The importance of interdisciplinary Psychology and Pedagogy seminars in the training of primary school teachers

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Abstract
The relevance of the study is determined by the need to enhance the professional competence of future primary school teachers using an interdisciplinary approach. The aim was to develop and implement an interdisciplinary seminar on psychology and pedagogy and assess its effectiveness. The research employed the following methods: pedagogical experiment, questionnaires, observation, and statistical data processing. In the experimental group, an increase in the high level of competence to 50% and a decrease in the low level to 6% were recorded. The obtained results indicate a positive impact of the proposed seminar format on the future teachers' training. The academic novelty is the first-time implementation of the methodology of interdisciplinary training in the context of primary school teacher training. A quantitative comparative analysis of the levels of professional competence before and after participation in interdisciplinary seminars was applied, supported by statistical methods and empirical tools. The discussion of the results includes a comparative synthesis with the conclusions of Domina, Gutareva and Sedova (2020), Debre *et al.* (2022), Wang *et al.* (2020), and other reseachers to ensure contextual relevance and theoretical justification. Research prospects include adapting the seminar to other levels of education and studying its long-term impact on the teachers' professional development.

Keywords
interdisciplinary seminar; Psychology and Pedagogy; primary school teachers; professional development; competence.

A importância dos seminários interdisciplinares de psicologia e pedagogia na formação de professores do ensino fundamental

Resumo
A relevância do estudo é determinada pela necessidade de aprimorar a competência profissional de futuros professores do ensino fundamental utilizando uma abordagem interdisciplinar. O objetivo era desenvolver e implementar um seminário interdisciplinar sobre Psicologia e Pedagogia e avaliar sua eficácia. A pesquisa empregou os seguintes métodos: experimento pedagógico, questionários, observação e processamento estatístico de dados. No grupo experimental, foi registrado um aumento no alto nível de competência para 50% e uma diminuição no baixo nível para 6%. Os resultados obtidos indicam um impacto positivo do formato de seminário proposto na formação de futuros professores. A novidade acadêmica é a implementação inédita da metodologia de treinamento interdisciplinar no contexto da formação de professores do ensino fundamental. Foi aplicada uma análise comparativa quantitativa dos níveis de competência profissional antes e depois da participação em seminários interdisciplinares, apoiada por métodos estatísticos e ferramentas empíricas. A discussão dos resultados inclui uma síntese comparativa com as conclusões de Domina, Gutareva e Sedova (2020), Debre *et al.* (2022), Wang *et al.* (2020) e outros pesquisadores para garantir relevância contextual e justificativa teórica. As perspectivas de pesquisa incluem adaptar o seminário a outros níveis de educação e estudar seu impacto a longo prazo no desenvolvimento profissional dos professores.

Palavras-chave
seminário interdisciplinar; Psicologia e Pedagogia; professores do ensino fundamental; desenvolvimento profissional; competência.

La importancia de los seminarios interdisciplinares de Psicología y Pedagogía en la formación del profesorado de primaria

Resumen
La relevancia del estudio radica en la necesidad de fortalecer la competencia profesional de los futuros docentes de primaria mediante un enfoque interdisciplinario. El objetivo fue desarrollar e implementar un seminario interdisciplinario sobre psicología y pedagogía, y evaluar su efectividad. La investigación empleó los siguientes métodos: experimento pedagógico, cuestionarios, observación y procesamiento estadístico de datos. En el grupo experimental, se registró un aumento del 50% en el nivel alto de competencia y una disminución del 6% en el nivel bajo. Los resultados obtenidos indican un impacto positivo del formato de seminario propuesto en la formación de los futuros docentes. La novedad académica radica en la implementación por primera vez de la metodología de formación interdisciplinaria en el contexto de la formación de docentes de primaria. Se aplicó un análisis comparativo cuantitativo de los niveles de competencia profesional antes y después de la participación en seminarios interdisciplinarios, con el apoyo de métodos estadísticos y herramientas empíricas. La discusión de los resultados incluye una síntesis comparativa con las conclusiones de Domina, Gutareva y Sedova (2020), Debre *et al.* (2022), Wang *et al.* (2020) y otros investigadores, para garantizar la relevancia contextual y la justificación teórica. Las perspectivas de investigación incluyen adaptar el seminario a otros niveles educativos y estudiar su impacto a largo plazo en el desarrollo profesional de los docentes.

Palabras clave
seminario interdisciplinario; Psicología y Pedagogía; maestros de educación primaria; desarrollo profesional; competencias.

