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Résumé de l'article

Pedagogical research competence has recently become an essential educational outcome in future teacher training to conduct social and professional activities. The purpose of this study is to identify the state and means of development of research activity of future primary schoolteachers. A questionnaire survey of students at a pedagogical university was conducted. The conditions for the formation of the specified competence in the system of modern education of Kazakhstan are offered. During this empirical research, the level of students' mastering of skills, which are the basis of research competence, was established. Future teachers at the stage of training need to receive proper research experience. The practical significance of this lies in the development of methodological recommendations, covering key, theoretical information about the features of pedagogical-research competence and its means of development, in the context of training future primary schoolteachers.

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Abstract

Pedagogical research competence has recently become an essential educational outcome in future teacher training to conduct social and professional activities. The purpose of this study is to identify the state and means of development of research activity of future primary schoolteachers. A questionnaire survey of students at a pedagogical university was conducted. The conditions for the formation of the specified competence in the system of modern education of Kazakhstan are offered. During this empirical research, the level of students' mastering of skills, which are the basis of research competence, was established. Future teachers at the stage of training need to receive proper research experience. The practical significance of this lies in the development of methodological recommendations, covering key, theoretical information about the features of pedagogical-research competence and its means of development, in the context of training future primary schoolteachers.

Introduction

Given the fast-changing educational environment influenced by progress in information technology and the dynamic characteristics of contemporary classrooms, it is crucial to cultivate research skills in upcoming primary schoolteachers. A comprehensive attribute, which is research competence for future educators and primary schoolteachers, includes the skills, knowledge, and attitudes that are required to conduct and apply research successfully in educational environments, thus improving teaching practices and professional growth. This proficiency is crucial, as it promotes ongoing personal and professional development, improves analytical and critical thinking capabilities, and nurtures important organizational and cognitive-research skills (Shcherban & Khoma, 2024). Furthermore, it promotes and fosters active engagement in research endeavours, which is essential for improving teaching approaches. Teacher-educational institutions have the duty of cultivating these research skills in upcoming educators, guaranteeing that they possess not only exceptional qualifications and competitiveness, but also, demonstrate motivation for self-improvement and the ability to apply innovative educational solutions and personalised approaches in their professional undertakings.

This topic warrants investigation, because the current information technology environment imposes stringent requirements on the effectiveness of pedagogical- professional training, particularly in the context of primary-school teacher competencies (Khrystiuk, 2023). There is a pressing need to train teachers who can adapt to the variability of the information society, engage with educational and scientific innovations, creatively apply acquired skills and abilities in their professional activities, pursue personal and professional growth and self-realization, think analytically and critically, possess organizational and cognitive-research skills, and actively participate in research activities (Danylevskyi, 2024). Thus, the role of teacher-educational institutions extends beyond training competitive primary schoolteachers and highly qualified specialists, but also to include the development of research skills. This will equip future teachers with the desire and readiness for regular self-improvement and self-development, skills for finding solutions in critical educational situations, the ability to introduce innovative educational and scientific methods, and the capacity to employ individualized approaches in their professional activities (Kozhevnikova & Kozhevnykov, 2024).

However, in recent years, the development of teachers' research competencies within professional training has not been consistent. This inconsistency is attributed to the lack of a sustainable system of pedagogical requirements that promotes the development of research skills among teacher-education students throughout the educational process (Kulimova, 2024). The challenges associated with the modernization of education and the introduction of a capabilities-based approach, which aims to foster pedagogical skills, including research competencies, further complicate this issue.

Scientific research conducted by Bekturganova et al. (2023) concentrated on examining the formation of research culture in prospective teachers by using a meta-competency approach. They concluded that research competence should be assessed by considering fundamental, foundational, and professional-pedagogical skills that facilitate research performance. These competencies exhibit interdependence and should not be differentiated into separate categories. In their study on the development of students' research skills in the use of digital innovations, Zhorobay and Mamirova (2023) found that research competence in the educational context is a crucial skill that is shaped by inherent personal traits and research behaviour, which comprise fundamental learning abilities.

