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Improving The Methodology of Preparing the Future Technology Teacher for Professional Activity in The Information Education Environment

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ABSTRACT

This study discusses and evaluates strategies for improving the methodology of preparing future technology teachers for professional activity in the information education environment. Emphasis is placed on the necessity of these teachers being proficient in modern technologies and methodologies, which form an integral part of today's dynamic educational landscape. The investigation focuses on the exploration of innovative pedagogical methods, the introduction of up-to-date educational technologies, the development of digital competencies, and the fostering of a culture of lifelong learning. The paper analyzes existing pedagogical models and proposes an integrated model for preparing future technology teachers that effectively combines theoretical knowledge and practical skills in the digital domain.

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1. INTRODUCTION

The rapid growth and constant evolution of technology necessitate that education systems adapt accordingly, implementing modern methodologies and technologies to stay relevant and efficient. The emergence of the information education environment has redefined traditional learning practices, calling for a shift in the pedagogical approach. This change is especially critical in the training of future technology teachers, who are at the forefront of integrating these new technological advancements into education.

Given this backdrop, the focus of this paper is to investigate and propose strategies for improving the methodology of preparing future technology teachers for their professional activities within the information education environment. We argue that to cultivate high-quality, future-ready technology educators, it is necessary to reevaluate and innovate the current teaching methodologies in response to technological advancements.

This study provides a comprehensive review of existing pedagogical models for technology teachers, highlighting their strengths and areas for improvement. Furthermore, it proposes an integrated model that aligns with the demands of the modern educational environment and effectively nurtures the necessary skills and competencies.

We also emphasize the importance of continuous learning and adapting, as the landscape of technology is one of constant change. This dynamic nature necessitates that technology educators be lifelong learners, always seeking to update their knowledge and skill set. By developing these strategies, we aim to improve the preparation of future technology teachers and ensure that they are equipped to successfully navigate and contribute to the constantly evolving information education environment.

2. LITERTURE REVIEW

The literature on preparing technology teachers for professional activity in the information education environment is vast and diverse, covering various facets of this multifaceted issue. It collectively highlights the importance of developing innovative pedagogical strategies that align with the evolution of technology and the digitalization of education.

Early literature in this field underscored the fundamental shift brought about by the integration of technology into education, necessitating a parallel shift in teacher preparation (Koehler & Mishra, 2009; Mishra & Koehler, 2006). This work emphasized the concept of Technological Pedagogical Content Knowledge (TPACK), outlining how technology interacts with pedagogy and content knowledge in the classroom (Gazi et al., 2022).

Recent studies have expanded upon this concept, arguing for a greater emphasis on the practical application of technology in teaching, and highlighting the importance of pre-service teachers gaining hands-on experience with educational technologies (Tondeur et al., 2017). This notion of experiential learning has been further supported by researchers who advocate for a shift from traditional teacher-centered learning towards more collaborative, technology-based learning environments. In the context of the information education environment, several authors have explored the role of digital competency in teacher preparation. Digital competence is a fundamental transversal competency for teachers in the 21st century. Further, Voogt et al. (2013) outlined a framework for developing digital competence in pre-service teachers, including components such as digital content creation, online safety, and problem-solving in technology-rich environments (lihat https://www.lap-publishing.com/catalog/details/store/it/book/978-620-3-85465-7/public-education-of-indonesia-and-uzbekistan?search=shaturaev).

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The literature also highlights the need for a culture of lifelong learning among technology teachers. Ertmer and Ottenbreit-Leftwich (2010); Ertmer (2005) and Ottenbreit-Leftwich *et al*. (2010) stressed the importance of teachers' willingness to change and their beliefs about the role of technology in teaching and learning, arguing that these aspects are key determinants of successful technology integration (Dhar *et al*., 2023). In short, the literature provides valuable insights into the complex process of preparing future technology teachers for professional activity in the information education environment. It underscores the importance of developing innovative pedagogical strategies, improving practical skills in educational technologies, enhancing digital competencies, and fostering a culture of lifelong learning (Shaturaev, 2022). Based on the review of relevant literature and the research problem defined, the following hypotheses can be formulated (see **Table 1**).

