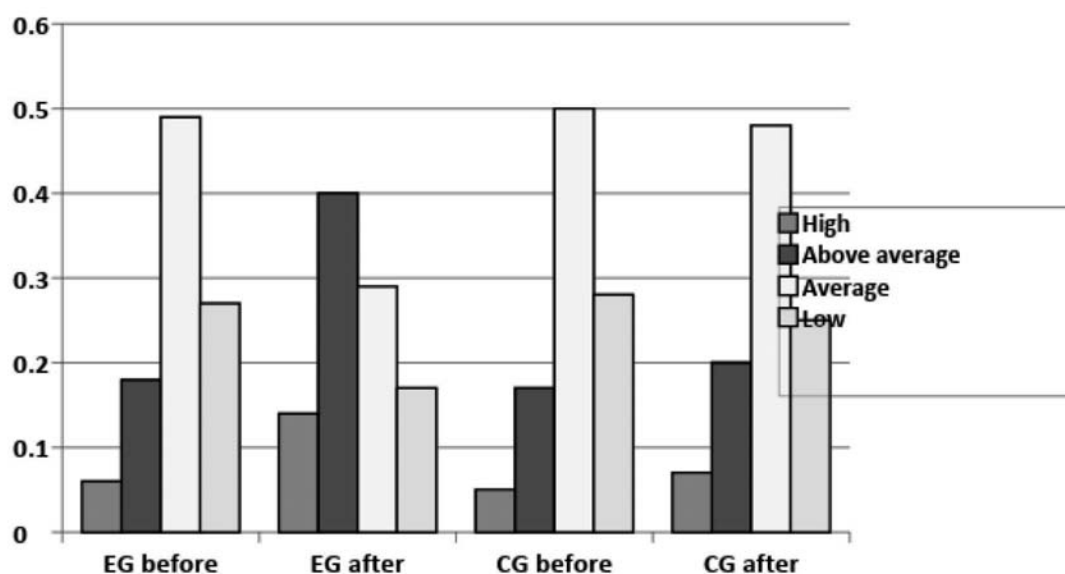
The following criteria for the selection of didactic materials for the development of a set of problem tasks were selected: thematic and semantic unity (taking into account the content, accessibility, novelty and relevance); psychological (taking into account the existing level of cognitive abilities of students); socio-cultural (taking into account the content lines of the current program, contributing to the formation of values and worldviews); competence (acquisition of basic and subject competencies by students in parallel with the formation of qualities inherent in cognitive-technological competence); emotional (the ability to empathise with the senses of the past and enjoy the creative process). To illustrate the information and show the results of the tasks, students prepared multimedia presentations. During the experimental training, teachers involved students in the reflection of their own activities.

The effectiveness of the method of formation of cognitive-technological competence in the process of studying Contemporary History of Europe and America was determined by the difference in the dynamics of the grades of formation

of cognitive activity of students in control and experimental groups. It is found that at the starting point of the experiment the levels of formation of cognitive activity of control and experimental groups were homogeneous by all criteria. The analysis of the obtained results finally of the formative experiment showed the growth in the number of students with a high level of formation of cognitive activity in the experimental groups from 6% to 14% while in the control groups — from 5% to 7%; also the number of students with a level above the average in the experimental groups increased from 18% to 40%, in the control groups — from 17% to 20%; the number of students with an average level in the experimental groups decreased by 20%, in the control groups — by 2%, and with a low level by 10% and 3%, respectively. The results of pedagogical observations at the formative stage of the study showed qualitative changes in the levels of formation of cognitive activity of students of experimental groups in contrast to the control ones (Figure 2).

Figure 2

Levels of formation of cognitive-technological competence of students in control (CG) and experimental (EG) groups before and after the formative stage of the experiment (in relative frequencies)



Source. Own research.

Quantitative and qualitative analysis of the results of the formative experiment gives grounds to assert that the indicators of the formation of cognitive-technological competence of experimental groups tend to increase, while in the control groups statistically significant changes did not occur. The reliability of the obtained results is proved by means of qualimetric calculation and statistical analysis by the method of Student's t-test.

CONCLUSIONS

The study allows us to draw some generalising conclusions. Firstly, modern science and education are not found in a state of equilibrium. Their tasks and purpose are fundamentally different, which is reflected in the lack of isomorphism of typologies of rationality in science and rationalism in education. However, their direct connection and interdependence allow us to consider rationalism in education as a kind of rationality of action, which affects the functioning and formation of scientific rationality, gives it a practical character and determines its axiological status in culture.

