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Formation of Research Competencies of Future Educational Psychologists in the Digital Educational Environment of the University

Abstract

Introduction. The article addresses the problem of forming research competencies among future educational psychologists in the context of digital transformation of higher education. The authors substantiate the relevance of developing research competencies as a key component of professional preparation, which encompasses not only methodological knowledge but also practical skills, analytical abilities, and personal qualities necessary for reflective professional practice in contemporary educational environments: methodology and Methods. Empirical data were collected through a questionnaire survey using closed-type instruments. The questionnaire included 5 thematic blocks. The research sample was formed using purposive sampling and comprised 41 respondents. *Results.* The findings demonstrate that the digital educational environment, when appropriately utilized through grounded pedagogical methodology, creates unprecedented opportunities for developing research competencies. The research reveals that structured integration of research methodology content with digital tools and authentic psycho-pedagogical projects facilitates more effective competency formation. Analysis of the institutional conditions indicates that seven principal characteristics significantly influence the formation of research competencies. *Scientific Novelty.* The study presents empirical evidence that the distinctive features of digital educational environments, particularly networked collaboration, sophisticated analytical tools, and authentic project implementation, fundamentally transform the conditions for developing research competencies among future educational psychologists and contribute to overcoming problem areas in their professional preparation. *Practical Significance.* The comprehensive approach proposed in the article, integrating reconceptualization of professional preparation content with strategic utilization of digital tools and creation of supportive pedagogical conditions, provides practical guidelines for higher educational institutions implementing research competency development programs for educational psychology students.

Keywords: research competencies, educational psychologists, digital educational environment, higher education, professional preparation, research-based learning activities.

Introduction. The current stage of higher education development is characterized (Alenezi, 2023; Zhao & Zhou, 2024) by an increase in the volume of available scientific information and an expansion of the range of digital analytical tools. However, the expansion of information resources and technological capabilities is not always accompanied by a corresponding improvement in the quality of students' research training (Burke & Prieto, 2019). In the context of professional training of educational psychologists, this gap acquires particular significance, since the professional activities of specialists in this field require not only the application of existing diagnostic methods and standardized procedures, but also the ability to act as a reflective practitioner-researcher, prepared for independent identification, analysis, and resolution of complex problems arising in specific conditions of educational practice.

The digital educational environment of the modern university (Vasyliuk et al., 2021), by providing access to international scientific literature databases, specialized software for data processing, and platforms for organizing

collaborative activities, creates new opportunities for developing students' research capabilities. However, the availability of technological resources, even when properly organized, is in itself insufficient for the formation of genuine research competence. The technological potential of the digital environment requires pedagogical reflection and integration into the system of professional training.

There exists a methodological gap between traditional approaches to organizing students' scientific work and the opportunities provided by the digital environment. Most existing models either remain within the framework of classical forms of organizing educational-research activities, supplementing them with individual digital tools, or use technologies fragmentarily, failing to integrate them into a holistic system of professional training. At the same time, the question remains insufficiently studied concerning the degree to which students themselves, future educational psychologists, recognize the necessity of developing research skills and competencies as an integral component of their future professional activities.

The relevance of this research is determined by the need to identify the problem of forming research competencies of future educational psychologists within the framework of the university's digital educational environment. The research aims to reveal and describe the nature of this problem, as well as to examine the position of students themselves regarding the significance of research skills in their professional development. To this end, a survey of future educational psychologists is planned, which will make it possible to determine their perceptions of the necessity of forming research competencies, to identify difficulties in developing these skills, and to establish a connection between the use of digital tools and the quality of research training. The data obtained will contribute to a better understanding of the state of students' research training and the identification of directions for improving the system of professional education in the field of educational psychology.

Research competencies in the context of higher education are understood as a set of skills that university students should develop in order to create and disseminate scientific products in the process of their academic activities (George-Reyes et al., 2023). Competencies extend beyond simple mastery of technical research procedures and include the ability for critical analysis of information, systematic problem-solving, and the formation of original scientific knowledge. Research competencies represent an integrative formation that combines cognitive, activity-based, and personal aspects of specialist training, including not only knowledge of research methodology but also practical skills in applying various methods of data collection and analysis, the ability to formulate scientific problems, and the capacity to interpret research results.

Research competencies acquire particular significance in the system of professional training of future teachers. According to the research of Nagymzhanova et al. (2025), pedagogical research competency has recently become the most important component of educational outcomes in the training of future teachers, enabling specialists to carry out professional activities based on scientific knowledge and empirical data.