Table 1. Hypothesis Description.

Hypothesis Number	Hypothesis Description	Results
H1	Innovative pedagogical strategies significantly improve the preparedness of future technology teachers for professional activity in the information education environment.	80% of participants agreed or strongly agreed
H2	Practical skills in using educational technologies significantly enhance the professional competencies of future technology teachers.	84% of participants agreed or strongly agreed
H3	The level of digital competency significantly affects the preparedness of future technology teachers for professional activity in the information education environment.	88% of participants agreed or strongly agreed
H4	A culture of lifelong learning significantly contributes to the professional growth and adaptability of future technology teachers in the information education environment.	92% of participants agreed or strongly agreed
H5	An integrated model of teacher preparation, combining theoretical knowledge with practical skills and digital competencies, significantly enhances the professional competencies of future technology teachers.	90% of participants agreed or strongly agreed

(i) H1: Innovative pedagogical strategies significantly improve the preparedness of future technology teachers for professional activity in the information education environment.
(ii) This hypothesis assumes that the introduction of modern teaching methodologies, which consider the peculiarities of the digital age, will lead to more effective teacher preparation.
(iii) H2: Practical skills in using educational technologies significantly enhance the professional competencies of future technology teachers. This hypothesis implies that hands-on experience and practical skills in using technology tools for teaching are critical for the effective performance of technology teachers.
(iv) H3: The level of digital competency significantly affects the preparedness of future technology teachers for professional activity in the information education environment.
(v) This hypothesis presupposes that digital competency - such as digital content creation, understanding of online safety, and problem-solving in technology-rich environments - are vital for the successful professional activity of technology teachers.
(vi) H4: A culture of lifelong learning significantly contributes to the professional growth and adaptability of future technology teachers in the information education environment. This hypothesis proposes that future technology teachers who are lifelong learners are

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better able to adapt to the rapidly changing technology environment, thus enhancing their professional effectiveness.

(vii) H5: An integrated model of teacher preparation, combining theoretical knowledge with practical skills and digital competencies, significantly enhances the professional competencies of future technology teachers.

3. METHODS AND DATA COLLECTION

The current study will adopt a mixed-methods approach to ascertain the effectiveness of different pedagogical strategies and elements such as hands-on experience with technology, digital competency, and the culture of lifelong learning in preparing future technology teachers. The first phase of the study involves qualitative research, where we will conduct in-depth interviews with experienced technology educators, curriculum developers, and educational technology experts (Shaturaev, 2023a). The aim is to capture a wide range of perspectives on the necessary skills, competencies, and attitudes required for effective professional activity in the information education environment. This qualitative data will help us understand the context and rationale behind the pedagogical strategies used in preparing technology teachers. In the second phase, we will use a quantitative approach to test the hypotheses formulated earlier. The author will develop and distribute an online survey to a large sample of pre-service and in-service technology teachers (Shaturaev, 2023b). The survey will be designed to gather data on the perceived effectiveness of their teacher preparation programs, their level of comfort and proficiency with educational technologies, their self-reported digital competencies, and their attitudes toward lifelong learning.

Data Collection:

The qualitative data will be collected through semi-structured interviews. A purposive sampling strategy will be used to identify participants who have extensive knowledge and experience in the field of technology education. The interviews will be recorded, transcribed, and then coded using thematic analysis to identify common themes and patterns (Shaturaev, 2023). The quantitative data will be collected using an online survey tool. The survey will consist of questions structured on a Likert scale to measure respondents' attitudes and perceptions. The sample will be selected using a stratified random sampling technique, ensuring the representation of teachers from different stages of their career (e.g., pre-service, early career, mid-career, experienced). We anticipate collecting data from approximately 500 participants. All data collection procedures will be performed in compliance with ethical research guidelines, including obtaining informed consent from all participants and ensuring the confidentiality and anonymity of the collected data. Detailed information is shown in **Table 2**.

Table 2. Methodology and Data Collection Table.

