



Digital Educational Technologies for Enhancing Methodological Competence of Pre-Service Foreign Language Teachers: A Quasi-Experimental Study in Ukrainian Higher Education

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ABSTRACT

Purpose of the study: This study aims to evaluate the effectiveness of digital educational technologies in developing the methodological competence of pre-service foreign language teachers through a quasi-experimental approach comparing experimental and control groups.

Methodology: This study employed a quasi-experimental pre-test–post-test design with control and experimental groups. Data were collected using proprietary 40-item tests administered via Moodle (version 4.0). Statistical analysis included Student's t-test, Pearson's chi-square test, and effect size (Cohen's d, Cramer's V). The intervention integrated digital tools such as Google Classroom, Kahoot!, Quizlet, and Padlet.

Main Findings: The findings indicate a positive but limited improvement in methodological competence among participants in the experimental group. The most notable increase occurred in the cognitive (8.1%) and motivational (9.5%) components, followed by reflective (6.8%) and activity-based (4.1%) components. Statistical analysis revealed significant differences only in the cognitive component ($p < 0.05$), while other components showed small effect sizes without statistical significance.

Novelty/Originality of this study: This study provides an integrated digital-methodological model grounded in TPACK and constructivist theory, empirically validated through a quasi-experimental design. It uniquely examines the differential impact of digital technologies on specific components of methodological competence, offering new insights into targeted competence development in foreign language teacher education within the Ukrainian higher education context.

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1. INTRODUCTION

Digitalization has fundamentally transformed the preparation of future foreign language teachers by integrating online platforms, multimedia resources, and technology-enhanced learning environments into pedagogical practice [1], [2]. The increasing use of digital technologies in higher education has expanded opportunities for interactive, flexible, and student-centered learning while simultaneously improving access to authentic linguistic and cultural resources [3]-[5]. Previous studies have demonstrated that digital technologies can enhance students' motivation, engagement, collaboration, and professional competence development in foreign language education [6]-[8]. Moreover, the rapid development of educational technologies has encouraged universities to redesign teacher preparation programs to better align with contemporary educational demands and digital learning ecosystems [9].

Despite these advancements, existing studies predominantly focus on isolated digital tools, general digital literacy, or teachers' technological competence rather than on the integrated development of methodological competence in foreign language teacher education [10]-[12]. Several studies emphasize digital platforms, blended learning, webinars, or multimedia applications as effective instruments for language learning; however, limited attention has been devoted to examining how these technologies systematically contribute to the formation of methodological competence among future teachers [13]-[15]. Furthermore, previous research frequently relies on descriptive or theoretical approaches, while empirical studies employing quasi-experimental designs remain limited [16]. Existing literature also lacks comprehensive models integrating pedagogical, methodological, and digital dimensions within a unified framework for teacher preparation [17]. Consequently, the effectiveness of digital educational technologies in improving specific components of methodological competence remains insufficiently validated empirically [18]-[20].

The theoretical foundation of this study is grounded in constructivist learning theory and the Technological Pedagogical Content Knowledge (TPACK) framework [21], [22]. Constructivist theory emphasizes that knowledge is actively constructed through interaction, collaboration, and authentic learning experiences, making digital environments particularly relevant for contemporary teacher education [23], [24]. Meanwhile, the TPACK framework explains the interrelationship between technological knowledge, pedagogical knowledge, and content knowledge in supporting effective instructional practices [22], [25]. The integration of these perspectives provides a conceptual basis for understanding how digital educational technologies can facilitate the development of methodological competence among future foreign language teachers [26].

Prior studies have highlighted several benefits of digital technologies in foreign language education, including personalized learning, immediate feedback, collaborative engagement, accessibility, and flexibility in instruction [28], [29]. Research has also emphasized the importance of digital literacy, adaptability, critical thinking, and ethical information use as essential competencies for modern foreign language teachers [30], [31]. In addition, blended learning, project-based learning, web-based technologies, blogging, screencasting, and multimedia platforms have been identified as effective approaches for improving language instruction and teacher preparation [32]-[34]. Nevertheless, the implementation of digital technologies continues to face substantial challenges, including infrastructural disparities, unequal access to digital resources, insufficient teacher training, and varying levels of technological readiness [35]. These limitations indicate that successful digital integration requires not only technological support but also pedagogically grounded methodological training [36].