In the process of an empirical study conducted through a survey of students at a pedagogical university, the authors established the level of students' mastery of the skills that form the basis of research competency. The research showed that future teachers at the stage of their training need to acquire appropriate research experience. The practical significance of these findings lies in the development of methodological recommendations covering key theoretical information about the peculiarities of pedagogical-research competency and the means of its development in the context of training future primary school teachers (Nagymzhanova et al., 2025).

Koletvinova and Bichurina (2019) propose considering research competency as a multifunctional, theoretically substantiated, and practice-oriented construct. The authors emphasize that the complexity of professional training of a creative teacher, based on the mastery of professional research competency,

dictates the necessity of developing research abilities of future educators. Successful professional activity of a teacher presupposes a multifunctional research character of his or her work.

The psychological and pedagogical conditions for developing students' research qualities, according to Koletvinova and Bichurina (2019), are based on a system of pedagogical actions that have intellectual significance in relation to individual and personal characteristics. These actions are aimed at creating a scientific-creative educational space through the use of developed mechanisms of self-regulation, self-projection, self-determination, self-development, and self-education. The study employed both theoretical methods (analysis of pedagogical, psychological, and methodological literature) and empirical methods (analysis, comparison, synthesis, observation, survey), a pedagogical experiment with stages of identification, formation, and control, the method of expert evaluations, and statistical processing of research results. The authors developed a multifunctional, structurally informative paradigm for the development of professional research competency of future teachers.

Sandoval-Henríquez and Sáez-Delgado (2023) conducted a systematic review following PRISMA guidelines to assess research competencies of higher education students. Their study covered the Science and Scopus scientific databases, analyzing publications from 2013 to 2022. As a result of the systematic analysis, the authors selected 32 studies that met the established inclusion criteria. The results of the systematic review by Sandoval-Henríquez and Sáez-Delgado (2023) revealed a number of critical deficiencies in the current state of research on research competencies. First, the authors noted a limited number of studies conducted in South America, which indicates a geographical imbalance in attention to this issue. Second, existing research often uses non-representative sample sizes, which reflects methodological limitations in the existing knowledge base. Third, the authors identified a lack of theoretical models that allow for the systematization of competencies. Fourth, the research often employs unreliable and invalid measurement instruments, which raises questions about the validity of the obtained empirical data.

The results of the systematic review demonstrate that university students exhibit significant deficiencies in specific competency dimensions. The identified weaknesses include inadequate skills in conducting literature analysis, insufficient competency in applying methodological approaches, and limitations in effectively communicating research results. George-Reyes et al., (2023) propose an innovative approach to developing research competencies through the integration of complex thinking frameworks and Education 4.0 applications. The authors implemented an educational experience aimed at improving students' competency levels through deliberate integration with complex thinking and the use of modern digital technologies.

The technological tools used in the research by George-Reyes et al. (2023) included applications for remote teamwork, web-based virtual reality systems, and social robotics. The study was conducted using a sequential-quantitative and descriptive methodological design. The authors applied pre- and post-intervention surveys to assess the perceptions of 105 Mexican university students regarding their research competencies. Subsequently, a rubric was developed for the teacher to evaluate competency.

The results of the study by George-Reyes et al. (2023) show that students noted an improvement in their research skills following the intervention. However, the results revealed an important gap: the assessment based on teacher ratings showed statistically significant differences from students' self-assessment regarding the extent of improvement in research skills. The gap between students' subjective perception and objective teacher evaluation raises important questions about the reliability of self-reports on competency improvement. Despite the identified discrepancy between student perception and objective evaluation, George-Reyes et al. (2023) conclude that their approach can be scaled to other educational

scenarios. The authors argue that disruptive teaching strategies, particularly those that integrate complex thinking frameworks with Education 4.0 applications, can effectively support the development of research skills. The scalability potential of the approach indicates possibilities for wider implementation in diverse contexts of higher education.

Education 4.0 represents a paradigm that integrates advanced digital technologies into the educational process to develop competencies necessary in the context of the fourth industrial revolution. In the context of developing research competencies, Education 4.0 tools create new opportunities for organizing students' educational-research activities. The application of Education 4.0 technologies in the development of research competencies includes the use of remote applications for teamwork, enabling students to collaborate regardless of geographical location; web-based virtual reality systems, which can create immersive research environments; and social robotics, which can facilitate the development of interaction and communication skills in the context of research activities. Technological tools allow the integration of complex thinking into the development process, as they require students to analyze multifaceted problems, interact with non-linear systems, and employ adaptive problem-solving.

