



Methods to Strengthen Research Competencies of Prospective Educators

Musoyeva Aziza Botirovna¹, Satria Abadi^{2*}

Samarkand State Institute of Foreign Languages, Uzbekistan¹

Universiti Pendidikan Sultan Idris, Malaysia²

Corresponding author: satriaabadi@meta.upsi.edu.my*

Received: 15-02-2025

Reviewed: 17-03-2025

Accepted: 20-05-2025

Abstract

Enhancing research skills in prospective teachers is essential for fostering reflective practice and contributing to the academic community. This study examines effective strategies for enhancing the research proficiency of pre-service teachers by emphasizing the integration of research into teacher training programs, leveraging technology, and facilitating collaborative inquiry. This study aims to assess potential instructors' academic writing proficiency and research competency. Utilizing Google Forms, an online survey instrument, 397 prospective educators were administered a revised multiple-choice questionnaire. The survey responses were statistically analyzed using the capabilities of Google Forms, facilitating descriptive statistics. The survey results indicate that a significant proportion of prospective educators possess knowledge of research skills and academic writing.

Keywords: Research Skills, Teacher Education, Pre-Service Teachers, Critical Thinking, Technology in Research, Collaborative Inquiry

Introduction

Research skills are vital for teacher education as they facilitate future educators' engagement in evidence-based practices, enhance their professional growth, and contribute to the advancement of the education sector. Effective research training enables educators to assess instructional policies, analyze classroom dynamics, and use innovative teaching methods grounded on empirical evidence. However, restricted exposure, insufficient motivation, or poor preparation hinder many pre-service teachers from developing research skills (Creswell, 2015). This study examines methods for enhancing research competence among prospective educators, highlighting the importance of teacher education programs in fostering inquiry-based learning, critical thinking, and technological integration (Ab Majid et al., 2024; Ranga Firdaus et al., 2024).

Methods to Strengthen Research Competencies of Prospective Educators

The term "research" derives from the Old French word *rechercher*, meaning "to seek out" or "to investigate thoroughly." It originates from the Latin term *circare* (to encircle, roam, or seek), along with the word *re-* (again), indicating a recurrent or methodical pursuit of knowledge. Historically, inquiry has progressed from casual inquiries in ancient civilizations to the systematic procedures of contemporary academic and scientific examination (Godfrey-Smith, 2003).

The term "competence" is derived from the Latin word *competentia*, which denotes a condition of sufficiency, suitability, or adequacy. In educational and professional settings, competence refers to the amalgamation of information, abilities, and attitudes essential for successful performance (Eraut, 2002). Cultivating research competency in prospective educators involves enhancing their capacity to do systematic inquiries, critically evaluate material, and implement results to advance educational practices (Musoeva, 2021).

Integrating research elements into teacher education courses is one of the most effective methods to improve research abilities (ISTIANAH et al., n.d.). Pre-service educators must be introduced to research procedures, data analysis techniques, and academic writing from the outset of their program. Courses must include research-focused tasks, including literature reviews, action research projects, and case studies, enabling students to participate in substantive inquiry (Dornyei, 2007). Furthermore, teacher educators must use a practical approach, directing students through research and motivating them to investigate subjects pertinent to their prospective teaching careers (Ab Majid et al., 2024).

Research proficiency is closely linked to critical thinking since proficient researchers must analyze, integrate, and assess data (Abadi et al., 2023). The incorporation of inquiry-based learning, whereby pre-service teachers critically investigate educational difficulties, formulate research questions, and pursue empirical evidence, ought to be a fundamental aspect of teacher training programs. According to Bloom's Taxonomy, higher-order cognitive skills such as analyzing, assessing, and producing are essential for developing research competence. Future educators may enhance their critical thinking skills and systematic research methodologies via discussions, problem-solving activities, and peer review sessions (LW et al., 2001; Zulkifli et al., 2022).

The research capabilities of future instructors may be significantly enhanced by integrating digital technologies and online resources (Adnan et al., 2023; Botirovna, 2024). Academic literature may be accessed via educational platforms such as Google Scholar, JSTOR, and ResearchGate; citation management is facilitated by reference software like Zotero and Mendeley (Majid et al., 2024; Rohmiyati et al., 2024). Qualitative and quantitative data analysis tools such as NVivo and SPSS are furthermore beneficial for pre-service teachers in swiftly examining research outcomes (Bryman, 2016). Incorporating these technologies into teacher preparation courses ensures that students acquire proficiency using digital tools for comprehensive research (Muhamad Adnan et al., 2024; Nur Ali Amri et al., 2023).