Bayalina and Damekova (2020) contended, in their study, on the structure and essence of research competence in mathematics teachers, that research activity, as an independent competence, is a crucial characteristic of a teacher's professionalism and an obligatory component of professional culture. It involves the ability to apply the scientific method of practical and theoretical pedagogical research. A study conducted by Akzholova et al. (2020) investigated the pedagogical factors that facilitate the growth of research competence in prospective teachers. These authors determined that this characteristic is a comprehensive human attribute that encompasses skills, knowledge, expertise, values, attitudes, and personal traits. It is demonstrated by the willingness to engage in research activities to acquire new skills through scientific thinking, creativity, planning, analysis, and evaluation of outcomes.

Zulkarnaeva (2020) outlined many prerequisites for successful teaching and research endeavours: precision in selecting topics, close relation to the educational process, contemporary scientific achievements in practical domains, progressive escalation in the intricacy of experimental tasks and subjects in the course sequence, and a professional-creative approach to research and development. For example, Kystaubaeva (2021), an author who examined the readiness of prospective primary schoolteachers to facilitate creative research activities among students, observed that teachers' abilities are demonstrated through their theoretical knowledge and literacy, effective psychological and pedagogical guidance used in the educational process, statistical analysis of collected data, formulation, and accurate presentation of findings. This scientist emphasized that the framework of research competence can facilitate pedagogical self-improvement, professional advancement, and the effective implementation of research methodologies.

The work of Horvat and Kuzma-Kachur (2022) provides valuable insights into the nature and importance of research competence in future primary schoolteachers. By integrating these perspectives into teacher-education programs, institutions can better equip future teachers with the skills, knowledge, and attitudes necessary for conducting and applying research effectively in their professional practice.

It is crucial to acknowledge that one of the unresolved problems in the studies mentioned above is the lack of adequate emphasis on research competence as a specialized skill during teacher training. This is a significant challenge, in the context of practical application, and essential in crucial educational scenarios. The objective of this study is to clarify the fundamental nature of research proficiency in prospective primary school teachers and its precise qualitative structure.

Materials and Methods

As part of their scientific endeavours, the researchers administered a questionnaire survey to students to assess the extent to which prospective primary-schoolteachers have developed their research skills across the framework of research projects. This study included a sample of 58 students who were in their second to fourth year of pedagogical courses at Karaganda University. The selection of this group was based on their status as aspiring primary-schoolteachers present in pedagogical training. This makes them very suitable candidates to evaluate the development of research skills within the framework of their educational growth and future professional needs. The mean age of the participants ranged from 19 to 21 years old, with 23 males and 35 females taking part. A web-based questionnaire survey was administered via the Google Forms platform. A single point was assigned to each response option, resulting in a total of 37 points. The collected data underwent extensive mathematical and statistical analysis to guarantee the accuracy and dependability of the findings.

The questionnaire comprised five sections, each specifically crafted to evaluate distinct facets of students' research skills. The initial segment sought to ascertain the distinctive

attributes of research competencies, including organization, sociability, initiative, creativity, innovativeness, independence, perseverance, capacity to collaborate, adaptability, and attentiveness. The second section concentrated on elucidating the obtained experience within the framework of pedagogical training. This encompassed an understanding of research concepts, efficient techniques of scientific inquiry, approaches to innovative research endeavours, and proficiency in utilizing personal experience and information, mastering data analysis and categorisation, and applying findings in professional endeavours. The third part evaluated the students' inclination towards research, encompassing their professional interests, engagement in scientific research, inquiry into creative possibilities, cognitive exploration, self-expression, and realization of pedagogical objectives. The fourth segment assessed the students' introspective elements, including self-inquiry, self-management, self-regulation, self-observation, and constructing a personal path of professional development. The fifth section required students to specify the nature of their research activities, including project research conducted during classes, coursework, diploma work, research presented at conferences or competitions, individual research conducted during internships, or research conducted on specific topics within a designated timeframe.