Another important issue concerns the imbalance between technical proficiency and methodological application in teacher education. Although many teacher preparation programs promote digital competence, they often fail to ensure that future educators can effectively integrate digital tools into instructional methodologies [37-39]. This gap demonstrates the need for an integrated educational model capable of combining digital and methodological competencies within authentic teaching contexts [40]. Such integration is particularly important in foreign language education, where communication, interaction, and contextualized pedagogical strategies play a central role in professional competence development [41].

Therefore, this study seeks to address these gaps by evaluating the effectiveness of digital educational technologies in developing the methodological competence of future foreign language teachers through a quasi-experimental design. The study specifically aims to: (1) assess the initial level of methodological competence through a pre-test; (2) implement a pedagogical intervention based on digital educational technologies; (3) determine changes in methodological competence after the intervention through a post-test; and (4) compare the results between experimental and control groups. The research hypothesizes that the integration of digital educational technologies significantly improves the methodological competence of future foreign language teachers compared to traditional instructional approaches.

The scientific novelty of this study lies in the development and empirical validation of an integrated digital-methodological model grounded in the TPACK framework and constructivist learning theory [21], [22].

Unlike previous studies that primarily examine separate technological tools or general digital literacy, this research investigates the combined influence of digital technologies and methodological training on future foreign language teachers' professional competence [42]. In addition, the study contributes empirical evidence from the context of higher education institutions in Ukraine through a quasi-experimental approach, thereby extending current discussions on digital transformation in teacher education and providing practical implications for the modernization of foreign language teacher preparation programs [43], [44].

2. RESEARCH METHOD

2.1. Type of Research

The study was conducted using a quasi-experimental design of the pre-test – intervention – post-test type, involving a control group (CG) and an experimental group (EG). The chosen research design served as a basis for assessing the impact of the pedagogical intervention (the use of digital educational technologies) on the level of methodological competence development in future foreign language teachers. The study consisted of the following stages: pre-testing, intervention, and post-testing. During the pre-testing stage (pre-test), the initial level of methodological competence of future foreign language teachers was diagnosed. At the intervention stage, an author-designed program incorporating digital educational technologies was developed and implemented in the experimental group. At the post-testing stage (post-test), the level of methodological competence was measured to assess changes. The proposed program using digital educational technologies was implemented only in the experimental group, while the educational process in the control group was organized in a traditional way without intervention. The study was conducted over the 2024–2025 academic year: December 2024 – pre-testing; January–June 2025 – implementation of the intervention; July 2025 – post-testing.

2.2. Research Population and Sample

The study was conducted within the framework of higher education institutions (HEIs) in Ukraine. It encompassed a cohort of 150 future foreign language teachers, comprising 74 individuals in the experimental group and 76 in the control group. The sample included fourth-year students enrolled in the Faculty of Foreign Philology at the first (bachelor's) level of higher education. The participants were 4th-year students (aged 20–22) from Ferenc Rakoczi II Transcarpathian Hungarian College of Higher Education, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, South Ukrainian National Pedagogical University named after K. D. Ushinsky, Volodymyr Vynnychenko Central Ukrainian State University, and the Municipal Establishment "Kharkiv Humanitarian-Pedagogical Academy" of Kharkiv Regional Council. This is explained by the presence of a basic level of methodological training after completing theoretical courses and pedagogical practice. The sample was formed on the principle of full coverage of all participants of all educational programs. The demographic breakdown featured 95 females and 55 males. All students exhibited varying levels of digital technology proficiency, with 100 individuals possessing sufficient skills and 50 demonstrating high proficiency. A preliminary analysis confirmed that the sample size was sufficient to detect small effects (Cohen's $d \approx 0.3$) with an acceptable level of statistical significance. All participants provided informed consent to participate in the study. Graduate students were selected for this study due to their anticipated methodological competence, having engaged in a comprehensive theoretical curriculum and completed pedagogical practice throughout their studies. The sample was formed based on the principle of full coverage, involving all candidates pursuing foreign philology educational programs in their final year. This approach ensured a sufficient sample size, yielding reliable and representative results. The sample size adheres to the minimum required criteria for a quantitative research sample in pedagogy, facilitating a comparative analysis between the experimental (EG) and control (CG) groups while also taking into account the possibility of statistically reliable verification of results. All research participants were thoroughly informed about the study's purpose, methodology, anticipated outcomes, and provided their voluntary and informed consent to participate. This adherence to ethical standards underpins the reliability and scientific integrity of the results obtained.