1 Introduction

The educational process is important for the development of society, so the training of qualified teachers plays a key role in the education system. The training of primary school teachers is important for the socialization and development of children (Mulligan *et al*., 2024). Professional training should include not only knowledge, but also the development of psychological, pedagogical, and methodological skills. Successful professional activity requires the constant development of professional thinking, creative skills and emotional intelligence (Demchenko *et al*., 2021). Individual value orientations are based on universal values that should be inherent in teachers (Brekhunets; Honcharenko, 2022).

Interdisciplinary psychology and pedagogy seminars combine knowledge of psychology, pedagogy, teaching methods. They help to form a comprehensive teachers' understanding of teaching and upbringing. This approach improves professional knowledge and helps to adapt to the realities of modern education (Wang and Sang, 2024).

The aim of this study is to assess the effectiveness of interdisciplinary psychology and pedagogy seminars to increase professional competence in the training of primary school teachers.

Empirical objectives: (1) identify the level of professional competence of future primary school teachers before and after participation in interdisciplinary seminars; (2) assess changes in the motivational value component of the participants' professional readiness; (3) analyse the impact of participation in the seminar on the future teachers' ability to apply integrated pedagogical technologies in the educational process; (4) summarize empirical data taking into account theoretical approaches to competency-based learning; (5) ensure the objectivity of the results by involving an independent expert for an external assessment of the effectiveness of interdisciplinary seminars and carry out long-term observation of the dynamics of changes in the participants' professional competence.

2 Literature review

The reviewed literature covers a wide range of issues, including: interdisciplinarity in pedagogy, integration of STEM education, development of teacher professional

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competencies, and innovative teaching methods. One of the key aspects of training future primary school teachers (FPST) is to ensure effective interdisciplinary interaction between psychological and pedagogical subjects. An important element of this process is interdisciplinary psychology and pedagogy seminars that contribute to the development of professional competencies (PC) and integration of knowledge. Tkachuk *et al.* (2021) explores the role of modern intelligent information systems in the educational activities of teachers. The author emphasises that technological progress is significantly changing the methodology of teacher training, in particular through the use of digital platforms to organise the learning process. These technologies can be useful in conducting interdisciplinary seminars (IS), as they facilitate interaction between students and teachers of different disciplines, providing access to a wide range of educational materials.

Kovalchuk *et al.* (2023) analyse the motivational component of the development of pedagogical skills of future teachers of labour education and technology. The researchers emphasise the importance of intrinsic and extrinsic motivation in the learning process, in particular through participation in scientific discussions and seminars. This emphasises the importance of interdisciplinary psychology and pedagogy seminars, which can help to increase the motivation of future teachers by interacting with different approaches to teaching, discussing pedagogical and psychological aspects of working with students, and involving modern technologies in the learning process.

Sehnem *et al*. (2020), Santaolalla *et al.* (2020) focus on the importance of integrating different subjects to develop sustainable management and learning models. Sehnem *et al.* (2020) emphasize the connection between interdisciplinarity and sustainability, while Santaolalla *et al.* (2020) emphasize the effectiveness of innovative educational projects. Liu, Watabe and Goto (2022) add that the integration of sustainable development issues contributes to improving the quality of education. In turn, the study by Chen, Lin and Chang (2020) emphasize the complexity of developing interdisciplinary programmes because of the need to integrate different pedagogical approaches. Zhumash *et al.* (2021) examine the structures, criteria and levels of PC of primary school teachers, particularly in the context of pre-service training. They identify the importance of a detailed assessment of these competencies for future teachers. This view is shared by Kenesbekova *et al*. (2019), who also emphasize the importance of self-learning, as well

as organizational and pedagogical conditions for the successful training of future teachers. Yehya (2020) believes that technology should be integrated into the teaching process to increase efficiency, which is also supported by the study by Harunasari and Halim (2019) on engaging students through digital platforms. At the same time, Vasiliene-Vasiliauskiene *et al.* (2020) draw attention to the difficulties associated with project-based learning, which may not always be compatible with the technological approaches mentioned by Yehya and Harunasari. Radid, Lotfi and Akoul (2020) focus on the impact of academic performance on students' perceptions of competence and self-esteem, which has something in common with the ideas about competence assessment and development expressed by Zhumash *et al*. (2021). All authors emphasize the importance of different approaches to the development of professional competencies, but differ in their emphasis on technological aspects and specific teaching methods.

Wu *et al*. (2019) investigate the use of design thinking in online training of future STEM teachers, emphasizing its importance for the development of creative thinking and solving complex problems. The authors argue that design thinking contributes to the effective integration of interdisciplinary knowledge. In turn, Wang *et al.* (2020) emphasize the importance of collaboration between teachers as a key factor for the implementation of STEM integration, emphasizing that joint work facilitates overcoming methodological and organizational barriers. However, Wang *et al.* (2020) argues that the results may be limited without effective communication between teachers.