To determine the frequency of research skills among the students surveyed, the authors performed calculations. Threshold scores were set for each section of the questionnaire and the percentage of students who achieved scores above these thresholds was computed. As an illustration of their approach, the authors presented an example using the reflection section of the questionnaire. The allotted maximum score for this section was five points. An arbitrary threshold of three points was established by the researchers for this category. The study revealed that 46 out of the total of 58 participants achieved scores of either 4 or 5 points in this sector. To determine the proportion of students who achieved scores above the established threshold, the authors employed the subsequent formula:

Percentage = (Number of Students above Threshold / Total Number of Respondents) * 100

Applying this formula to the reflection-section data, they calculated:

Percentage = (46 / 58) * 100

Percentage = 80%

This methodology enabled the researchers to measure the percentage of students who exhibited high levels of proficiency in each section of the questionnaire. The authors conducted a comparative analysis of the relative strengths and weaknesses in various aspects of research competence, among the surveyed, future, primary-schoolteachers, by employing consistent thresholds across different sections.

For this study, such materials as the Law of the Republic of Kazakhstan No. 319-III “On Education” (Law of the Republic of Kazakhstan No. 319-III “On Education,” 2007) were used, which notes the importance of the implementation of scientific activity in the field of education. The principles of educational activity are integrative, and the scientific nature of education in the international environment task higher-educational institutions to organize scientific activity creatively for students, and scientific personnel by integrating the application of scientific results in practical and professional activities. Scientific resources (Ybyraimzhanov & Yespolova, 2020), curricula (Planning of research activities at NAO “Karaganda Technical University,” 2021) and legislative acts (Address by the President of the Republic of Kazakhstan, Leader of the Nation, N. Nazarbayev “Strategy Kazakhstan-2050”: New political course of the established state,” 2012) were analyzed to identify the position of the development of research competence of future primary-schoolteachers.

Results

To investigate the student research competence of future teachers, it is important to analyze the research characteristics that they possess or acquire in educational scenarios. These abilities are necessary at the stage of student formation, the success of their results, and for future work with elementary-school students. The results of the questionnaire are presented in Table 1.

Table 1: Analysis of the research competence of future teachers.

Research competence		Character traits	Number of points	Result (average points)
1	Qualities	Organization; communication skills; initiative; creativity; innovativeness; independence; persistence; ability to cooperate; flexibility; attentiveness.	0-10	7
2	Experience	Knowledge of research concepts; effective means of scientific research; methods of innovative research activities. Skills 1: use of personal experience; use of information; mastery of data analysis and classification; application of results in professional activities. Skills 2: searching for information in various resources; using information for self-development.	0-9	8
3	Focus	Professional interest; participation in international scientific research; creative search; cognitive search; self-expression; pedagogical self-realization.	0-6	4
4	Reflection	Self-analysis; self-control; self-regulation; introspection; building a personal trajectory of professional growth.	0-5	4
5		Type of research work: project research work in the classroom; coursework; diploma; research paper for conferences; competitions; individual research during internship; research work on topics in a specially allocated time.	0-7	3

Source: created by the authors based on Yaw and Serrano (2022).

Using statistical analysis, the authors assessed the research skills of prospective primary-schoolteachers, and pinpointed the areas where students demonstrate exceptional performance, or require continued improvement (Table 2).

Table 2: Statistical analysis of the prevalence of specific research competence.