2.2. Data Collection Techniques

The following methods were employed to conduct the study: the assessment of methodological competence through both incoming and outgoing evaluations utilizing proprietary tests designed to ascertain three distinct levels of the phenomenon under analysis (Table 1) and its components (Table 2). The testing was administered on the Moodle platform (version 4.0). The selection of Moodle is attributed to its widespread adoption within higher education institutions, its open-source nature, and its comprehensive toolkit that facilitates effective testing and ensures the reliable data collection;

Table 1. Levels of methodological competence formation of future foreign language teachers

Levels	Characteristic
High	The future teacher mastered a comprehensive framework of methodological knowledge, skills, and competencies, possessing a profound capacity for self-analysis, self-assessment, and self-correction within their didactic-methodological endeavors. Furthermore, they have cultivated a well-defined system of pedagogical values and exhibit a strong motivation for the continuous enhancement of their methodological skills.
Average	The future teacher has a sufficient level of mastery of the system of methodological knowledge, skills and abilities, partially shows the ability to self-analyze, self-assess and self-correct the didactic-methodological activity, has a general idea of the system of pedagogical values and occasionally shows motivation for further improvement of methodological skills.
Low	The future teacher partially masters the system of methodical knowledge, skills and abilities, occasionally shows the ability to self-analyze, self-assess and self-correct the didactic-methodological activity, has no general idea of the system of pedagogical values and is unmotivated for further improvement of methodological skills.

Table 2 presents the structural components used to assess the methodological competence of future foreign language teachers in this study. The identified components reflect the multidimensional nature of methodological competence, encompassing not only theoretical knowledge, but also practical teaching skills, reflective abilities, and professional motivation. Each component was operationalized through specific indicators to provide a comprehensive evaluation of participants' readiness for professional pedagogical activity in the context of foreign language education.

Table 2. Components of the methodological competence of future foreign language teachers

Components	Characteristic
Cognitive	The future teacher has mastered the system of knowledge on the methodology of teaching a foreign language. They know modern approaches, methods and technologies of teaching, psychological and pedagogical conditions of the educational process.
Activity-based	The future teacher has mastered the skills and abilities of planning and conducting classes, selecting and adapting teaching materials.
Reflective	The future teacher possesses the ability to self-analyze and self-evaluate pedagogical activity, readiness for correction and improvement of professional actions.
Motivational	The future teacher has positive professional motivation; awareness of the importance of methodological competence; orientation towards continuous professional growth and innovation, a formed system of pedagogical values.

2.4. Research Instruments

The research tools employed comprised entrance and exit assessments, which consisted of 40 questions. These are test tasks of different types: with the choice of one correct answer, tasks for establishing correspondence and short open questions. The criteria for evaluating the answers were determined by a point scale. The points obtained were translated into three levels of formation (high, medium, low) of competence for each component. These assessments were designed to evaluate the methodological competence across various components, categorizing proficiency levels as high, medium, or low. The evaluation process was conducted within a 35-minute timeframe in a modular setting. To ensure the assessments' reliability, a Cronbach's alpha value of 0.84 was calculated.

2.5. Data Analysis Techniques

The collected data were analyzed using both quantitative statistical procedures and modeling techniques. Student's *t*-test was employed to determine statistically significant differences between the mean scores of the experimental group and the control group before and after the intervention. In addition, Pearson's chi-squared test was applied to examine differences in the distribution of methodological competence levels between the two groups. To support the development of the pedagogical intervention, modeling techniques were also utilized in designing a program aimed at fostering the methodological competence of future foreign language teachers through the integration of digital educational technologies.

3. RESULTS AND DISCUSSION

The results of the input test in CG and EG are presented below in Figure 1. At the first stage of the study, descriptive statistical analysis of the pre-test results for the control (CG) and experimental (EG) groups was also

conducted. The mean values (M) and standard deviations (SD) for the components of methodological competence are presented in Table 3.

Table 3. Descriptive statistics of pre-test results (M±SD)

Component	CG (M±SD)	EG (M±SD)
Cognitive	2.32 ± 0.62	2.34 ± 0.60
Activity-based	2.04 ± 0.68	2.06 ± 0.66
Reflective	1.89 ± 0.62	1.91 ± 0.61
Motivational	1.97 ± 0.65	1.98 ± 0.64

A χ^2 analysis was also performed on the experimental data obtained (high/medium/low distribution in CG and EG). The results are presented in Table 4.