Tytler *et al.* (2023) propose an innovative pedagogy of representation that combines science and mathematics for primary school students. Falloon *et al.* (2020) add that the development of STEM literacy requires a comprehensive framework that covers all levels of education. Feser and Michalik (2023), who studied the interdisciplinary competence of future teachers and emphasized the importance of interest and a sense of belonging, their thoughts correlate with the view of Yakavets *et al*. (2023), who explore the teachers' role in transforming educational practices in Kazakhstan.

They note that successful reforms require the teachers' active participation in the development of new approaches, although changes often face resistance because of a lack of necessary resources and support. A significant number of studies agree on the importance of implementing innovative approaches to teaching, but interdisciplinarity and the integration of new methodologies require significant resources, which often limits their

effectiveness. Studies by Tytler *et al*. (2023) and Wu *et al.* (2019) offer promising methodologies, but their practical implementation faces challenges such as low teacher training and lack of support from the administration. The literature review demonstrates that effective education requires an interdisciplinary approach, innovative methodologies, and teachers' active participation in reform processes. At the same time, the successful implementation of these approaches requires systemic support, in particular at the level of curriculum development, teacher training, and resource provision.

3 Methods and materials

3.1 Research design

The experimental study was conducted in three stages: summative, formative, and control. At each stage, appropriate methods were used to assess the effectiveness of the interdisciplinary psychology and pedagogy seminar for primary school teachers.

1. The summative stage. This stage provided for the collection of preliminary data on the level of professional competencies of the participants before the start of the seminars. The initial level of knowledge and skills of future teachers, as well as their psychological characteristics were identified.

2. The formative stage. The data collection from the participants was followed by the implementation of a programme of psychology and pedagogy seminars aimed at integrating knowledge of psychology, pedagogy, and teaching methods. The seminars included lectures, practical classes, and discussions. The seminar programme was designed to promote the development of skills in an integrated approach to teaching and increase psychological readiness for learning. The programme of the author's IS Psychology and Pedagogy in Action: Competence Development is presented in Table 1. The seminar programme was organized over a month and included 4 meetings lasting 4-5 hours. The seminars were held once a week, which allowed participants not only to delve deeper into each topic, but also to have time to reflect on the knowledge gained and apply it in pre-graduate practice. These seminars were held for the EG only in order to identify differences in both groups.

Table 1 – The programme of the IS Psychology and Pedagogy in Action: Competence Development (continue)

Day 1: Psychological foundations of a teacher's professional activity		
Time	*Topic*	*Description*
9:00–9:30	Opening of the seminar: Introduction to the programme and objectives of the seminar	Introducing the participants to the seminar programme, objectives, and requirements. Discussing the goal of integrating subjects
9:30–11:00	Fundamentals of psychology in pedagogical activity: The role of psychology in the teacher's work	Lecture on the psychological aspects of a teacher's work, including emotional intelligence, stress, and student motivation
11:00–11:15	Break	
11:15–12:45	Psychology of communication and pedagogical influence: strategies for effective interaction	Training on classroom communication, emotional intelligence development, and classroom management techniques. Practical exercises
12:45–13:30	Lunch break	
13:30–15:00	Psychological aspects of working with children: Features of child psychology	Lecture on the age specifics of children, stages of development, psycho-emotional needs of students. Discussion of crisis periods
15:00–15:15	Break	
15:15–16:45	Practical part: Psychological exercises for the development of emotional intelligence	Practical tasks to develop teachers' psychological readiness to work with students, work in groups
16:45–17:30	Results of the day: Discussion of the results of the seminar	Discussion of the gained knowledge and impressions of the participants, preparation for the next day
Day 2: Pedagogical strategies and teaching methods in primary school		
9:00–9:30	Introduction to pedagogical activity: The teacher's role in the educational process	Lecture on the importance of the teacher's role in shaping the learning environment and a positive image of learning for children.
9:30–11:00	Pedagogical strategies: active learning methods	Overview of various active learning methods, such as the project method, interactive technologies, differentiated learning
11:00–11:15	Break	
11:15–12:45	Using multimedia and interactive technologies in the classroom	Practical lesson: How to use modern technologies (electronic boards, multimedia presentations) in pedagogical practice
12:45–13:30	Lunch break	
13:30–15:00	Theories of learning: shaping students' ideas and skills through pedagogical approaches	Lecture on basic pedagogical theories: constructivism, integrative approach, problem-based learning
15:00–15:15	Break	
15:15–16:45	Pedagogical exercises: Practical application of techniques in the classroom	Workshop on pedagogical techniques: creating lesson plans, games for developing skills
16:45–17:30	Results of the day: Analysis of results and discussion of experience	Discussion with participants, discussing the methods used and strategies that they plan to apply in the classroom
Day 3: Integration of psychological and pedagogical knowledge and practices		
9:00–9:30	Introduction to Integration: Psychological and Pedagogical Approach to Learning	Lecture: How to combine psychological and pedagogical knowledge for effective teaching and support of students in the classroom
9:30–11:00	Theories and Practices of Knowledge Integration: How to Combine Pedagogical and Psychological Methods	Practical seminar on integrating teaching methods and psychological aspects into the educational process
11:00–11:15	Break	
11:15–12:45	Psychological and Pedagogical Diagnostics: Assessment of Professional Competencies	Assessment of participants' knowledge, use of psychological techniques to develop skills in pedagogical activity