Secondly, in terms of undergraduate students training the didactic component of this process is embodied in the technological potential of teaching methods. The results of the study indicate the search of didactic approaches that could transform learning into a perfect technological process with effective and predictable results, directed towards the formation of cognitive-technological competence of future teachers of History.

Thirdly, the analysis of general didactic and methodological researches allowed to outline methodological directions of formation of cognitive-technological competence of students who acquire the profession of history teacher studying on a specialty 014.03 secondary education (history) and through the prism of ideas and tools of various types of training (developmental training, problem training, project training) to model a procedural component of technological approach to historical education.

Fourthly, during the experimental verification of the effectiveness of our proposed method on the example of studying the course Contemporary History of Europe and America, we found a positive dynamics of quantitative changes in the development of all components of cognitive-technological competence: the increased percentage of students with above average level of cognitive-technological competence (+ 21% EG and + 3% CG); the increased number of students who demonstrate the characteristics of cognitive-technological competence at a high level (+ 8% EG and + 2% CG). In addition to purely quantitative indicators, there were changes within each of the levels, which was reflected in the increase in the experimental groups those students who had higher scores within the scale of a certain level.

The presented scientific results of the conducted research do not exhaust all aspects of the problem of formation of cognitive-technological competence as a way of realisation of a rational component of training of the future teacher. At the present stage, pedagogical science faces the task of developing a holistic program for managing the process of becoming a person as a specialist who is able to realise his potential in professional activities. In this aspect, further scientific research can be devoted to the study of ways to implement cognitive-technological competence in the methodological work of a potential history teacher; formation of a comprehensive integrated model of professional growth and raising the level of professional competence of a history teacher.

At the same time, we will single out a number of unsolved problems in the process of working with students. In particular, the need to discuss the advantages and disadvantages of distance learning in the implementation of a rational component in training undergraduate students: the development of students' responsibility for learning; modernisation of the methodological support of basic curriculum in accordance with the specifics of online education; training to develop cognitive-technological competence of undergraduate students in the speciality 014.03 secondary education (history) in a pandemic.

REFERENCES

- Andrushchenko, V. (2009). Umovy ta napryamy innovatsiynoho rozvytku osvity: model' innovatsiynoho rozvytku vyshchoyi shkoly [Conditions and directions of innovative development of education: a model of innovative development of higher education]. *Vyshcha osvita Ukrayiny*, 3, 5–13.
- Andrushchenko, V. P. (2008). Ukrayins'ka osvita v rozshyrennyah rozvytku: osnovni napryamy reformuvannya osvity ta yih vplyv na pedahohiku vyshchoyi shkoly [Ukrainian education in the contradictions of development: the main directions of education reform and their impact on higher school pedagogy]. *Vyshcha osvita Ukrayiny*, 1, 7-9.
- Auzina, M., O. & Vozna, A. M. (2003). Innovatsiyni protsesy v osviti [Innovative processes in education]. LBI NBU.
- Bondar, T. I., Telychko, N. V., Tovkanets, H. V., Shcherban, T. D., & Kobal, V. I. (2020). Trends in higher education in EU countries and non-EU Countries: Comparative analysis. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(1Sup1), 77-92. <https://doi.org/10.18662/rrem/12.1sup1/224>
- Carrillo, R., Miranda, V., Tataje, F., Fernandez, R., Shardin-Flores, L., & Martinez, J. (2020). The phenomenological confidence of the teacher in conducting learning projects. *International Journal of Higher Education*, 9(9), 1-10. <https://doi.org/10.5430/ijhe.v9n9p1>
- Chantarasombat, C. & Sombatsakulkit, E. (2021). Doctoral program learning module on developing leading secondary school teachers in creative thinking for enhancement of students' learning activities in Thailand. *International Journal of Higher Education*, 10(3), 138-149. <https://doi.org/10.5430/ijhe.v10n3p138>
- Chen, C. & Yang, Y. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review journal*, 26, 71-78. <https://doi.org/10.1016/j.edurev.2018.11.001>
- Desyatov, T. (2020). Suchasni innovatsiyi v pedahohichniy osviti [Modern innovations in pedagogical education]. *Visnyk Cherkas'koho natsional'noho universytetu imeni Bohdana Khmel'nyts'koho. Seriya «Pedahohichni nauky»*, 1, 5-9.
- Dychkivs'ka, I. M. (2004). Innovatsiyni pedahohichni tekhnolohiyi: navchal'nyy posibnyk [Innovative pedagogical technologies: bulk. aid.]. Akademvydav.
- Hrytsenko, A. (2020). Developing the Content of Forming the System of Intending History Teachers Professional Competence Using Multimedia Technologies. *Revista Românească pentru Educație Multidimensională*, 12(1Sup1), 330-346. <https://doi.org/10.18662/rrem/12.1sup1/238>
- Ihnatenko, N. V. (2020). Profesiynny rozvytok uchytelya istoriyi v konteksti realizatsiyi kontseptsiyi «Nova ukrayins'ka shkola» [Professional development of a history teacher in the context of the implementation of the concept of “New Ukrainian School”]. *Naukovi zapysky Ternopil's'koho natsional'noho pedahohichnoho universytetu. Seriya: Pedahohika*, 2, 42–49. <https://doi.org/10.25128/2415-3605.20.2.6>
- Kravets', V. (2011). Paradoxy pedahohichnoyi osvity v epokhu tsyvilizatsiynykh zmin [Paradoxes of pedagogical education in the era of civilizational change]. *Shlyakh osvity*, 1, 4-11.
- Nagovitsyn, R. S., Zamolotskikh, E. G., Sokolnikova, E. I., & Rybakova, L. V. (2020). Creative Pedagogical Development of Students Based on the Implementation of Didactic Games. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(4), 156-171. <https://doi.org/10.18662/rrem/12.4/339>

