

Influence of individualised teaching methods on improving the professional flexibility of future primary school teachers



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Abstract

The study aims to determine the effectiveness of individualised teaching methods for developing future primary school teachers' professional flexibility. The authors have developed individualised learning mechanisms that provide for the development of language competence, as well as mathematical, interdisciplinary and innovative competence. It has been determined that the most significant impact on the development of professional flexibility, in the opinion of teachers and students, was made by language and interdisciplinary competence, which contributed to the clarity of their thoughts. The study results showed the achievement of a high level of information assimilation by future teachers after training (0.74). It was found that individualised learning mechanisms contributed to the formation of developmental individualisation (23%) and creative thinking (22%) in the first place. The work's practical significance is finding effective mechanisms for forming professional flexibility for future primary school teachers.

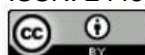
Keywords

educational level; language competence; interdisciplinary competence; innovative applications; creative thinking; emotional stability.

Influência dos métodos de ensino individualizados na melhoria da flexibilidade profissional dos futuros professores do ensino primário

Resumo

O estudo visa determinar a eficácia de métodos de ensino individualizados para o desenvolvimento da flexibilidade profissional dos futuros professores do ensino primário. Os autores desenvolveram mecanismos de aprendizagem individualizados que proporcionam o desenvolvimento da competência linguística, bem como da competência matemática, interdisciplinar e inovadora. Constatou-se que o impacto mais significativo



no desenvolvimento da flexibilidade profissional, na opinião de professores e alunos, foi causado pela linguagem e pela competência interdisciplinar, o que contribuiu para a clareza de seus pensamentos. Os resultados do estudo mostraram o alcance de um alto nível de assimilação de informações pelos futuros professores após a formação (0,74). Verificou-se que os mecanismos de aprendizagem individualizados contribuíram para a formação da individualização do desenvolvimento (23%) e do pensamento criativo (22%) em primeiro lugar. O significado prático do trabalho é encontrar mecanismos eficazes para formar flexibilidade profissional para futuros professores do ensino primário.

Palavras-chave

nível educacional; competência linguística; competência interdisciplinar; aplicações inovadoras; pensamento criativo; estabilidade emocional.

Influencia de los métodos de enseñanza individualizados en la mejora de la flexibilidad profesional de los futuros profesores de primaria

Resumen

El estudio tiene como objetivo determinar la eficacia de los métodos de enseñanza individualizados para desarrollar la flexibilidad profesional en los futuros profesores de primaria. Los autores han desarrollado mecanismos de aprendizaje individualizados que proporcionan el desarrollo de la competencia lingüística, así como de la competencia matemática, interdisciplinar e innovadora. Se determinó que el impacto más significativo en el desarrollo de la flexibilidad profesional, en opinión de profesores y estudiantes, lo tuvo la competencia lingüística e interdisciplinaria, que contribuyó a la claridad de sus pensamientos. Los resultados del estudio mostraron la consecución de un alto nivel de asimilación de información por parte de los futuros docentes tras su formación (0,74). Se encontró que los mecanismos de aprendizaje individualizados contribuyeron en primer lugar a la formación de la individualización del desarrollo (23%) y el pensamiento creativo (22%). La importancia práctica del trabajo es encontrar mecanismos eficaces para formar flexibilidad profesional en los futuros profesores de escuela primaria.

Palabras clave

nivel educacional; competencia lingüística; competencia interdisciplinaria; aplicaciones innovadoras; pensamiento creativo; estabilidad emocional.

1 Introduction

The knowledge acquired during the training influences professional skills development and ensures professional adaptation in the future. To develop an appropriate level of expertise, it is necessary to ensure an individual approach to each student. This will promote motivation and successful assimilation of information relevant to professional activities (Ostrovskaya *et al.*, 2023; Stringer *et al.*, 2023). Therefore, the chosen area of research is relevant, contributing to the search for approaches to improving the professional flexibility of future teachers.