Complex thinking, as demonstrated in the research of George-Reyes et al., (2023), plays a critically important role in the development of research competencies. Complex thinking involves the ability to analyze multifaceted, non-linear, and dynamic systems, the capacity to synthesize information from various sources, the skill to identify patterns in complex data, and the ability to employ adaptive problem-solving. The integration of complex thinking with research competencies is particularly important in the context of professional activities in complex, dynamic environments, such as contemporary education. The development of complex thinking enables students not only to master the technical procedures of research but also to learn to see systemic connections, understand interdependencies between various factors, and analyze problems at multiple levels, which significantly enhances the quality of scientific work.

The analysis of literature conducted by Sandoval-Henríquez and Sáez-Delgado (2023) reveals a number of significant deficits in the development of research competencies among university students. The first critical deficit is associated with insufficient skills in conducting scientific literature analysis. Students experience difficulties in searching for relevant sources, assessing their quality, and applying information from various sources to form their own research position. The second significant deficit concerns methodological competencies. Students often demonstrate limited understanding of the principles of organizing empirical research, selecting appropriate research methods, and justifying methodological decisions. This deficit points to the necessity for more in-depth theoretical training in the field of methodology. The third deficit is related to skills in communicating research results. Students experience difficulties in formulating conclusions, interpreting results, and presenting findings in various formats and for different audiences. This indicates the need to develop scientific communication skills as an integral component of research competencies. The research revealed a gap between students' perception of their competencies and the objective evaluation of their competency levels by instructors. The observation by George-Reyes et al. (2023) points to the importance of using multi-method approaches to assessing research competencies and the necessity of developing students' critical self-analysis about their research abilities.

Results. The collection of empirical data was carried out through a survey method using a closed-ended questionnaire. The questionnaire included 5 thematic blocks aimed at identifying: 1) respondents' understanding of the essence of the concept "research competency"; 2) assessment of its level of formation in the context of the digital educational environment; 3) identification of problem areas in the structure of research competencies; 4) analysis of institutional conditions for their

development. The research sample was formed using purposive sampling and comprised 41 respondents. The inclusion criteria were: enrollment in the fourth year of the "Educational Psychologist" program, which is due to the final stage of professional competency formation and experience in participation in educational-research activities.

In accordance with the requirements of research ethics, all participants were previously informed about the research objectives, principles of anonymity, and confidentiality of data processing. The survey procedure was conducted voluntarily after obtaining informed consent from the respondents. For statistical processing of the obtained data, a matrix was created in SPSS format, where responses were coded using a nominal scale. The subsequent analysis involves the application of descriptive statistics methods (calculation of frequencies and percentage distributions) and procedures for analyzing relationships (chi-square test) to identify significant patterns in the data (Figures 1-5, Table 1).

Figure 1

Survey results for question 1 of the questionnaire "Which of the following definitions of research competency do you agree with most?"

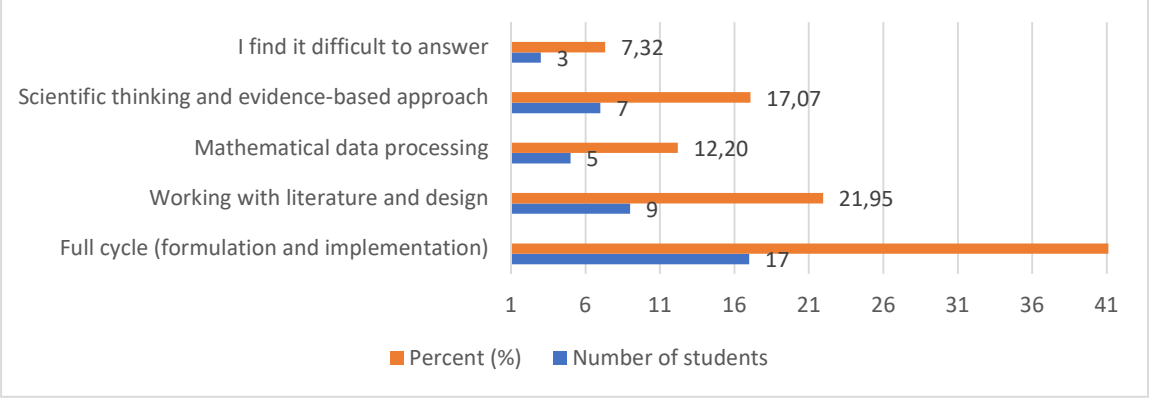

Figure 2

Survey results for question 2 of the questionnaire "To what extent, in your opinion, does your educational program develop research competency?"