Table 1 – The programme of the IS Psychology and Pedagogy in Action: Competence Development (conclusion)

12:45–13:30	Lunch break	
13:30–15:00	Interactive Methods: How to Create a Supportive Atmosphere for Students	Workshop on interactive teaching methods: development and use of activity approaches to develop student motivation
15:00–15:15	Break	
15:15–16:45	Problematic Situations in Pedagogical Practice: Solutions through Knowledge Integration	Analysis of real pedagogical situations, application of theoretical knowledge in practice
16:45–17:30	Seminar Results: Discussion of Results and Impressions	Learning outcomes: discussion of changes in teacher training, exchange of experience and preparation for future challenges
Day 4: Summary and development of professional readiness for innovation		
9:00–9:30	Results of the psychological and pedagogical masterclass: Are we ready for change?	Lecture: Analysis of changes in teacher training that occurred after the seminar, assessment of the level of professional readiness
9:30–11:00	Developing teachers' professional competencies through continuous learning	Discussion of the importance of continuous professional development and the role of seminars in this process
11:00–11:15	Break	
11:15–12:45	Presentation of the results: Group work	Presentation of the results of the participants' work in groups: implementation of the acquired knowledge into everyday practice
12:45–13:30	Lunch break	
13:30–15:00	Discussing future challenges: planning	

Source: Developed by the authors (2025).

3. Control stage. After the seminars were completed, a re-assessment of the participants' competence level was carried out. The purpose was to identify changes that occurred in their professional training after participating in the seminar.

3.2 Research methods

The study employed various methods to determine the PC of students majoring in Psychology and Pedagogy. The author's questionnaire The Study of Motivation for Learning in Higher Education Institutions (HEIs) with 15 questions was used. The survey included closed and open questions regarding the motives of learning, attitude to the profession of a teacher, and expectations from education. The questionnaire Readiness Scale for Creative and Innovative Activity, which assessed readiness for modern educational technologies, and K. Zamfir's Motivation for Professional Activity method, which assessed the students' intrinsic and extrinsic motivation, were also used.

The method of observing students during the seminars recorded their behaviour and activity. The cognitive component (CC) was assessed using the questionnaire

Pedagogical Technologies in the Activities of Primary School Teachers, which included 10 questions. Analysis of practice reports determined the level of the activity component (AC). The results of the CG and EG were compared to assess the impact of the seminars on professional competencies. Statistical data processing confirmed the reliability of the results through descriptive statistics and correlation analysis. Therefore, the analytical approach to interpreting the research results had an interdisciplinary basis, combining the concept of professional competence (according to Zhumash *et al.*, 2021), the model of motivation of professional activity according to K. Zamfir, as well as the scale of readiness for innovative pedagogical activity. In accordance with these theoretical guidelines, we considered changes in the cognitive, motivational value, and activity components of professional competence not only as statistical shifts, but as manifestations of the internal dynamics of professional development. This approach made it possible to integrate empirical results with theoretical foundations, which added conceptual completeness to the analytical part of the study.

3.3 Sample

The study involved 100 FPST. The participants were students of two HEIs: Taras Shevchenko National University “Chernihiv Collegium” (Faculty of Preschool, Primary Education and Arts, hereinafter — NUChK) and the Municipal Institution “Nikopol Professional Pedagogical College” of the Dnipropetrovsk Regional Council (hereinafter — NPPC). The students were evenly distributed between the CG and the EG, by random selection, 50 people from each institution in each group.

The gender composition of the participants included mainly women, which reflects the general trend in the structure of students majoring in Pedagogy. The main selection criteria were: studying in the 4th year of the bachelor’s degree to become primary school teachers, and voluntary consent to participate in the study.