Table 4. Results of χ^2 -tests (based on input testing data)

Component	χ^2	p	Cramer's V
Cognitive	0.042	0.979	0.017
Activity-based	0.013	0.993	0.009
Reflective	0.032	0.984	0.015
Motivational	0.022	0.989	0.012

In Table 4, it can be seen that all p-values are > 0.05. No statistically significant differences were found between the CG and EG at the initial stage. When taking the entrance test, future foreign language teachers in both groups showed average levels of methodological competence in most cases (Figure 1).

The most pronounced indicators were observed in the reflective and motivational dimensions, while the least significant were noted in the activity and cognitive aspects. This suggests that respondents lack the necessary knowledge and skills essential for the execution of their methodological concepts. Nevertheless, they exhibit a strong motivation to enhance their methodological competence and are capable of reflection.

Following the entrance assessment, a comprehensive program aimed at fostering the methodological competence of prospective foreign language educators through the utilization of digital technologies was devised. The program's objective is to facilitate the development of methodological proficiency among future foreign language teachers by integrating digital educational technologies into their professional training. The program aims to familiarize the educators with various digital tools and cultivate their capacity to adapt these resources for the execution of methodological tasks. Additionally, the program emphasizes the cultivation of skills necessary for the independent creation of digital educational content, the assessment of its efficacy, and the encouragement of innovative professional endeavors in the context of educational digitalization.

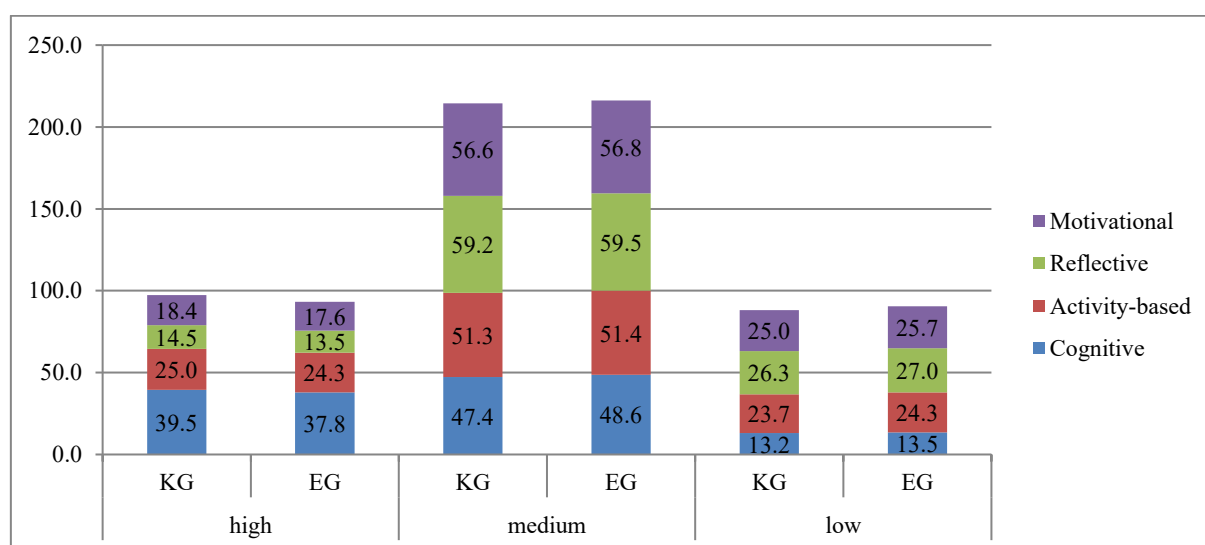


Figure 1. Results of the entrance test for the formation of methodological competence of future foreign language teachers, %

The program designed to enhance the methodological competence of future foreign language teachers through digital technologies is anchored in the principles of integrativeness, activity, individualization, flexibility, and mobility. The integrative principle underscores the combination of theory, practice, and technology. Owing to the application of the activity principle, instruction is delivered via practical assignments. The individualization principle necessitates consideration of the varying digital literacy levels among students. Flexibility and mobility foster an environment conducive utilizing cloud services and mobile applications. The program for developing the methodological competence of future foreign language teachers utilizing digital technologies delineates specific stages (Figure 2).