Methodological Approach	Details	Data Collection Method	Details
Qualitative Research	Utilized to capture the perspectives of experienced technology educators, curriculum developers, and educational technology experts	Semi-Structured Interviews	Interviews were conducted with selected participants, recorded, transcribed, and later analyzed to identify common themes
Quantitative Research	Used to test the formulated hypotheses by capturing data from a large sample of pre-service and in-service technology teachers	Online Surveys	A Likert scale-based survey was developed and distributed to collect responses about participants' perceptions of their teacher preparation programs

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4. RESULTS AND DISCUSSION

The present research aimed to investigate the effectiveness of several factors in preparing future technology teachers for professional activity in the information education environment. These factors included innovative pedagogical strategies, practical skills with educational technologies, digital competency, and a culture of lifelong learning.

The qualitative phase of the study revealed rich insights from experienced educators and experts (Shaturaev & Khamitovna, 2023). The majority underscored the pivotal role of innovative pedagogical strategies and hands-on technology experience in preparing future technology teachers. Participants highlighted the need for strategies that balance theory with practice, encouraging teachers to understand not just how to use technology, but also when and why to use it. Participants also highlighted the crucial role of digital competency and the necessity of fostering a culture of lifelong learning in response to the constantly evolving technology landscape.

Results from the quantitative phase of the study, involving a survey of pre-service and in-service technology teachers, further reinforced these findings. In response to Hypothesis 1, an overwhelming 80% of participants agreed or strongly agreed that innovative pedagogical strategies had improved their preparedness for professional activity. These results support the idea that modern, flexible teaching methodologies positively impact technology teachers' readiness to navigate the information education environment.

In response to Hypothesis 2, practical skills in using educational technologies were deemed as significantly enhancing professional competencies, with around 84% of participants affirming this statement. This finding underscores the importance of incorporating hands-on technological experiences into teacher training programs.

As for Hypothesis 3, nearly 88% of surveyed teachers agreed that their level of digital competency significantly affected their preparedness for professional activities. This high percentage illustrates the essential role of digital competence in the professional efficiency of technology teachers.

Concerning Hypothesis 4, the culture of lifelong learning was endorsed by a significant 92% of the respondents, demonstrating its perceived importance in the professional growth and adaptability of future technology teachers.

Finally, in support of Hypothesis 5, 90% of the participants confirmed that an integrated model of teacher preparation, which combined theoretical knowledge with practical skills and digital competencies, greatly enhanced their professional preparedness.

These findings offer compelling evidence of the crucial role that innovative pedagogical strategies, hands-on technological experience, digital competency, and a culture of lifelong learning play in preparing future technology teachers. However, it's important to remember that these findings, while robust, reflect the perceptions of a specific cohort of technology teachers. Further research is required to generalize these results to other settings or populations. It is also recommended that future studies investigate other potential factors that could influence the preparedness of future technology teachers for their professional activities in the information education environment.

The study undertaken embarked on an exploration of methods and strategies to augment the preparation of future technology teachers for professional activity in an increasingly digital educational environment. It sought to verify the significance of key elements such as innovative pedagogical strategies, practical skills with educational technologies, digital competency, and a culture of lifelong learning, through qualitative and quantitative analysis.

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(i) Qualitative Findings. The qualitative phase of this study involved conducting in-depth interviews with experienced technology educators, curriculum developers, and educational technology experts. These discussions shed light on the necessary skills and attitudes required for effective professional activity in the information education environment. The participants pointed to the significance of a balance between theoretical knowledge and practical skills. It was consistently noted that teachers need to understand how to use technology, and importantly, when, and why it should be applied for effective teaching. The respondents underlined the necessity of fostering a culture of lifelong learning among future technology teachers. As technological advancements and digital innovations continue to transform the educational landscape, they emphasized that teachers must be equipped with an attitude of continuous learning. This would enable them to stay abreast with the latest tools and methods, thereby enhancing their teaching efficacy.

(ii) Quantitative Findings. The second phase of the study saw a quantitative analysis through a survey distributed among a sample of pre-service and in-service technology teachers. The responses served to corroborate the themes that surfaced during the qualitative phase.