The CG did not participate in IS, while the EG went through all stages of training according to the developed author’s methodology, which consisted in students taking interdisciplinary psychology and pedagogy seminars. This approach ensured the objectivity of the results and the reliability of the conclusions.

3.4 Instruments

The research instruments were educational materials aimed at developing the professional competencies of the participants, as well as assessing their readiness to introduce innovations into the educational process. Lectures, trainings, workshops, practical classes in psychology and pedagogy, and questionnaires were used to collect qualitative data.

4 Results

To determine the motivational value indicator (MCI) in the structure of PC, the Studying Motivation in HEIs Technique was used, the results of which are presented in Table 2.

Table 2 – Students' motivation for studying in HEIs (%)

Groups	EG		CG	
Motives	Summative stage	Control stage	Summative stage	Control stage
Mastering the profession of a teacher	17	44	22	28
Obtaining knowledge in the field of organizing the educational process	33	39	33	33
Obtaining a document certifying higher education	50	17	44	39

Source: Developed by the authors (2025).

The survey data showed that the motives associated with mastering the profession of EG students were higher in quantitative terms than those of CG students. The growth dynamics of this indicator in EG was more pronounced, from 17% to 44%, while there was a slight increase in the CG. The motives associated with obtaining a document certifying higher education among the EG students decreased from 50% to 17%. In the CG, the decrease in this formal indicator of PC was only 6%, from 44% to 39%. The testing EG students showed that obtaining the profession of a teacher for them is a personally significant goal in their education. The profession of a teacher is important for them and has prospects in their future career. When answering the questions, they also noted that studying subjects is important for mastering the teacher's professional skills. The second diagnostic indicator in the MCI structure was aimed at studying the motivation of professional activity using the K. Zamfir's Motivation for Professional Activity

method, which is based on the concept of external and internal motivation. The results of testing are presented in Table 3.

Table 3 – Study of the motives of professional activity among bachelors of psychological and pedagogical education (%)

Groups	EG		CG	
Levels of motivation	Summative stage	Control stage	Summative stage	Control stage
High	17	44	11	22
Medium	57	50	61	50
Low	28	6	28	28

Source: Developed by the authors (2025).

The study revealed the predominance of internal motives for professional activity in the EG, where their level increased from 17% to 44%. They included such motives as “satisfaction with the process”, “self-realization”, and “achievement of respect”. The level increased from 11% to 22% in the CG. A total of 50% of participants in both groups had a medium level of motivation based on external positive factors. The low level of motivation based on negative external motives was 6% in the EG and 28% in the CG. In the EG, the number of participants with negative external motives decreased from 28% to 6%. The final stage of the study concerned the readiness of primary school teachers to use modern educational technologies. For this purpose, a modified questionnaire Readiness for Creative and Innovative Activities Scale was used. The results are presented in Table 4.

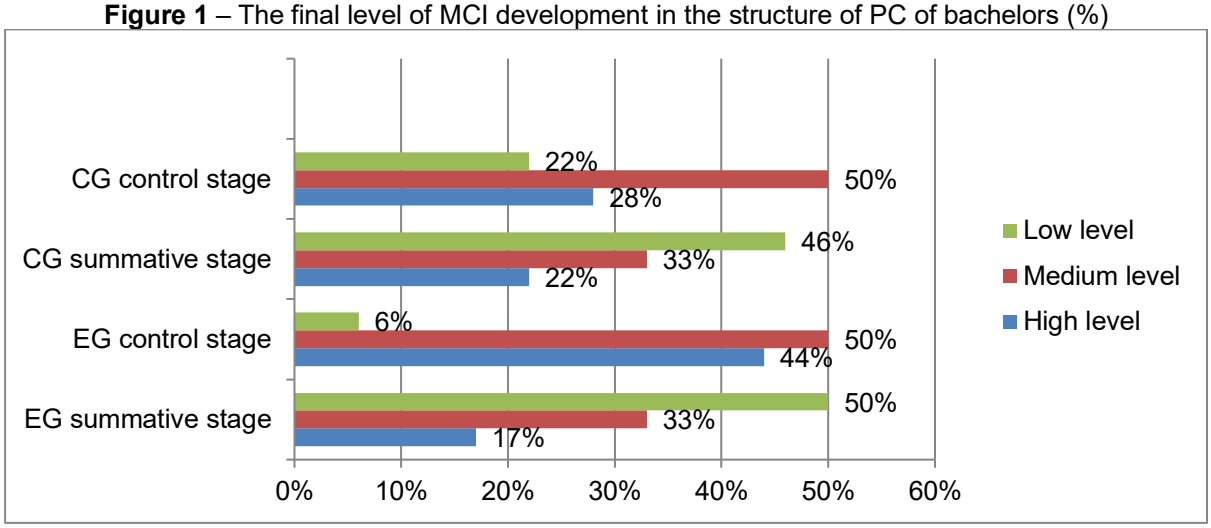
Table 4 – Motivational readiness to implement modern pedagogical technologies in future professional activity (%)

Groups	EG		CG	
Levels of motivation	Summative stage	Control stage	Summative stage	Control stage
High	22	50	22	28
Medium	33	44	28	33
Low	44	6	50	39

Source: Developed by the authors (2025).