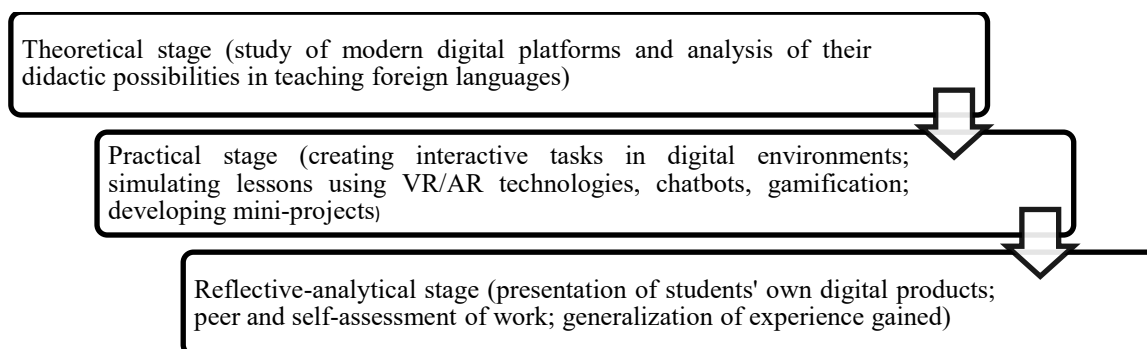


Figure 2. Stages of the program for developing the methodological competence of future foreign language teachers using digital technologies

The initial stage of the program entails an exploration of the pedagogical potential inherent in contemporary digital platforms, such as Google Classroom, Moodle, Kahoot!, Quizlet, Padlet, Mentimeter, Duolingo for Schools, and various AI services. During the subsequent stage, future teachers had the opportunity to devise their own digital educational content utilizing cutting-edge technologies like virtual and augmented reality, chatbots, and gamification. The digital assignments developed by the students served as the foundation for the creation of their digital portfolios. In the third stage, students presented their portfolios, which aim to encapsulate and showcase the evolution of their methodological competencies, the cultivation of skills in employing digital educational technologies, as well as their reflections and commitment to self-improvement.

The digital portfolio comprises lecture notes, reflections on foreign language teaching methodologies, and analytical records concerning the application of digital technologies. Additionally, students incorporate the developed lesson plans, interactive exercises, digital tasks, mini-projects, and gamified activities; along with screenshots, video demonstrations of their interactions with digital platforms, and feedback from participants. A significant component of the digital portfolio is dedicated to personal reflections on the employed methods' efficacy, challenges encountered, and plans for skill enhancement.

The program encompasses the engagement of future foreign language teachers with a diverse array of digital platforms and tools, including Google Forms, Mentimeter, Google Classroom, Moodle, Quizlet, Kahoot!, Duolingo, LearningApps, Wordwall, Classcraft, Padlet, Canva, Powtoon, Edpuzzle, Anchor.fm, YouTube, Socrative, Google Slides. Within the framework of this initiative, future foreign language teachers master digital instruments for developing interactive lessons. They also acquire the skills necessary to organize online and blended learning experiences, while reflecting on and assessing the effectiveness of their methodological decisions within the digital landscape.

This program was implemented at the higher education institution during the second semester of the 2024/2025 academic year. Its execution necessitated adjustments to the educational process, which were duly sanctioned by both the institution's administration and the students. The outcomes of the initial assessment for both the control group (CG) and experimental group (EG) are delineated in Fig. 2. A χ^2 -test, along with measures of mean, standard deviation, p-value, and Cohen's d, was conducted drawing on the experimental data, which delineates the distribution of high, medium, and low proficiency levels within both groups. The results of this analysis are presented in Tables 5 and 6.

Component	χ^2	p	Cramer's V
Cognitive	6.22	0.045	0.204
Activity-based	2.93	0.231	0.140
Reflective	4.33	0.115	0.170
Motivational	1.60	0.450	0.103

A statistically significant difference was identified between the CG and EG only for the cognitive component ($p < 0.05$), with a modest effect size (Cramer’s $V \approx 0.20$). For the activity-based, reflective, and motivational components, the differences were not statistically significant ($p > 0.05$), although moderate effect sizes were observed in some cases (Cramer’s V ranging from 0.10 to 0.17). These findings suggest that the experimental program had a limited but measurable impact, primarily affecting the cognitive component of methodological competence.