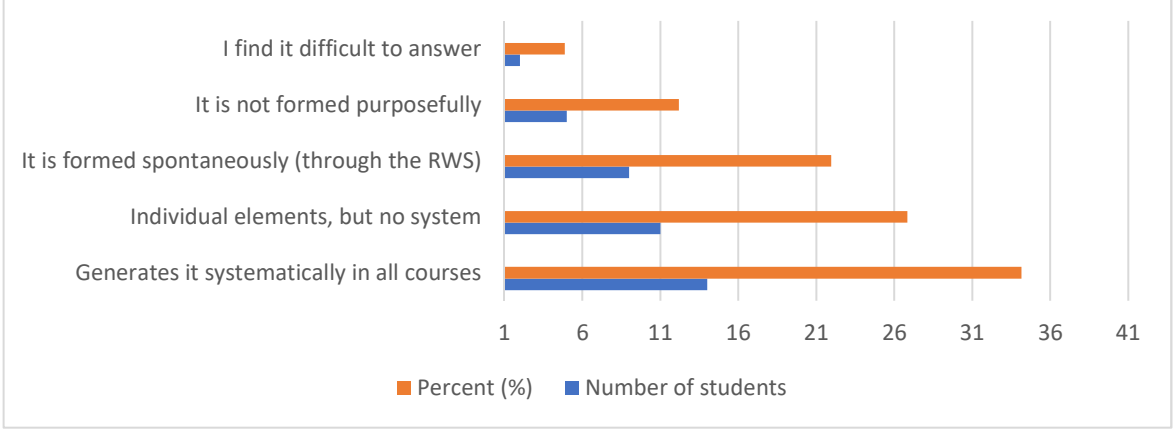

Figure 3

Survey results for question 3 of the questionnaire "To what extent does the digital environment of your university contribute to the development of research skills?"

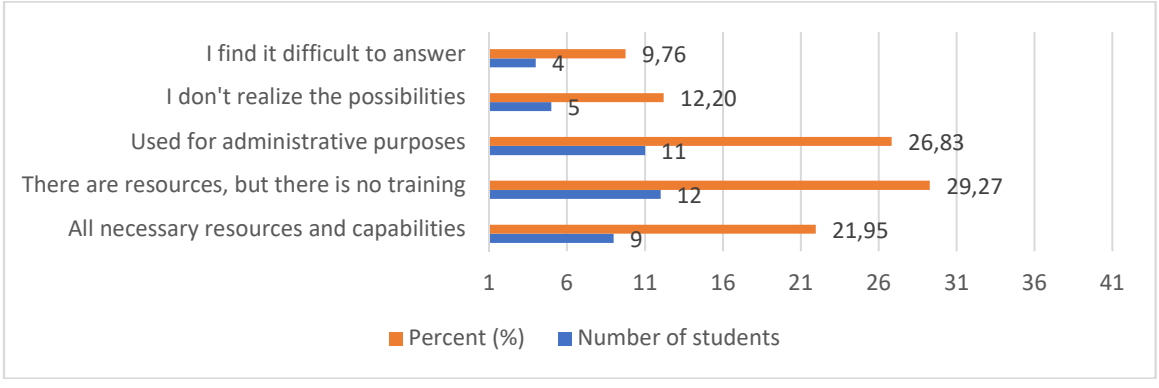

Figure 4

Survey results for question 4 of the questionnaire "Which components of research competency present the greatest difficulties for you?"