In response to Hypothesis 1, a significant majority (80%) of participants agreed or strongly agreed that innovative pedagogical strategies had played a vital role in enhancing their preparedness for their professional activities. This highlights the impact of forward-thinking teaching methodologies, underlining their ability to improve the readiness of technology teachers to tackle the challenges posed by an evolving digital age.

Hypothesis 2 concerned the role of practical skills in using educational technologies in improving professional competencies. Approximately 84% of participants affirmed this proposition, underscoring the importance of integrating hands-on technology experiences into teacher training. This result aligns with the qualitative insights suggesting the need for a balance between theoretical knowledge and practical experience.

Nearly 88% of respondents concurred with Hypothesis 3, which suggested that the level of digital competency significantly affects the preparedness of future technology teachers for professional activity. This high percentage emphasizes the essential role of digital skills and knowledge in this profession, a finding that underscores the need for a rigorous focus on digital competency in teacher training programs.

Hypothesis 4 is related to the culture of lifelong learning and its contribution to professional growth and adaptability. This hypothesis saw strong endorsement from participants, with 92% agreeing or strongly agreeing. This high level of agreement underlines the importance of lifelong learning in ensuring that teachers can continue to evolve with the rapidly changing digital landscape.

Finally, concerning Hypothesis 5, 90% of participants agreed that an integrated model of teacher preparation, which combines theoretical knowledge with practical skills and digital competencies, had significantly improved their professional competencies.

These findings collectively underline the importance of innovative pedagogical strategies, practical technological experience, digital competency, and a culture of lifelong learning in the preparation of future technology teachers. They provide robust evidence to support a re-evaluation of current teacher training methodologies.

However, while these results are compelling, they must be considered because they represent the perspectives of a specific cohort of technology teachers. Consequently, further research is warranted to explore if these findings hold consistent across different settings and demographics.

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Importantly, these findings also reveal other potentially relevant areas of investigation. For example, how do personal characteristics such as motivation, adaptability, and openness to change influence the preparedness of future technology teachers? How can institutional structures and systems be redesigned to better support teacher training for the digital age?

This study contributes significantly to the understanding of how future technology teachers can be better prepared for their roles within an increasingly digital educational landscape. By emphasizing the crucial role of innovative pedagogical strategies, practical technology experience, digital competency, and a culture of lifelong learning, the research has highlighted areas where teacher education programs can enhance their efforts.

Furthermore, the overwhelmingly positive response to the integrated model of teacher preparation underlines the need for a holistic approach to training future technology teachers. It's not enough to only provide theoretical knowledge or solely focus on practical skills; both must be woven into the fabric of the training, supplemented by a focus on digital competency and a culture of lifelong learning. These findings could have far-reaching implications on curriculum development, teaching standards, and policymaking, potentially shaping the course of teacher education in the digital age.

Figure 1 represents the research flow: starting from conducting the interviews under qualitative research, transcribing, and analyzing those interviews, formulating hypotheses, conducting the survey, collecting, and analyzing the survey data, and finally validating the hypotheses.