The generalization of the survey results shows that the EG there had an increase in the high level of readiness to use modern pedagogical technologies in primary school: from 22% to 50%, while the low level decreased from 45% to 6%. The EG participants highly appreciate the importance of modern teaching methods for increasing the efficiency of the educational process and demonstrate a willingness to overcome difficulties through the use of appropriate technologies, taking into account the level of preparation of students (Figure 1).

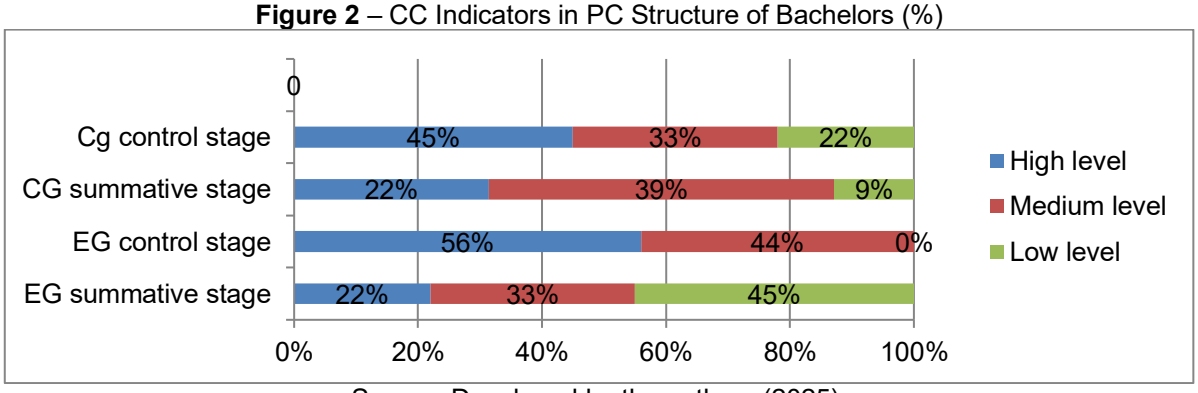
Figure 1 – The final level of MCI development in the structure of PC of bachelors (%)



Source: Developed by the authors (2025).

In the CG, the high level increased only from 22% to 28%, and the low level decreased from 50% to 39%. Although the CG students also recognize the importance of modern technologies, they are less confident in their ability to independently overcome difficulties when using them. High (44%) and medium indicators (50%) in the EG indicate a personally significant position in professional activities with the use of modern educational technologies to organize student learning. The data obtained using the method Pedagogical Technologies in the Activities of a Primary School Teacher to determine the CC are shown in Figure 2.

Figure 2 – CC Indicators in PC Structure of Bachelors (%)



Source: Developed by the authors (2025).

The results of the study show that high indicators prevail among the EG and CG students, however, EG students have 11.1% more high indicators, and there are no low indicators. Analytical materials of practice reports generally reflected the level of proficiency of interns in such skills as constructive, organizational, and communicative. A

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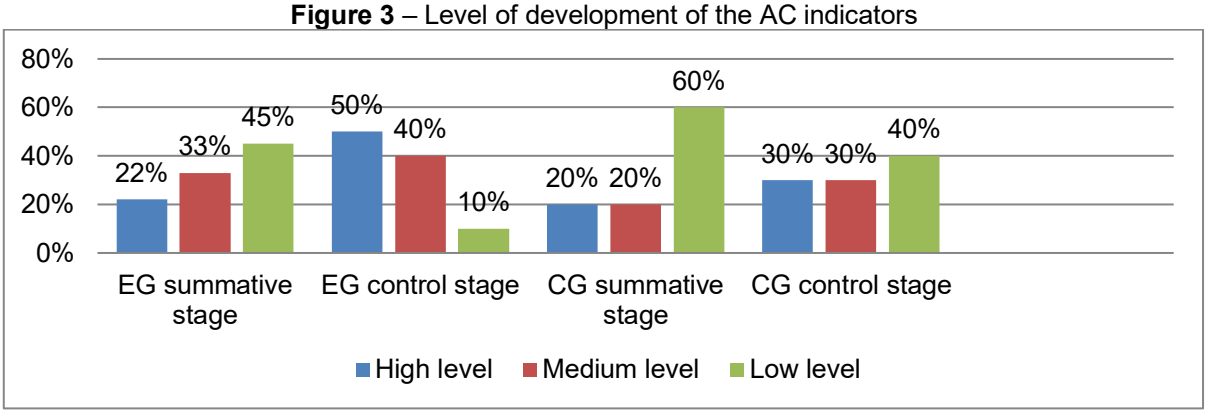
high level of proficiency in pedagogical skills and abilities was revealed during the control stage in 50% of EG students and 30% of CG students (Figure 3).