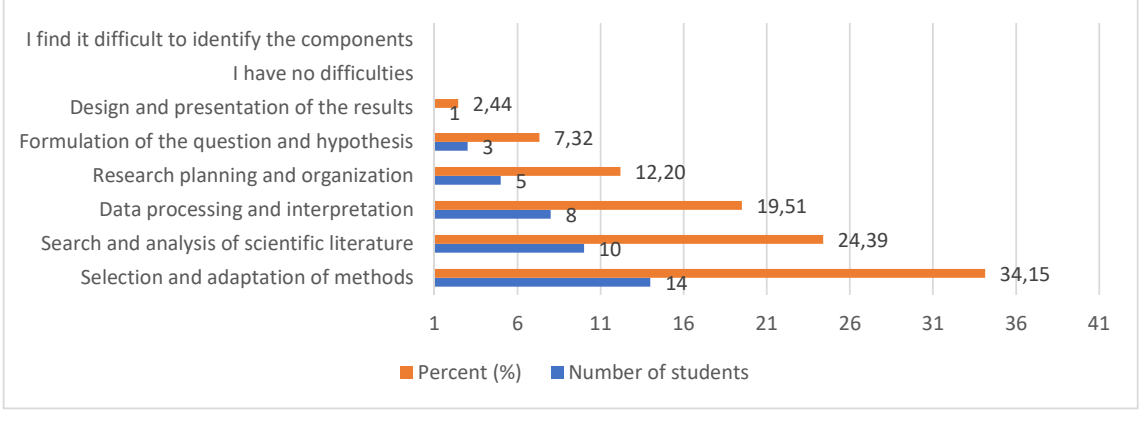

Figure 5

Survey results for question 5 of the questionnaire "How do you primarily acquire research skills and competencies?"

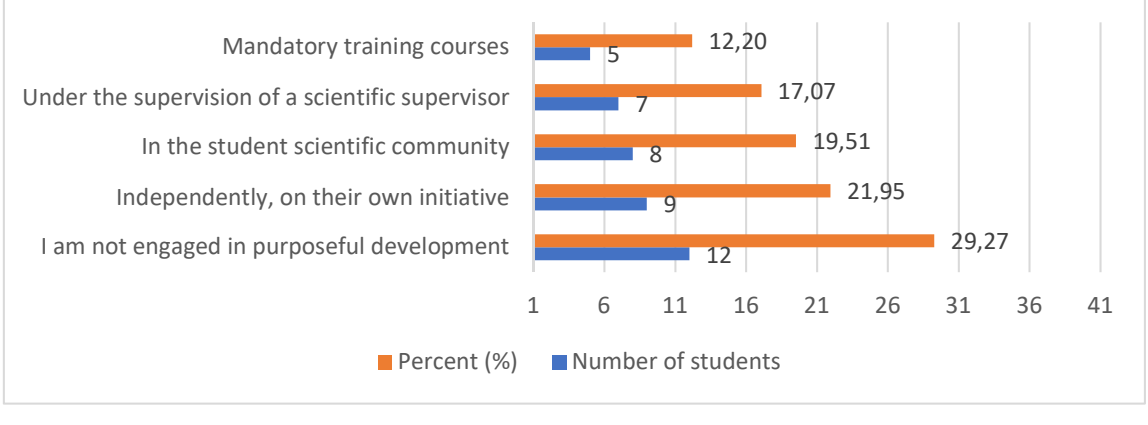

Table 1
Descriptive data statistics

	Which of the following definitions of research competency do you agree with most?	To what extent, in your opinion, does your educational program develop research competency?	To what extent does the digital environment of your university contribute to the development of research skills??	Which components of research competency present the greatest difficulties for you?»	How do you primarily acquire research skills and competencies?
Average	2,825	2,675	3,05	4,175	3,625
The standard error	0,22328406	0,22184396	0,26054676	0,31802173	0,26235497
The median	2,5	3	3	4	3,5
Mode	2	1	1	4	5
Standard deviation	1,41217236	1,40306441	1,64784241	2,01134602	1,6592785
Sample variance	1,99423077	1,96858974	2,71538462	4,04551282	2,75320513
Excess	-1,2576975	-1,0914277	-1,6326314	-1,0027171	-1,3141048
Asymmetry	0,26879641	0,32470798	-0,1561697	0,14579658	-0,1423503
Interval	4	4	4	7	5
Minimum	1	1	1	1	1
Maximum	5	5	5	8	6
The amount	113	107	122	167	145
Total	41	41	41	41	41

Analysis of the survey results makes it possible to identify several key patterns and contradictions in the system of forming research competency among future educational psychologists. First, students demonstrate an adequate, comprehensive understanding of research competency, viewing it as the ability to conduct a complete research cycle, demonstrating the presence of understanding of the essential characteristics and significance of the competency being formed, as well as correct conceptual foundations for further competency development. However, the identified discrepancy between the perceived systematicity of competency formation (the mode indicates a positive assessment, but the mean value is more critical) points to the necessity of reconsidering the organization of the educational program. It is necessary to ensure greater consistency, integration, and explicit purposefulness in the development of research competencies throughout the entire training program.