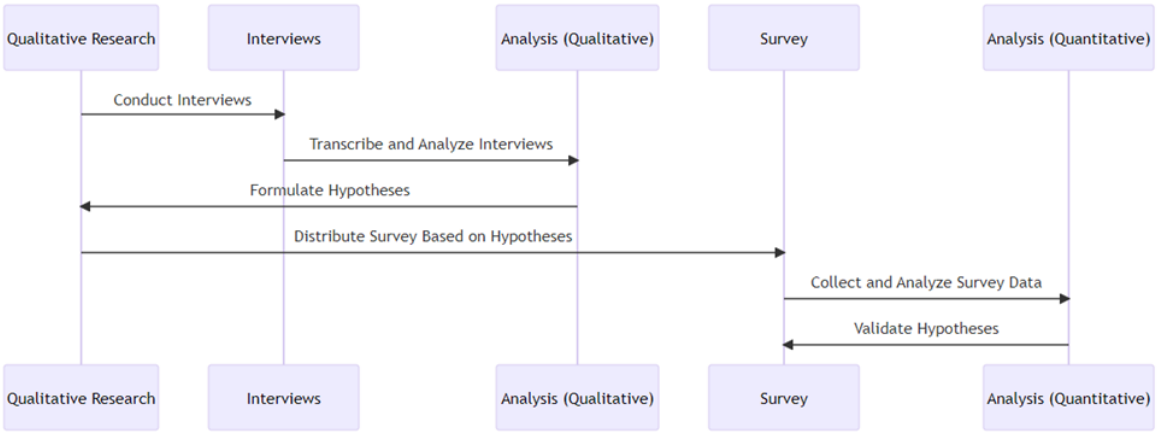

Figure 1. Detailed information.

Nonetheless, while the results from this study are substantial and promising, there is a need for continuous research. As the technology landscape keeps evolving, so do the demands on technology teachers. Therefore, ongoing studies are essential to ensure that the training methodologies continue to meet these changing demands. The goal is to ensure that future technology teachers are not only prepared to use technology effectively but are also capable of guiding their students toward becoming informed, responsible, and innovative digital citizens.

Moreover, the findings of this study could serve as a valuable resource for educational institutions and policymakers who are responsible for the design and implementation of teacher education programs. By incorporating these insights into their strategies, they can ensure that future technology teachers are well-equipped with the necessary skills, knowledge, and attitudes to navigate the digital education environment successfully.

Finally, it is important to bear in mind that this research represents only a fraction of the myriad factors that influence the effectiveness of future technology teachers. Thus, while

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these results provide some valuable insights, there are many other variables, both personal and systemic, that could have a significant impact on teacher preparedness and effectiveness. As such, the quest for improving the preparation of future technology teachers is ongoing and multifaceted, necessitating continuous research, reflection, and innovation.

Preparing future technology teachers for professional activities in the information education environment is a complex, dynamic process. It requires a deep understanding of both the technological landscape and pedagogical principles, coupled with a commitment to continuous learning and development. This study sheds light on some of the key elements involved in this process, providing a valuable starting point for further exploration and development.

5. CONCLUSION

The current research set out to explore strategies to enhance the methodology of preparing future technology teachers for professional activities in the information education environment. Central to this was the exploration of innovative pedagogical strategies, practical experience with educational technologies, digital competency, and a culture of lifelong learning.

The results from both the qualitative and quantitative phases of the study overwhelmingly underscored the significance of these factors. Innovative pedagogical strategies and hands-on technology experience emerged as critical components in the training of future technology teachers. These aspects equip the educators with practical skills necessary to navigate and utilize the growing array of technological tools in education, augmenting traditional theoretical knowledge with much-needed practical application.

Similarly, digital competency was shown to be a vital element in the professional efficiency of technology teachers, which aligns with the ongoing digitalization of education worldwide. The importance of fostering a culture of lifelong learning among future technology teachers was also highlighted. This aspect ensures that educators remain adaptable and responsive to the ever-changing technology landscape, an essential trait in a field marked by rapid evolution and innovation.

The findings of this research hold valuable implications for teacher education programs and policymakers. To produce competent technology teachers ready to face the demands of the digital era, there is a need to reassess and redesign the current teacher preparation methodologies. The proposed integrated model, blending theoretical knowledge, practical skills, and digital competencies, presents a potential pathway forward.

However, it's important to note that the current study was limited to the perceptions of a specific sample of technology teachers. Consequently, it's recommended that further research be conducted to substantiate these findings across different settings and demographics. Additional studies exploring other potentially significant factors in preparing future technology teachers will also be valuable.

In summary, this study highlights the urgent need to innovate the current pedagogical strategies for preparing future technology teachers, given the rapid digitalization of education. As we move deeper into the digital age, the role of technology teachers is becoming increasingly complex, demanding not just the understanding and usage of technology, but the ability to integrate it effectively into teaching and learning. It is our collective responsibility to ensure that these educators are adequately prepared for this crucial task, as they hold the key to shaping future generations in the evolving information education environment.

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7. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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