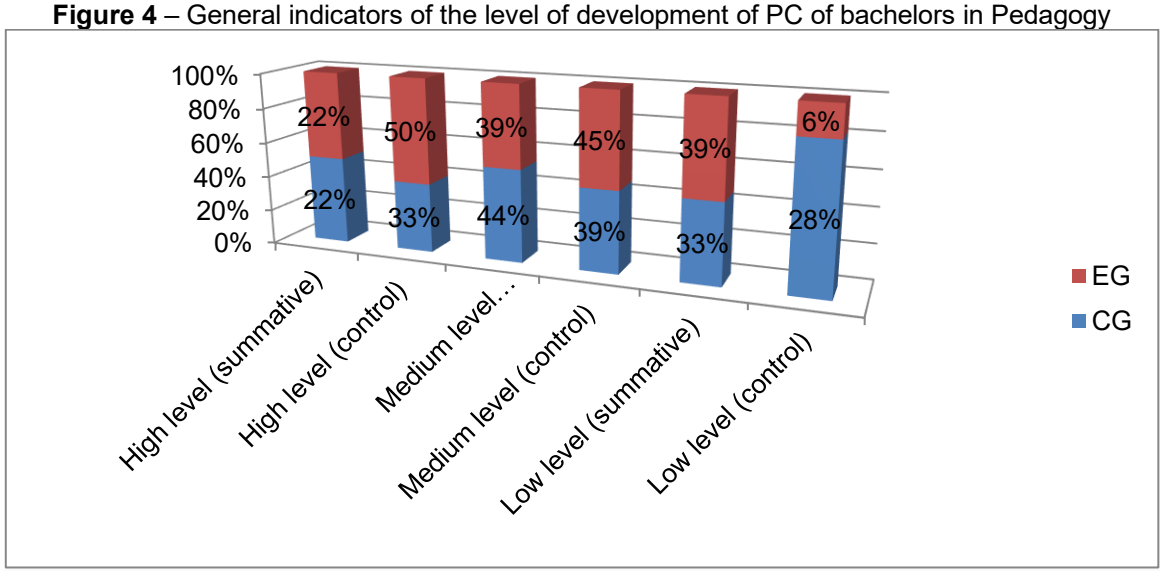
Figure 3 – Level of development of the AC indicators



Source: Developed by the authors (2025).

In the EG, a positive change in the results is observed (an increase from 22% to 33%), which may indicate the effectiveness of the programme. In the CG, the results remain stable at both stages (20% at the summative and 30% at the control stage). The generalization of data from all procedures of the control stage showed that the dynamics of changes in the level of development of PC indicators of bachelors of psychological and pedagogical education is most clearly traced at a high level of development of indicators in the EG (Figure 4).

Figure 4 – General indicators of the level of development of PC of bachelors in Pedagogy



Source: Developed by the authors (2025).

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At the summative stage, 22% of students in the CG and 22% in the EG have a high level of competence, which indicates similar initial data. After the introduction of seminars in the EG, the high level increases to 50% (+28%), and in the CG — by 11%. This indicates a positive impact of seminars on the EG. The medium level in the CG at the summative stage is 44%, and in the EG — 39%. After the seminars in the CG, the average level decreases to 39%, and in the EG — to 45%. In the EG, a positive shift to high indicators is observed. The level of low competence at the initial stage in the CG is 33%, and in the EG — 39%. After the seminars in the CG, the low level decreases to 28%, and in the EG — to 6%. This indicates a significant reduction in low competence in the EG, confirming the effectiveness of IS.

The objectivity of the assessment of the effectiveness of IS was ensured by involving an independent expert in the study — PhD in Pedagogy, Associate Professor of the Department of Pedagogy and Psychology of another higher educational institution, who was not involved in the preparation or conduct of the seminars. His task was to conduct external observation, interview participants, as well as an independent expert assessment of changes in the students' PC level according to agreed criteria. A long-term assessment of the effect of participation in the seminars was also carried out: a repeat survey was conducted and reports on pedagogical practice were analysed three months after the completion of the seminars. The results of the additional assessment are presented in Table 5.