Pedagogical flexibility reflects activities aimed at the symbiosis of substantive and dynamic characteristics that affect the thinking of future teachers (Martínez-Borreguero *et*

al., 2022) and contributes to finding the most effective approaches to conducting classes and finding problem-solving mechanisms. Professional flexibility development allows mechanisms for improving a situation based on scientific analysis and adjusting it for successful resolution. On its basis, it is possible to form a stable learning system that will facilitate the transfer of knowledge from teacher to student (Isac *et al.*, 2022). It is through an individual approach to learning that the development of pedagogical flexibility can be shaped. This is due to unlocking each student's capabilities, which contributes to activity development and professional skills disclosure (Heirweg *et al.*, 2022).

It is possible to provide individualised mechanisms for teaching future teachers by modernising the education system. This is possible through innovative pedagogical technologies that contribute to achieving the set results (Yuan *et al.*, 2020). Interactivity in learning allows for adapting materials to students' capabilities, enabling them to develop independence and correct knowledge gaps. This approach also allows continuous access to learning materials, contributing to their additional processing and structuring for better learning (Rodrigues *et al.*, 2021). An individual approach to learning allows for fragmented learning, contributing to a more detailed study of the main details (Záhorec *et al.*, 2021).

The theoretical study of this issue allowed us to identify various information on the need to use individualised teaching methods to develop pedagogical flexibility. The gaps in the research are related to the lack of specific mechanisms that would facilitate individualised learning for future teachers. The purpose of the study is to determine the impact of individualised teaching methods on the professional flexibility of future primary school teachers.

The objectives of the study were to develop individualised teaching methods to increase the professional flexibility of future teachers, to identify training mechanisms that will help increase professional flexibility, to determine the level of knowledge acquired by future primary school teachers, and to identify the professional flexibility skills that students have developed during their studies.

2 Literature review

It is possible to provide an individualised approach to training future teachers with the help of mobile devices, which contribute to a creative approach to learning. The

effectiveness of mobile devices is related to the possibility of using a broader approach to learning information. This has allowed for the development of alternative learning that focuses on the initial level of knowledge (Javid *et al.*, 2023). An individualised approach to learning was of the utmost importance during the Covid-19 pandemic. Learning was associated with using modern tools and technologies that facilitate continuous learning. Technologies facilitate constant interaction between teachers and students, which allows them to control the level of knowledge and mastery of a particular aspect of the educational material. The formation of professional knowledge is possible by creating interdisciplinary courses that promote critical thinking. An individualised approach to learning can be ensured by conducting tests among students, which affects the training module's perception level. Based on the test data, it is possible to use the compensatory method for additional knowledge development in a particular subject (Zhang *et al.*, 2023).

Technological development facilitates constantly updating the learning process, which contributes to developing new digital skills. This approach has a positive impact, facilitating constant interaction between teachers and students. It also allows for updating theoretical materials, contributing to learning flexibility. This is further reflected in improving practical skills, focusing on pedagogical support for teachers (Ilomäki *et al.*, 2023a). It is possible to develop the professional skills of future teachers by providing autonomous learning. This approach is possible due to the flexibility of learning, which allows for the formation of diverse classes for successful learning. Changes in the workload can help improve the learning process by focusing on the individual capabilities of students (Sotardi; Brogt, 2023). Innovative learning helps to motivate students to develop professional skills. It also contributes to creating new pedagogical opportunities based on rethinking practical possibilities. Innovative technologies allow for constant variations in the learning process and promote flexibility and relevance of information (Charteris *et al.*, 2022).

STEM education provides more effective mechanisms for forming professional competence, aiming to develop students' mental, cognitive, and personal skills. STEM education based on established indicators helps to understand approaches to solving complex problems. STEM education also ensures the development of student motivation (Valko; Osadchyi, 2021). To ensure an individualised approach to learning, it is necessary to ensure the most effective approaches to teacher training. It is also necessary to choose strategies to promote the development of thinking and interaction between other students.

The peculiarities of the published articles made it possible to determine that in forming teachers' professional competence, the emphasis is also placed on ensuring individualisation in teaching. However, research gaps are related to the focus on using digital technologies in the context of the Covid-19 pandemic.

3 Methodology

3.1 *The research procedure*

The study's first stage was developing individualised teaching methods for training future primary school teachers. The development of teaching methods also considered the possibility of developing professional flexibility. Based on the developed individualised methods, the training took place over six months in 2023. The second stage of the study is related to identifying the learning elements that had the most significant impact on the development of professional flexibility. The results will be obtained after six months of study. The third stage of the study involved determining the level of knowledge acquired by students and the skills of professional flexibility. The results were obtained based on the tasks completed by the students during their studies and the control test.