- Shkilnyy svit. (2002, April). Nationalna doktryna rozvytky osvity v Ukraini 21st [The national doctrine of the development of education in Ukraine in the 21st century]. http://schoolchem.ho.ua/ZavKab/NormD/1_7_nac_doktryna.pdf
- Rudyshyn, S. D., Kravets, V. P., Samilyk, V. I., Sereda, T. V., & Havrylin, V. O. (2020). Features of the fundamentalization of education in higher educational institutions of Ukraine in the context of sustainable development. *Journal of Educational and Social Research*, 10(6), 149-161. <https://doi.org/10.36941/jesr-2020-0116>
- Santi, E. A., & Gorghiu, G. (2019). Cognitive and emotional dimensions recorded when implementing specific responsible research and innovation aspects in science lessons. *Revista Romaneasca Pentru Educatie Multidimensionala*, 11(3), 224-234. <https://doi.org/10.18662/rrem/147>
- Shinogaya, K. (2021). Effective ways of enhancing the quality of question generating and spontaneous information search outside the classroom. *International Journal of Higher Education*, 10(3), 58-74. <https://doi.org/10.5430/ijhe.v10n3p58>
- Syrotenko, H. O. (2005). Innovatsiynyy rozvytok osvity: problemy perekhodu vid teoriiy do praktyky [Innovative development of education: problems of transition from theory to practice]. *Upravlinnya shkoloyu*, 1, 15–18.
- Vitvyts'ka, S. S. (2003). *Osnovy pedahohiky vyshchoyi shkoly: metodychnyy posibnyk dlya studentiv mahistratury* [Fundamentals of higher school pedagogy: a method]. Tsentr uchbovoyi literatury.
- Vnukova, N. I. (2010). Innovatsiynyy potentsial vyshchoyi osvity v umovakh hlobal'nykh vyklykiv XXI st [Innovative potential of higher education in the global challenges of the XXI century]. *Vyshcha shkola*, 12, 26–36.
- Voinea, M. (2019). The Development of future competences—A challenge for the educational system. *Revista Românească pentru Educație Multidimensională*, 11(4Sup1), 328-336. <https://doi.org/10.18662/rrem/193>
- Yarovenko, T. S. (2012). Vydy innovatsiy v osviti ta yikh klasyfikatsiya [Types of innovations in education and their classification]. *Visnyk Dnipropetrovs'koho universytetu*, 20(10/1), 214–219.
- Zablotskyi, V., Zablotska-Siennikov, N., Hutsol, A., Saienko, O., & Hutsol, O. (2020). Improving the System of State Management of Educational Establishments at the Regional Level in Ukraine in The Process of Adaptation of European Experience. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(3), 404-415. <https://doi.org/10.18662/rrem/12.3/328>
- Zakon Ukrayiny. (2012, October). *Zakon Ukrayiny Pro priorytetni napryamy innovatsiynoyi diyalnosti v Ukrayini (№ 5460-VI)*. <https://zakon.rada.gov.ua/laws/show/3715-17#Text>
- Zakon Ukrayiny. (2020, April). *Zakon Ukrayiny «Pro osvitu» (№ 2145-VIII)*. <https://zakon.rada.gov.ua/laws/show/1060-12#Text>
- Zhuk, M. V. (2008). Suchasni osvitni stratehiyi: Vyklyky hlobalizatsiyi ta poshuk vidpovidey [Modern educational strategies: challenges of globalization and search for answers]. *Vyshcha osvita Ukrayiny: teoretychnyy i nauково-metodychnyy zhurnal*, 4, 303–310.