Table 6. Results of t-tests (M, SD, p, Cohen’s d)

Component	CG (M±SD)	EG (M±SD)	t	p	Cohen’s d
Cognitive	2.32 ± 0.62	2.46 ± 0.50	-1.57	0.119	0.26
Activity-based	2.04 ± 0.68	2.18 ± 0.60	-1.29	0.197	0.21
Reflective	1.89 ± 0.62	2.08 ± 0.57	-1.92	0.057	0.31
Motivational	1.97 ± 0.65	2.11 ± 0.65	-1.26	0.209	0.21

Table 6 indicates that no statistically significant differences were found between the experimental and control groups across all components ($p > 0.05$). The highest effect size was observed for the reflective component ($d = 0.31$), followed by the cognitive component ($d = 0.26$), both of which correspond to small effects. The remaining components demonstrated small effect sizes ($d \approx 0.20-0.21$). Although the differences did not reach statistical significance, the effect size values suggest a weak but consistent improvement in the experimental group, particularly in the reflective and cognitive components.

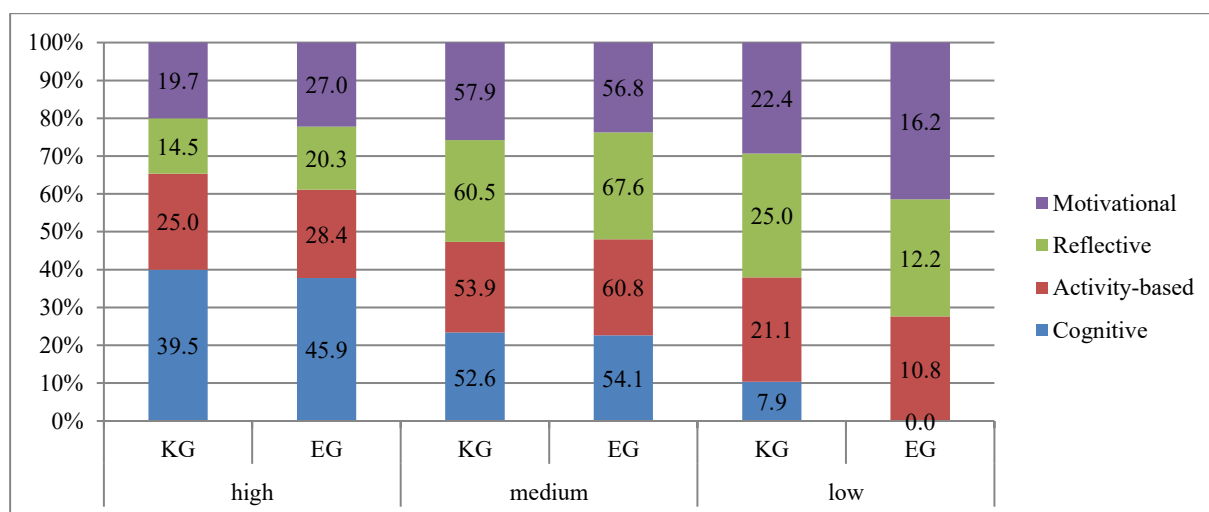


Figure 3. Results of the initial assessment on the formation of future foreign language teachers' methodological competence, %

Results of the initial assessment (Figure 3) reveal the predominance within the control group of future foreign language teachers characterized by an average level of methodological competence development. Furthermore, the highest indicators were observed in the reflective and motivational components, whereas the activity and cognitive dimensions exhibited the least favorable outcomes. In the experimental group, students similarly demonstrated a prevailing average level of methodological competence development. Notably, the highest results were recorded in the reflective and activity components, indicating that these students possess the capability to construct didactic content and critically evaluate its effectiveness. Conversely, the motivational and cognitive components yielded the lowest scores, suggesting that these students lack sufficient motivation and require an expansion of their knowledge base. The rates of progression for the analyzed indicators diverge between the two groups. The dynamics of change in both the control and experimental groups, as illustrated by the results of the entrance and exit assessment, are summarized in Table 6.