Table 5 – Independent assessment of changes in PC and long-term effect (%)

Indicator / Group	EG (3 months after)	CG (3 months after)
High PC level	48	31
Successful implementation of integrated technologies	46	28
Positive dynamics in mentors' assessments	44	30
Self-assessment of growth in professional confidence	51	33

Source: Independent expert assessment, author's survey (2025).

The obtained results confirm the sustainability of the effect of introducing the seminars. According to the conclusions of an independent expert, the EG participants demonstrated higher confidence, better organization of the educational process, and greater readiness to use integrated technologies. In this way, both internal and external validation of the study was ensured.

5 Discussion

Domina, Gutareva and Sedova (2020) note that interactive cooperation contributes to the formation of professional competencies. In our experiment in the EG, the high level of MCI increased to 44%, which confirms the authors' conclusions about the significance of interactive methods. However, their study did not take into account the aspect of the CC, which in our case increased by 11.1% more in the EG compared to the CG. Debre *et al.* (2022) found that the methodology for developing professional competencies for future teachers of labour training provides a high level of assimilation of pedagogical knowledge. We agree with their conclusions, as our results also demonstrate a significant improvement in the CC in the EG (absence of low indicators). However, their study does not focus on motivational aspects, where we found a significant increase in intrinsic motivation in the EG.

Wang *et al.* (2020) emphasize the importance of interdisciplinary interaction in STEM education. Our study confirms the effectiveness of such an approach, although it covers a wider range of pedagogical competencies. Jakavonytė-Staškuvienė and Mereckaitė-Kušleikė (2023) reveal the importance of integrated learning in primary school; the increased readiness for the implementation of modern technologies by up to 50% in EG confirms the relevance of integration, however, our study focuses on teacher training. Fan (2022) identified key competencies for "maker education"; in our study, student activity in EG increased by 20%, which indicates the effectiveness of the implemented technologies. We also emphasize the importance of the motivational value aspect, which the author did not consider. Chang (2020) emphasizes the competency approach, which is confirmed by our increased motivation in EG by 28%. Frumkina *et al.* (2020) link the integration of subjects with the training level, while our results (50% of the active component in the EG) demonstrate the effectiveness of the interdisciplinary approach, unlike their subject analysis. Humeniuk and Blyznyuk (2022) emphasize the importance of interdisciplinary coordination in teacher training. In our experiment, the use of IS confirms their findings. However, our study also takes into account the CC, which is missing in their analysis. Santaolalla *et al.* (2020) analyses the effectiveness of innovation projects in teacher training. We agree with their findings regarding the importance of innovation, as the high level of the AC increased by 20% in the EG. However, their study does not consider motivational aspects, which are important for our experiment. Similar

results were obtained by Lupak *et al.* (2024), emphasizing the role of the individualized approach in increasing teacher motivation. Martini and Hobold (2024) and Sousa, Colares and Sartori (2025) also emphasize the importance of adaptive interdisciplinary learning models, which is also confirmed by our data.

6 Conclusions

The result of the IS introduction in the EG is a significant increase in PC: the high level increased from 22% to 50%, while in the CG — only to 33%. The low level in the EG decreased to 6%, which indicates the effectiveness of the proposed format. Comparative analysis confirmed a more dynamic growth in the EG compared to the CG. A comprehensive approach to learning, based on the integration of psychological and pedagogical subjects, contributes to the development of both theoretical knowledge and practical skills. The academic novelty of the study is the first-time introduction of the seminar format, which combines different fields of knowledge. The practical value is proven by a statistically significant increase in indicators, which enables scaling the methodology for other educational levels and areas.

6.1 Recommendations

The results of the study give grounds to provide a number of recommendations to improve the effectiveness of primary school teacher training through the introduction of interdisciplinary psychology and pedagogy seminars. First, it is appropriate to improve the interdisciplinary approach in the FPST training by integrating psychology and pedagogy seminars seminars that will contribute to the PC development through the interaction of various pedagogical subjects. Such seminars should cover key aspects of the development of cognitive, motivational value, and AC of professional training.

6.2 Ethical considerations

The study was conducted in accordance with the ethical principles set forth in the Declaration of Helsinki. The study project was approved by the ethics committee of

Municipal establishment, Nikopol Professional Pedagogical College of Dnipro Region Council, as confirmed by protocol Nº 51328. All participants were informed about the purpose of the study and provided written consent to participate on a voluntary basis. All stages of the study were conducted in compliance with the voluntary participation and the anonymity of the data.

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DATA AVAILABILITY

The entire dataset supporting the results of this study has been published in the article itself.

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