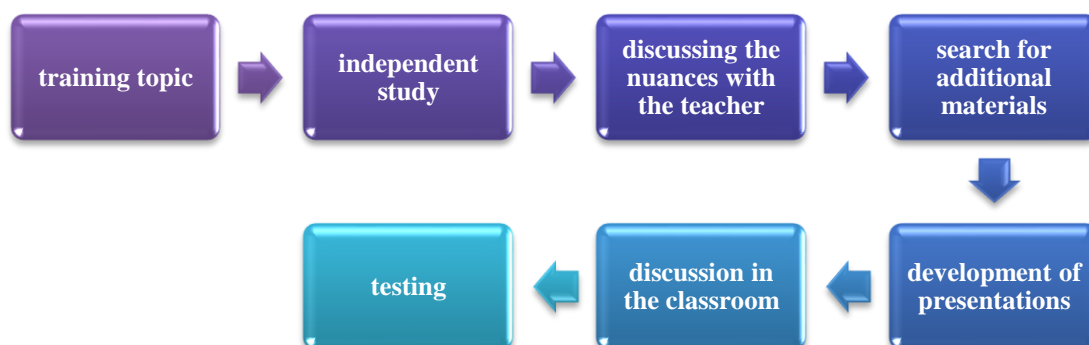
3.2 *Sample selection*

The study involved 179 future primary school teachers at the Khmelnytskyi Humanitarian-Pedagogical Academy. The respondents were represented by 3rd-year students who have already started studying specialised disciplines to develop their professional activities. No additional information on a certain level of knowledge was required to select the respondents, as the study was conducted in entire groups of students in real-life conditions. At the initial stage of the study, the authors planned to involve another 85 second-year students. However, a sufficient number of general academic subjects could have affected the study's validity, which aimed to determine the level of professional competence. Therefore, 85 students were excluded from the study at the initial stage. The study also involved 20 teachers of educational institutions who were directly involved in teaching.

4 Methods

The development of individualised teaching methods to improve future teachers' professional flexibility involved using the analysis method. The analysis method involved studying existing approaches to teaching (Caliskan *et al.*, 2020; Kowalczyk-Walędziak; Underwood, 2023; Özdemir *et al.*, 2023; Poulter; Cook, 2022). At the same time, it was taken into account that the mechanisms developed by the authors were included in each subject during the students' training. The individualisation of learning involved active interaction between students and teachers, which was aimed at mastering the required level of knowledge on a particular topic. The existence of possible gaps in students' knowledge meant finding new mechanisms for presenting information based on the level of students' knowledge (Figure 1).

Figure 1 – Mechanisms for ensuring individualised learning



Source: Own elaboration (2024).

The elements of the learning mechanisms that had the most significant impact on the development of professional flexibility were identified based on data from teachers and students. To determine them, the Likert scale was used, according to which the most crucial element of training should be given 4 points, and the least important one is 1 point. The data collection was made possible by using e-mail, which resulted in additional calculations of the coefficient of variation (Hart-Anderson; Holme, 2023):

$$C_v = \frac{s}{\bar{x}}, \quad (1)$$

s – is the standard deviation of a particular indicator;

\bar{x} – sample expected value of a random variable.

The average data in the results was planned to be indicated to determine the level of knowledge gained by future teachers. The teachers marked them during the entire period of study and based on the results obtained during the control test. The knowledge test was conducted in a written format, which allowed students to concentrate on completing the tasks. The creative assignment also included the development of a curriculum for students in grades 3-4. The results were based on the calculation of the knowledge assessment coefficient. The authors of the article developed the coefficient. The same approach was used to determine the skills developed among students, focusing on professional flexibility.

$$y_0 = \frac{\sum e_c + \sum a_k + \sum u_T}{l(l-1)}, \quad (2)$$

e_c – grade for demonstrated learning effectiveness during the semester;

a_k – grade for the knowledge gained during the test;

u_T – grade for the creative task;

l – the possibility of getting the highest score.