Table 6. Comparative analysis of the dynamics of changes in the formation of methodological competence in the control and experimental groups according to the results of the entrance and exit assessment

Components / Levels of methodological competence development	High		Average		Low	
	CG	EG	CG	EG	CG	EG
Cognitive	0.0	8.1	5.3	5.4	-5.3	-13.5
Activity-based	0.0	4.1	2.6	9.5	-2.6	-13.5
Reflective	0.0	6.8	1.3	8.1	-1.3	-14.9
Motivational	1.3	9.5	1.3	0.0	-2.6	-9.5

Based on the data presented in Table 6 and Figure 3, it can be stated that the experimental group demonstrated higher growth rates in methodological competence compared to the control group; however, these improvements should be interpreted cautiously in light of the limited statistical significance and effect sizes. Notably, the most significant advancement was observed in the motivational component (an increase of 9.5%) and the cognitive component (an increase of 8.1%) of methodological competence. The reflective component demonstrated a moderate growth rate (an increase of 6.8%), while the activity component showed the least improvement (an increase of 4.1%). This indicates that following the implementation of the proposed program, aspiring foreign language teachers not only acquired new insights but also broadened their existing knowledge regarding the methodological potential of digital tools. Furthermore, their motivation to pursue further exploration in this domain has been markedly enhanced. Their capacity for self-assessment and reflective analysis of their own practices in employing digital tools for methodological purposes has also seen significant growth. Nevertheless, a considerable proportion of students still require support in the development of their own methodological materials utilizing digital educational technologies. Collectively, these findings underscore the efficacy of integrating digital tools in enhancing the future foreign language educators' methodological competence.

The scientific research related to our study underscores the significance of integrating digital educational technologies in the enhancement of methodological competence among foreign language educators [6], [30], [31]. The authors of empirical investigations confirm the necessity of discovering innovative methods to synthesize traditional pedagogical approaches with digital advancements in foreign languages teaching [2], [7], [45]. Scholars also emphasize the critical importance of successfully assimilating digital resources into the foreign language learning framework [46], [47]. These resources are designed to foster the development of communication skills, socio-cultural competence, soft and technical skills, empathy, and cultural sensitivity [21], [48].

Our results indicate the limited and differentiated impact of the regular use of digital platforms on the methodological competence of learners [49]-[51]. The results indicate a positive tendency in the development of methodological competence; however, the magnitude of the observed effects remains limited in several components. This suggests that the intervention had a selective rather than a comprehensive impact. The study confirms certain positive shifts in the development of students' methodological competence; however, these do not always reach the level of statistical significance. This may be explained by the complexity and multidimensional nature of methodological competence, as well as the need for longer-term and more systematic implementation of digital technologies. These findings are consistent with the results of recent systematic reviews, which emphasize the variability of the effects of technology-oriented learning and the dependence of outcomes on the conditions under which interventions are implemented [52], [53], [48].

Similar studies advocate for initiatives aimed at enhancing the accessibility of digital media-based curricula in foreign language education. It is equally essential to provide teachers with practical guidance and illustrative examples to cultivate digital culture, literacy, and communicative language skills [17], [22], [50], [51]. Our research indicates that students exhibit higher motivation and engagement when digital technologies are incorporated into project-oriented tasks. However, such effects appear to be only tentative and therefore require further verification under the conditions of a long-term pedagogical experiment. In addition, other studies demonstrate that the effectiveness of digital technologies depends on instructional design and the level of digital competence of participants in the educational process [54]-[56].

Foreign language teachers need to cultivate digital competencies, and training programs should equip them with the skills necessary to leverage technology effectively in their teaching [23], [31], [50]. We align with other researchers in acknowledging the pivotal role of digital educational technologies in the ongoing professional development of foreign language teachers [16], [32]. Within the framework of our research, we also obtained empirical validation of the assertions made by other scholars regarding the beneficial influence of digital technologies on the cultivation of methodological competence in future foreign language educators. However, this influence is uneven and determined by the structure of methodological competence. This is fully consistent with research on the importance of integrating its technological, pedagogical, and subject components [45], [46], [51].

Our data shows that the incorporation of digital tools into instructional practices facilitates the sustainable enhancement of students' critical thinking and analytical abilities. A comparative analysis with international research indicates that similar trends in improving the efficacy of methodological training through digital technologies are observed on a global scale [49], [57], [58]. Consequently, the results obtained not only affirm existing scholarly conclusions but also illustrate the practical effectiveness of an integrated digital approach within the Ukrainian context. But this effectiveness is partial and its expressiveness varies depending on the specific component of methodological competence. This has been stated and empirically proven by the results of research in the field of technology-oriented learning [48], [53], [54].