Most critical is the identified discrepancy between the availability of the digital environment and its practical use for research purposes. High standard deviation (1.65) and mean value of 3.05 with mode 1 indicate that, despite the availability of technological resources, their integration into the research process remains insufficient, pointing to the necessity for deliberate efforts to increase competency among both students and instructors in the use of digital tools for research purposes, as well as to develop structured methodological recommendations for the application of digital technologies in various components of research activities. The identified diversity of difficulties experienced by students (high standard deviation, distribution across the entire range) requires a differentiated approach aimed at addressing specific difficulties of various groups of students. The presence of a significant number of students not engaged in deliberate formation of research skills points to

the necessity of strengthening the motivational component and creating more structured and attractive opportunities for developing research competency. The obtained results demonstrate the necessity for a comprehensive revision of the system for forming research competency, including supplementing the educational program, integrating digital tools into the research process, developing differentiated approaches to overcoming difficulties, and increasing student motivation for active competency development.

Discussion. The formation of research competency among students who are future educational psychologists in the context of the university's digital educational environment is characterized by a set of fundamental features that qualitatively distinguish this process from traditional approaches to organizing scientific training. However, the question of whether the digitalization of the educational environment actually creates favorable conditions for the development of research competencies or, conversely, generates new challenges and contradictions, remains a subject of scientific debate.

On one hand, the unprecedented expansion of access to information resources and scientific sources through digitalization opens new horizons for students' professional development. The digital educational environment of the modern university (Peters, 2000; Samerkhanova et al., 2019) provides students with the opportunity for direct and immediate access to international scientific literature databases (PubMed, Web of Science, Scopus, ERIC, PsycINFO), electronic journal versions, dissertation research, and open scientific data. This accessibility allows students to familiarize themselves with the current state of scientific knowledge in the field of psychological and pedagogical research, track the dynamics of scientific idea development, and determine their place in the scientific field. However, it should be critically noted that expanded access to information per se does not guarantee quality mastery of research competencies. On the contrary, unlimited information abundance (Skivko, 2021) creates a paradoxical situation: students face information overload and experience difficulties in selecting relevant sources. There is a risk that students become lost in an ocean of information, failing to develop critical thinking and information literacy skills to a sufficient degree. Thus, an important question arises: is it sufficient to simply provide access to information resources, or is deliberate pedagogical work necessary to develop skills in critically evaluating sources and distinguishing authentic scientific information from pseudoscientific content?

A similar contradiction is observed with regard to the availability of professional digital tools (Mhlongo et al., 2023) for data processing and analysis. On one hand, the modern digital environment provides students with the opportunity to apply professional statistical analysis programs (SPSS, R, Jamovi, Statistica), specialized systems for qualitative analysis of textual data (NVivo, MAXQDA, Atlas.ti), and cloud platforms for creating electronic surveys. This significantly expands the range of methods available for students' scientific work and makes the data processing process more efficient and aligned with modern standards of scientific work. However, there is a danger of superficial, uncritical application of statistical methods without adequate understanding of their theoretical foundations and assumptions of use. Students lacking deep methodological knowledge may use powerful analytical tools mechanically, obtaining numerical results that appear scientifically justified but do not actually reflect reality. As researchers emphasize, there is a risk that the technological complexity of tools can conceal methodological errors and misinterpretation of data. Thus, the question of whether the availability of digital tools contributes to the genuine development of research competencies or creates an illusion of competency remains open.

The transformation of the character of organizing collaborative research activities in the digital environment also provokes contradictory assessments (Hussain et al., 2024). Cloud services, project management systems, and asynchronous communication tools indeed open new possibilities for organizing research groups and engaging experts from various universities.

The possibility of cross-institutional and international collaboration appears to be a significant achievement of modern education. However, the asynchronous nature of such interaction presents new demands on students and creates specific problems. The necessity of developing skills in self-organization, time management, and autonomous work while maintaining team coordination may prove excessively complex for students, especially at the early stages of training. The question arises of whether excessive mediation of interaction in the digital environment leads to a decrease in the quality of scientific mentoring and guidance, which was traditionally carried out through direct, synchronous interaction. There are concerns about the social alienation of students who work in asynchronous modes and lose immediate, face-to-face communication with the scientific community.