Section	Mean Score	Median Score	Mode Score	Percentage above Threshold (%)
Character traits (out of 10)	7.24	7	7	70 (threshold: 6)
Experience (out of 9)	6.31	6	6	89 (threshold: 5)
Focus (out of 6)	3.86	4	4	67 (threshold: 3)
Reflection (out of 5)	3.55	4	4	80 (threshold: 3)
Type of research work (out of 7)	2.76	3	3	42 (threshold: 2)

According to the obtained results of the questionnaire survey of the students in pedagogical universities, it is observed that in the context of personal qualities, 40 students, which is 70%, possess the relevant characteristics that are necessary, both for the implementation of research activities and for the future promotion of research skills of young schoolchildren. In the direction of research experience, 89% of students (51 participants of the questionnaire) possess or have obtained, the relevant knowledge, skills, and abilities when studying in a higher educational institution, which indicates the quality pedagogical training of a future specialist. Regarding students' orientation, 67% of students (39 participants of the research) consciously participate in educational-research activities and understand its importance for future instructional formation. Regarding the reflexion of students of pedagogical specialities, 80% of the survey participants (46 students) noted that they possess at least four reflexive properties that are necessary in the conditions of performing difficult research tasks. Despite the significant results for the characteristics of research competence possessed by the questionnaire participants and future teachers, only 42% of the listed works are involved in the context of their participation in research work. This may indicate insufficient encouragement of students to participate in educational-research activities, or low motivation to obtain results in this direction.

Based on the foundations of research activity considered in the course of scientific work, the analysis of research competencies of future educators, as a set of descriptors characterizing abilities, skills, and knowledge, was conducted. Thus, a student with established research competence should master a good deal of knowledge that will facilitate reorientation in a complex research environment, as well as ideas about the means and principles of research activity. At the same time, the student should be able to give an adequate assessment of the issues in the real space, form the goal, objectives and results, separate the main analytical elements from the secondary supporting elements, create logical chains and conclusions, identify the causes and consequences of certain processes and phenomena, work on research projects, and apply research skills at the stage of problem-solving. It is also important to be able to solve questions in the direction of scientific and educational industries and to perform individual search activities at different levels of research. Based on all of the above, a student with well-formed research competence should master the basic tools and techniques of scientific research, have the ability to realize experimental tasks, possess exceptional computer literacy, understand scientific design skills, and be able to retrieve information using various resources.

Given the obtained results of the empirical study, the interrelated, recommended levels of formation regarding the research competence of students of pedagogical educational institutions were investigated. The first level is analytical and was conducted in the first year of study. Its main mission is to activate student inclusion in various types of reflexive research and pedagogical practice, foster motivation and interest in mastering the minimum necessary set of theoretical and methodological knowledge, become proficient in analytical skills and focus students' attention on the predictive component of research work. The second level is value-based and is introduced in the second educational course. It consists of student analysis and awareness of the acquired experience, comprehension of the meaning of professional formation, as well as formation of the meaningful behaviour of research work as a personal value. This is how the basis for self-realization and designing a research idea in practice is formed. The third level is project-based and is implemented for third-year students. At this stage, students are immersed in modernized research work. Thus, students evaluate and consolidate the innovative bases of behaviour on self-concept, search for personal style, and form a value attitude to society and to themselves, as an important participant of the pedagogical industry, which is expressed in the changing manifestations of behaviour. At this level, the student's value orientations are formed, and the role of research competence in the implementation of future pedagogical activity becomes clear. The fourth level is called the realization level, which is characteristic of the fourth-year education students, and consists in the implementation of the individual position in the research direction. Research competence, which procures special meanings for future specialists, develops new stimuli, along with significant goals and consequences of these activities. In the conditions of self-formation, there are reassessments by students of the manifestations of their own research knowledge and skills of scientific cognition and improvement of pedagogical space, as well as formation of personal style, regarding the implementation of research work. The transition from one level to the next interacts with the growth of students' research skills as future teachers to a new effective stage. Each subsequent level has a relative end, consisting in obtaining certain results of the stage of formation and qualitative character. The development of some attributes forms the conditions of transition to a higher and qualitative stage.

The obtained results show that the quality and effectiveness of the stage of formation, and the development of research competence in future teachers at all levels of education are realized in the conditions of providing a variety of factors. These would include the orientation of students' training on the improvement of research skills, along with active information about their achievements in the direction of scientific methodology, didactics, pedagogy, and psychology. In addition, the development of skills in the application of innovative technologies, introduction of the results of research works into practice, and the growth of research skills in the field of teaching and learning, were also indicated in this study.