4.1 Data analysis

Data analysis involved additional statistical calculations. The need to include them in the study is related to the possibility of conducting a more correct analysis based on confirmed mechanisms. In addition, the statistical calculation of the J. Phillips coefficient makes it possible to compare the results obtained based on existing methods, not just visually (Zhelnovach *et al.*, 2022). Data analysis was additionally carried out at the second and third stages of the study.

$$p = 1 - \frac{6 \sum d^2}{n^3 - n} \quad (3)$$

d – the difference in the ranks of the established indicators;

n – the total number of indicators included in the study;

$\sum d^2$ – the sum of the squares of the difference in the ranks of the established indicators.

The correlation between the indicators will be observed if the calculated value is equal to or close to 1.

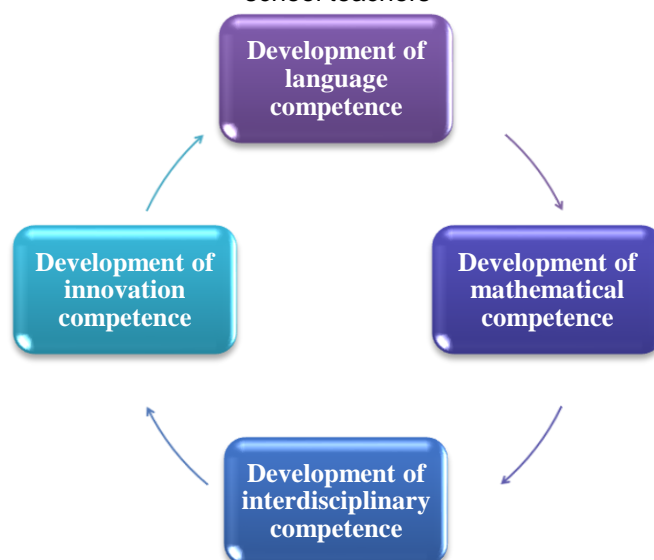
4.2 Ethical criteria

Special attention was paid to ethical issues during the study, as they help to ensure compliance with regulatory standards for the publication of scientific articles. The authors also confirm that all study participants were informed about the stages of the study and their participation in each (The Norwegian..., 2016).

5 Results

The variety of individual teaching methods can influence the achievement of different results. Therefore, the authors primarily developed teaching methods that affect the possibility of individualised learning for future primary school teachers to increase their professional flexibility. The mechanisms of student learning were based on the needs of primary school students (Figure 2).

Figure 2 – Individualised learning mechanisms for developing professional flexibility for future primary school teachers



Source: Own elaboration (2024).

The development of language competence involves the ability to express oneself freely in oral and written form. An independent approach to a more detailed study of the topic was provided during the training. This involved self-expression through writing and

creating lecture notes. Learning was associated with increased professional knowledge, contributing to its free manipulation. The individualised mechanism in learning was related to the personalised discussion of completed assignments by students. Piktochart facilitated the creation of presentations, allowing students to use templates to prepare creative presentations to highlight their vision of a particular topic. The Piktochart app also made it possible to check students' understanding of a specific topic and its presentation more accurately. This is related to the development of communication skills. Active use of the language contributes to a better understanding of the learning material and its correct use. The study of the specifics of the mother tongue also contributes to the development of cultural competence, which develops a conscious understanding of one's abilities for creative expression.

The development of mathematical competence contributed to the development of critical and logical thinking. The individualised learning mechanism in this area was to create experiential learning aimed at forming interdisciplinary development. At this stage, students needed to provide an independent solution to a particular situation, which, through brainstorming, contributed to public speaking. Using the modelling method, students determined mathematical dependencies, which formed mathematical competence. Thus, the students were individually targeted during the training, which involved understanding the most effective approaches to solving problems. During the training, students were required to perform specific mathematical calculations, contributing to generalising individual training results.

Individual approaches to developing interdisciplinary competence involve forming new ideas and students' conclusions. The training was intended to expand theoretical and practical knowledge, which was reflected in the formation of specific patterns. The interdisciplinary approach contributed to searching for new mechanisms for managing educational structures and teaching methods. Cross-curricular competence was associated with studying knowledge blocks from different subjects aimed at informational and emotional enrichment. This contributed to understanding the integrity of all subjects for the possibility of transferring knowledge to future students. This may be due to the development of similar research methods in different subjects, which contributes to expanding cognitive reality.