The transformation of the instructor's role (Ivanenko, 2015) in the process of forming research competency raises important pedagogical and philosophical questions. The shift from the model of direct mentor to the model of curator and facilitator undoubtedly contributes to the development of student autonomy and initiative (Tatto, 2021). However, one should critically consider whether the quality of personal mentoring, which plays a critically important role in developing not only skills but also value orientations and personal characteristics of a researcher, is lost in this process. The facilitator model assumes that student assumes greater responsibility for their own development, but the question arises: Are students sufficiently prepared for such responsibility? Does the lack of direct guidance lead to an increase in the number of students who feel lost in the digital environment and do not receive the necessary support?

The integration of synchronous and asynchronous forms of interaction, although providing greater flexibility, simultaneously complicates the organization of the educational process. An important question about balance arises: which types of activities are indeed more effective in synchronous mode, and which in asynchronous mode? There is a risk that with improper organization of the hybrid format, some students will gain advantages (for example, those who are better organized and can work effectively asynchronously), while others will be disadvantaged. Thus, the implementation of hybrid formats per se does not guarantee improved educational quality; careful pedagogical design and continuous evaluation of the effectiveness of various combinations of synchronous and asynchronous elements are necessary.

The increased authenticity of research projects due to the possibility of remote interaction with practical educational organizations is undoubtedly a positive aspect. However, questions arise about the quality of this interaction and the extent to which online diagnostics and remote collaboration can fully replace face-to-face interaction with the actual educational environment. There are concerns that many important contextual aspects of real practice are lost in the process of online interaction. Furthermore, schools and kindergartens may not be prepared for the active inclusion of student researchers in their work in the format of online collaboration, which may result in the superficial nature of such interaction.

The development of digital literacy and media competency (Park et al., 2021) as components of research competency is necessary in the modern context; however, it should be noted that this significantly expands the volume of content that students must master. The question arises of whether the spectrum of required competencies becomes excessively broad and complex for assimilation within the framework of a standard training program. Furthermore, the rapid pace of digital technology development means that educational content in this field may quickly become outdated, which creates additional challenges for educational programs.

It is important to note the discrepancy identified by researchers between students' perception of their competencies and instructors' objective evaluation. George-Reyes et al., (2023) note that students overestimate the improvement of their research skills as a result of educational intervention, while objective evaluation shows less significant changes. These

contradictions raise deep questions about what is actually being measured in the process of assessing research competencies. It is possible that students experience an increase in their confidence and motivation, which is a valuable outcome, but objective indicators of research skills do not improve proportionally. This discrepancy requires further critical analysis and may indicate the necessity of reconsidering both teaching methods and assessment approaches.

Thus, the digitalization of the university's educational environment undoubtedly creates new opportunities for developing students' research competencies. However, these opportunities are not realized automatically. On the contrary, each of the identified features of the digital environment carries potential risks and contradictions that require constant pedagogical attention and resolution. The question is not whether digital technologies should be implemented in the educational process (this becomes inevitable in the context of modern social development), but rather how to ensure that this digitalization actually contributes to the development of deep, sustainable research competencies, rather than creating an illusion of competency or leading to a degradation in the quality of scientific training. Solving this problem requires a reconceptualization of pedagogical approaches in the professional training of future educators, the development of more valid assessment instruments, and continuous analysis of the effectiveness of educational innovations.

Conclusion. The present study confirms that the digitalization of the educational environment contains significant potential for enhancing the preparation of future educational psychologists; however, this potential is insufficiently realized. The identified contradictions between students' theoretical understanding of research competency and its practical implementation, as well as between the availability of technological resources and their instrumental utilization, demonstrate the necessity for a fundamental reconceptualization of pedagogical strategies. Merely providing access to digital resources is insufficient for the formation of research competency; deliberate methodological work is required to integrate innovative technologies into the structure of professional preparation, taking into account the individual needs of various student groups.

The research findings justify the necessity for developing a comprehensive approach to overcoming the identified deficits, encompassing reconceptualization of educational content, creation of conditions for motivated student engagement in research activities, improvement of competency assessment methods, and continuous monitoring of the effectiveness of educational innovations. The proposed directions for enhancing the preparation system can serve as a foundation for developing practical recommendations for higher educational institutions seeking to ensure quality development of research competencies among future educational psychologists.

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