Recommendations for attracting future teachers, in addition to the disclosure of creative potential, education of comprehensively developed specialists, and other characteristic qualities of research competence were identified., The types of motivation were manifested by high grades or automatic crediting of points during examinations. In addition, there was a social component that included the possibility of new acquaintances, ongoing support, and the constant accompaniment by a teacher. The students also benefitted from the opportunity to choose a supervisor. Their training, courses, and the prospect to participate in international research events, competitions, conferences, as well as the likelihood of participation in international research activities also influenced the desire for students to become teachers., Thus, it can be summarized that when encouraging students to research, teachers and educational institutions should apply, and combine, different types of motivation, among which are social, professional, psychological, educational, and material.

Discussion

Teachers' research competencies contribute to their ability to synthesize knowledge through experimental activities, and to gain new, positive or negative, experiences. These encounters form new skills and knowledge, which contribute to the construction of a strategic approach to self-development by acquiring personal and professional self-improvement. At the same time, the degree of pedagogical readiness grows. This is how teachers can achieve professional competencies in the modern, changing arena of academia. Self-education has a direct influence on teachers' development of pedagogical skills. Modern primary-schoolteachers must continuously improve themselves, focusing on the learning needs of students and constant communication with students and their parents. In addition, it is envisaged that responsible, organized, and creative teachers, who work on self-development, can obtain a measure of academic freedom. They will be able to develop individual educational programs, choose class materials, manuals, educational strategies, methods, and other means of teaching. In this way, they can actively express their personal professional position. The state, and the educational institution itself, will benefit from these teachers' creative approaches. This will cultivate a modernized role for teachers, who will now be able to be moderators, mentors, and coaches in the personal educational trajectories of their students.

The understanding of research competence in students of pedagogical specialization was extensively explored by Ayala (2020). Ayala's findings highlighted that research competence is a multifaceted professional trait that integrates motivation for scientific inquiry, mastery of pedagogical research methods, and significant personal characteristics, such as innovative thinking and creativity. This perspective aligns well with the results of this study, which also emphasized the motivational aspect as a key component in developing research competence among future specialists. However, Ayala's work would benefit from a more detailed definition of how creative and innovative thinking specifically applies to pedagogical activities. Similarly, Sernaqué et al. (2023) underscored the importance of research competence within the broader context of pedagogical competencies. They identified critical components, including the application of scientific knowledge in practice, along with the understanding of research methodology, history, and methods. This study corroborates these findings by demonstrating that research competence involves essential knowledge and skills that are fundamental to professional pedagogical activities. The emphasis on practical application and scientific methodology supports the development of professionalism, as echoed in both studies.

In examining digital pedagogical competencies, Hauck et al. (2020) characterized research competence as a complex psychological system encompassing various integral human traits that enhance effectiveness in the academic environment. While this view acknowledges the psychological aspects, it diverges from these findings by not fully addressing the broader scope of research activities in education. This study suggests that research competence also includes technical skills and methodological knowledge, beyond the psychological dimension, which are necessary for effective pedagogical practice. The study by Hegde and Karunasagar (2021) focused on the formation of research competence in undergraduate students, highlighting the necessity of mastering research methodologies, hypothesis formation, and organizing experimental tasks. Their conclusions agree with these results, which emphasize the importance of the motivational component, and the general skills that are required for conducting research. Both studies recognize the need for a systematic approach to research activities and the practical implementation of these skills in educational settings.