Developing innovative competence involves finding approaches to express individual mechanisms of presentation of materials. Using the KAHOOT application has made it possible to create different lessons for primary school students, which is associated with ensuring successful learning. The educational content created with the help of KAHOOT can be checked by the teacher directly in the application, eliminating possible errors in learning the material. The innovative competence was implemented using paired teaching methods, which involved the development of intellectual abilities. With the help of these tools, an individual approach of students to understanding educational designers that form professional skills is formed since they can be used to provide an understanding of how to achieve specific goals through a broader systematisation of knowledge.

After focusing on individual learning mechanisms, it was determined which indicators had the greatest impact on increasing professional flexibility (Table 1).

Table 1 – Elements of the curriculum that had the greatest impact on the development of professional flexibility

| Curriculum element | According to the teachers | According to students | Comparison based on the J. Phillips coefficient |
|---|---------------------------|-----------------------|---|
| Formation of language competence | 0,95 | 0,98 | 0,9853 |
| Formation of mathematical competence | 0,82 | 0,87 | 0,9244 |
| Formation of interdisciplinary competence | 0,90 | 0,89 | 0,9897 |
| Formation of innovation competence | 0,84 | 0,85 | 0,9895 |

Source: Own elaboration (2024).

Based on the results of future primary school teachers, it was found that language competence had the most significant impact on increasing professional flexibility. This is because learning the state and foreign languages allowed greater access to various materials. Also, during the training, students were allowed to express their thoughts orally and in writing, allowing them to vary the information. Expressing their opinions permitted for more precise interaction with the teacher and other students, which influenced the development of creative thinking. Interdisciplinary competence was necessary for developing professional flexibility, which is related to the possibility of using materials from different subjects to study a topic. The interdisciplinary competence contributed to developing practical test lessons for primary school students. The innovative competence was also necessary, as it influenced the ability to use various digital technologies to study and process information.

Innovation competence also enhances creativity and contributes to the development of professional skills. Mathematical competence had a lesser impact. It was aimed at developing certain aspects of professional skills but, at the same time, contributed to the development of logical thinking.

The respondents were assessed on the level of assimilation of the information received during the training. The control of the level of knowledge gained involved mastering a particular topic and understanding the principles of professional training in general (Table 2).

Table 2 – The level of knowledge gained by students before and after the study

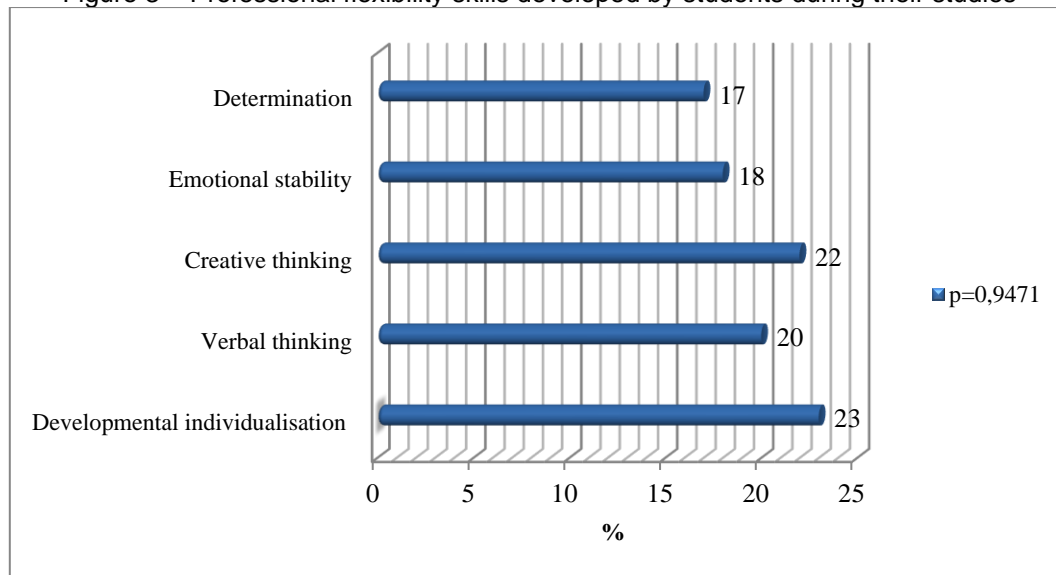
| Level of knowledge gained | Before studying | After studying | Comparison based on the J. Phillips coefficient |
|---------------------------|-----------------|----------------|---|
| High level | 0,70 (31%) | 0,74 (72%) | 1,5874 |
| Sufficient level | 0,52 (38%) | 0,58 (16%) | 1,3219 |
| Intermediate level | 0,44 (27%) | 0,46 (12%) | 1,2938 |
| Low level | 0,31 (4%) | - | |

Source: Own elaboration (2024).