The results obtained substantiate the hypothesis as follows: the cultivation of methodological competence among future foreign language teachers will be more effective when predicated upon the systematic integration of digital educational technologies. These technologies can be seamlessly incorporated into the training framework for foreign language teachers at higher education institutions [59]-[61].

Our research is characterized by a holistic approach to the development of methodological competence in prospective foreign language teachers through the utilization of digital innovations. It delineates the essential components of teachers' methodological competence. For each component, we propose targeted activities with students aimed at fostering methodological competence through the application of digital advancements. This is particularly salient due to the potential for a synergistic approach to the development of methodological competence among future foreign language teachers. Within the framework of the study, students were afforded the opportunity to deepen their understanding of digital tools, explore their didactic potential, apply them in their pedagogical endeavors, and curate their own digital portfolios.

The study confirmed its scientific novelty. It consists in the application of a quasi-experimental design and analysis of the impact of digital technologies on individual components of methodological competence. The use of statistical methods (χ^2 -tests, t-tests) and effect size indicators within the study provided a differentiated and scientifically substantiated interpretation of the results. The study proved the presence of different effectiveness of digital interventions on different components of methodological competence. This is consistent with modern approaches to the analysis of educational data and technologically mediated learning [52], [62], [63] and provides a basis for clarifying various aspects of the formation of methodological competence. The overriding limitations of the study are its small sample size among future foreign language teachers. However, the problem under study is relevant for the professional training of future philology teachers of all HEIs in Ukraine.

The main recommendations advocate for the expansion of the sample population by incorporating future philology teachers from various higher education institutions, thereby enhancing the representativeness of the findings. It is advisable to increase the number of instructional sessions within the proposed program to foster a more enduring impact on developing the methodological competence. Higher education institutions are encouraged to leverage platforms such as Moodle, Google Classroom, and Microsoft Teams within the educational framework. Furthermore, it is essential to integrate courses focused on the methodology of foreign language instruction, incorporating a module titled "Digital Educational Technologies" into the curricula. A synthesis of traditional methodological paradigms with digital resources is recommended. Additionally, it is imperative to organize master classes for students and novice teachers on the effective utilization of contemporary educational technology tools, cloud services, and multimedia support tools.

4. CONCLUSION

The research addresses the topical issue of employing digital educational technologies in the cultivation of methodological competence among future foreign language teachers. The principal emphasis lies on examining the influence of digital educational technologies on the development of methodological competence in students specializing in foreign philology. Distinct components of methodological competence (cognitive, activity-based, reflective, and motivational) are delineated, categorized into high, medium, and low levels. Entrance and exit assessments of future foreign language teachers were conducted. A program aimed at enhancing the methodological competence of future foreign language teachers through the integration of digital technologies was proposed and subsequently tested. The findings reveal that most future foreign language teachers exhibit an average level of methodological competence. The experimental evaluation of the program indicated a positive trend, with a notable increase in the number of participants demonstrating a high level of methodological competence across various components: cognitive (an increase of 8.1%), activity-based (4.1%), reflective (6.8%), and motivational (9.5%). The results of the study indicate the partial effectiveness of the use of digital educational technologies in increasing the methodological competence of future foreign language teachers. The implications of this study are pertinent to the professional training of future foreign language teachers within higher education institutions. We see the prospects for further inquiry, including the expansion of the sample size and conducting a comparative analysis of implementing digital educational technologies in the advancement of methodological competence among teachers of various disciplines across different countries worldwide. Future research should examine AI-driven tools and cross-cultural differences in digital teacher training effectiveness..

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AUTHOR CONTRIBUTIONS

Conceptualization, I.D. and I.S.; Methodology, Antonina P.; Software, O.D.; Validation, O.D.; Formal Analysis, Antonina P.; Investigation, Anna P.; Resources, O.D. and Anna P.; Data Curation, O.D.; Writing – Original Draft Preparation, I.D. and I.S.; Writing – Review & Editing, I.D., Antonina P. and I.S.; Visualization, Anna P.; Supervision, O.D. and Anna P.; Project Administration, Anna P.

INFORMED CONSENT STATEMENT

This study did not involve human participants, and therefore, informed consent was not required.

CONFLICTS OF INTEREST

Authors must identify and declare any personal circumstances or interest that may be perceived as influencing the representation or interpretation of reported research results. If there is no conflict of interest, please state “The authors declare no conflict of interest.” Any role of the funding sponsors in the choice of research project; design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript; or in the decision to publish the results must be declared in this section ...

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

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