Marrs et al. (2022) explored the perceived research competence of young scientists, asserting that modern educational paradigms promote a value-based relationship with professional training, enabling the development of individual research trajectories. This aligns with findings that emphasize the importance of personalizing research activities according to

individual capabilities and professional demands. Marrs' study and this research both highlight the significance of accommodating individual paces, strategies, and plans in the research process, which enhances the overall professional development of future teachers. Jamieson and Saunders (2020) considered the contextual basis for developing research competence, describing it as an integrated property that includes motivation, value attitude, and a system of necessary skills and knowledge. This study supports this perspective, particularly in recognizing the role of motivation and the comprehensive set of skills, which are required for effective research. However, Jamieson and Saunders' work does not sufficiently address the importance of involving students in research activities, which this study identifies as crucial for developing a robust research competence among future teachers. Lastly, Epstein et al. (2023) examined the role of research competence in the careers of young scientists, concluding that it is a vital element of both general and professional education. Their findings underscore the practical significance of research activities in solving academic problems and shaping the educational process according to modernized value objectives. This is consistent with this study, which also highlights the practical application of research skills in professional pedagogical contexts, and the impact of these skills on educational outcomes.

The contributions of Kozhevnikova and Kozhevnykov (2024) provide a comprehensive framework for understanding research competence in future primary-schoolteachers. The authors emphasis on the relationships between knowledge and practice highlights the importance of integrating theory and practice in teacher education. Together, these perspectives suggest that research competence in future primary-schoolteachers should be viewed as a multifaceted attribute that encompasses not only technical skills, but also critical reflection, collaborative learning, and active engagement in the research process. By fostering these competencies, teacher-educational institutions can better prepare future instructors to address the complex challenges of modern classrooms and contribute to the ongoing development of educational strategies and wisdom.

In summary, the comparison of these studies, with this current research, highlights the intricate and varied features of research competence in aspiring elementary-schoolteachers. While the importance of integrating theoretical knowledge with practical skills is well recognized, this study emphasizes the crucial requirement for active student involvement in research activities, and the value of customized approaches to improve research proficiency. This investigation adopts a holistic approach, considering not just psychological or methodological factors, but also motivational variables, technical abilities, and the feasible application of research skills in educational settings. This all-encompassing approach aligns with the evolving demands of modern education and underscores the need for teacher-training programs to not only develop research abilities but also facilitate the development of a research-oriented mindset among future primary schoolteachers.

Conclusions

The results presented in this paper emphasize the crucial need for cultivating research proficiency among prospective primary-schoolteachers. The findings indicate that although students exhibit a strong basis in research skills, there is a requirement for increased involvement and motivation to fully actualize their research capabilities. The empirical evidence obtained from the questionnaire survey reveals several significant domains in which students demonstrate exceptional performance, such as personal attributes and research expertise. However, it also exposes areas that need additional improvement, such as active engagement in research endeavours.

The examination of research competencies among prospective teachers reveals that a considerable percentage of students exhibit the essential personal characteristics and have obtained pertinent knowledge and skills during their pedagogical education. Nevertheless, the limited engagement in research endeavours indicates a requirement for more effective motivational techniques and support structures within educational establishments. The proposed comprehensive framework, consisting of four levels—analytical, value-based, project-based, and realization—provides a systematic method for fostering research competencies throughout the educational process.

It is crucial to cultivate research proficiency among upcoming elementary-schoolteachers to facilitate their professional development and enhance educational methodologies. Colleges of teacher education should give top priority to the cultivation of research skills and establish a conducive atmosphere that promotes active participation in research endeavours. In doing so, they can enhance the readiness of prospective educators to tackle the intricacies of contemporary classrooms and make valuable contributions to the continuous progress of educational methodologies and understanding. The recommendations outlined in this study provide pragmatic measures to accomplish this objective, guaranteeing that upcoming primary-schoolteachers are adequately prepared to address the requirements of a dynamic and changing educational environment.

Future research should explore the implementation of these recommendations to further develop the research competencies of future primary-schoolteachers. The data obtained from this study can be instrumental for specialists in creating pedagogical manuals and textbooks aimed at training future educators. By adopting these strategies, the research competencies of future primary-schoolteachers can be significantly enhanced, benefiting the educational landscape.

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