It has been established that most students obtained a high level of information assimilation after the training. The results are related to the availability of an objective assessment and independent information processing. This approach made it possible to ensure a more correct expression of their thoughts. Due to the individualisation of learning, it formed a correct perception of approaches to further education of primary school students. Based on the material studied, students were able to develop practical skills, which are associated with an understanding of transformational approaches to further professional activities. The high level of knowledge reflects the positive dynamics in the perception of educational materials. This is due to its qualitative rethinking, focusing on forming interdisciplinary, linguistic, mathematical, and innovative competence. High results are associated with the students' activity in the learning process, which stimulates independent improvement of a high level of professional competence. A sufficient level is associated with understanding educational information, but there is a need for teacher intervention to clarify certain aspects of a particular topic. The average level of knowledge among future teachers was associated with a lack of understanding of certain topics due to their focus on the traditional way of learning information. This is due to the lack of active participation in preparing students to study a particular topic.

In order to achieve this goal, the authors of the study determined which skills were developed in students. The focus in determining the developed skills was on professional flexibility (Figure 3).

Figure 3 – Professional flexibility skills developed by students during their studies



Source: Own elaboration (2024).

It was found that individualisation was primarily developed among students. This is due to the search for their approaches to the presentation of materials based on the independent study of additional information. Developmental individualisation is associated with correctly using various means and mechanisms to shape the learning process. Adjusting the learning process allowed students to participate more actively and learn the necessary material. Creative thinking was also developed, which is associated with students' motivation to complete tasks. The creative approach was also due to the possibility of developing more professional knowledge by focusing on additional materials. The use of digital technologies contributed to the creative disclosure of students' abilities. Verbal thinking relates to communication, reflecting constant interaction to resolve or highlight a particular issue. Based on the knowledge gained, students could vary it, allowing them to present educational material in a new format. Emotional resilience is associated with dealing with various situations. It also impacts maintaining calm during stressful situations (exams, tests). This allowed for a quick and correct response to unforeseen situations, which is important for future primary school teachers (when explaining tasks, resolving student conflicts, etc.). The students also developed a sense of purpose, which

included the opportunity to study new materials and analyse a particular topic in more detail.

6 Discussion

The emergence of artificial intelligence is bringing about a positive change in the learning process. Artificial intelligence allows for the expansion of the learning process, as well as taking into account potential opportunities and threats. Artificial intelligence can be used to provide targeted learning, which allows you to achieve specific pedagogical goals. Artificial technologies can teach a single module or a complex discipline (Kushnir; Valko, 2023; Lopez, 2023). Innovative learning environments allow for flexibility in learning and interaction between students and teachers. They are also based on the possibility of choosing self-regulating mechanisms that contribute to a better perception of information. This allows for combining different learning models and processes, focusing on subject materials and environments. It also affects the structuring of learning and support for student achievement (Trask *et al.*, 2023). Individual approaches to learning can be provided through a game-based approach, which helps to build student motivation. Gamification is an intelligent learning system that allows you to maintain a cause-and-effect relationship in learning. The advantages of gamification are related to the availability of a specific learning time, softening the links between the material studied and the tasks set. Also, students' basic knowledge is not enough to solve tasks, as they are aimed at a deeper study of the material (Tahir *et al.*, 2022). It is possible to provide an individualised approach to learning in distance education with the help of intelligent technologies. However, due to stressful situations and isolation, students' motivation decreased, reflected in their lack of focus and confidence. Flexible learning was provided among teachers to address this situation, which contributed to finding the most favourable approaches to learning (Hartnett *et al.*, 2023). Published articles reflect the importance of intelligent technologies in developing professional competence. Our work found that professional flexibility can primarily be formed by focusing on the formation of language, mathematical, interdisciplinary, and innovative competence.

A detailed study of theoretical material with subsequent analysis should be provided to ensure quality training for future teachers. The analysis of each topic should be related to

objectivity, selection of the most critical points, and the intensity of cooperation and focus on particular objects. Individuality in learning can be formed by focusing on open and closed tasks, teacher support, and clearly defined objectives. Properly structured and oriented tasks enhance professional skills (Ilomäki *et al.*, 2023b). The formation of subject-methodological competence of future primary school teachers is possible through digital technologies. Digital technologies help students navigate the information space and develop their professional skills. Positive results are associated with the availability of high-quality material for study and the use of professional teaching methods. Digital technologies can be used to create mind maps in the learning process. They help to summarise the training sessions, presentations, and comics that help to visualise materials. A virtual whiteboard can coordinate work in groups and organise student communication (Palamar *et al.*, 2023). The training of future primary school teachers should be based on developing communication skills in the first place. This will also help build students' dialogue skills, facilitating the expression of their opinions. The development of communication skills should be based on the requirements of an education system that promotes the free realisation of one's potential. This allows for thinking resulting from expressing one's thoughts and studying a particular issue in more detail (Muratbekova *et al.*, 2022). Our work has established that it is possible to ensure high professional competence for future primary school teachers due to focusing on integrated learning. This will ensure the development of individualisation, verbal and creative thinking, emotional stability, and purposefulness, which forms professional flexibility.

Introducing digital technologies into the learning process is a common practice that expands professional competence and shapes pedagogical values. However, introducing digital technologies should be based on assessing their necessity and effectiveness for teaching a particular topic. It is also necessary to consider the barriers that may arise during their use (Stringer *et al.*, 2022).

A comparison of published articles with our work has shown widespread study of the benefits of digital technologies for personalised learning. Our article identified the possibility of using individualised learning for future primary school teachers. When developing learning mechanisms, we considered the digitalisation of learning and the development of language, mathematical, and interdisciplinary competence. It was also determined which professional flexibility skills were developed in the learning process, which confirms the effectiveness of the selected training programmes.

6.1 Restrictions

The study's limitations are related to the development of professional flexibility for future primary school teachers, excluding middle and high school. Nevertheless, the authors conducted a detailed study to identify the most influential individualisation mechanisms for the development of professional flexibility. They also took into account overall performance and skills acquired, which are interrelated to professional flexibility.

6.2 Recommendations

A high-quality learning approach is possible due to focusing on students' individual capabilities. Therefore, paying attention to each student allows us to work on each topic more deeply. This also affects the ability to develop students' independence. This affects the meaningful acquisition of professional skills and will allow for a creative approach to teaching students in the future.

7 Conclusions

In order to achieve this goal, the study primarily developed individualised teaching methods aimed at training future primary school teachers. The authors came to the conclusion that professional flexibility can be formed through the development of language, mathematical, interdisciplinary, and innovative competence. The study assumed that the development of language competence could be realised through writing essays and lectures. This approach allows us to ensure the impact on communication. The development of mathematical competence involved providing experiential learning. Approaches were planned to be created to develop interdisciplinary competence and find similar learning mechanisms in different subjects. Innovative competence development was partially implemented using the Kahoot application, which contributed to developing creative skills in creating various lessons.

The study found that, in the students' opinion, language competence had the greatest impact on increasing professional flexibility (0.98). This is because it provided for

increased access to various materials. Also, interdisciplinary competence (0.89) allowed them to vary different knowledge. Innovative (0.85) and mathematical (0.87) competence contributed to the development of logical thinking. The study results showed that individualised learning mechanisms positively impacted the achievement of a high level of knowledge (72%). The results obtained are related to the active involvement of students in the learning process and independent processing of information. Also, a high level of knowledge was achieved by taking into account each student's individual level of knowledge, which made it possible to eliminate gaps in knowledge. A sufficient level of knowledge after the training was achieved among (16%) of students.

It was found that in forming professional flexibility, students developed skills of developmental individualisation (23%), creative thinking (22%), verbal thinking (20%), emotional stability (18%), and determination (17%).

The practical significance of the work is to study the effectiveness of the developed individualised learning mechanisms that contribute to the formation of future primary school teachers' professional flexibility. Prospects for the study may be related to the comparison of the most favourable method of developing professional flexibility, focusing on individual and group learning.

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