Collaborative research promotes teamwork, information sharing, and academic discourse. Future educators should engage in group research projects, transdisciplinary studies, and co-authored publications with mentors and colleagues. Research mentorship efforts, in

which experienced educators assist pre-service teachers with research projects, may enhance their academic confidence and research skills (Johnson & Golombek, 2016). Participation in research conferences and publication of findings in academic journals further enhances their ability to communicate research effectively.

Literature Review

Previous studies documented the relationship between academic writing proficiency and research competency of potential instructors. Zhang (2024) examined strategies to enhance academic writing proficiency among technological college majors through task-based assignments involving small research projects. This pedagogical approach helped students improve research skills, critical thinking, and academic writing proficiency by engaging them in authentic research activities such as topic selection, literature review, and data analysis. The study emphasizes that task-based learning effectively strengthens academic writing and research competencies (Zhang, 2024). Since critical thinking is a core element of instructor competencies related to research and pedagogy, this suggests that academic writing proficiency is closely linked to essential instructor competencies such as reasoning, evaluation, and problem-solving. The study recommends that instructors simultaneously foster critical thinking and academic writing through collaborative and student-centered learning approaches (Khairuddin et al., 2024).

Research indicates that academic competencies and writing proficiency positively affect learning processes and thesis grades among Bachelor's and Master's students. This implies that strong academic writing skills are integral to research competency and overall instructor effectiveness in guiding research (Kyndt et al., 2021). Students who mastered research skills could better plan, monitor, and evaluate their academic writing tasks independently. This autonomy is an important instructor competency, reflecting the ability to effectively conduct and supervise research projects (Azmi & Daud, 2019). Since critical thinking is a core element of instructor competencies related to research and pedagogy, this suggests that academic writing proficiency is closely linked to essential instructor competencies such as reasoning, evaluation, and problem-solving. The study recommends that instructors simultaneously foster critical thinking and academic writing through collaborative and student-centered learning approaches (Khairuddin et al., 2024).

Line with Ghasemi and Alavi (2023) showed a small but significant relationship between academic qualification and writing assessment, and between writing proficiency and assessment outcomes. This suggests that writing proficiency is a key factor in potential instructors' ability to perform and assess academic writing, which is integral to research competency (Ghasemi & Alavi, 2023). This also highlights that affective factors like attitude also influence academic writing proficiency, a key instructor competency (Julumkya, Sujarwati, & Sofyan, 2025).

Research Method

The research included 397 potential educators from four institutions: Uzbekistan State University of World Languages, National University of Uzbekistan after Mirzo Ulugbek, Bukhara State University, Jizzakh State Pedagogical University, and Samarkand State Institute of Foreign Languages.

Figure 1 illustrates that of 397 respondents, over 60% are aged 20-25, but more than 21% are aged 26-30. 11.8% of respondents are aged 31-35, whilst 6.2% are aged 36 and older.

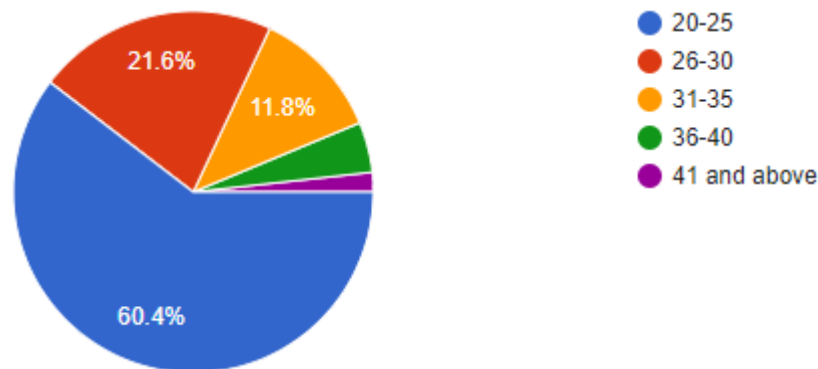


Figure 1. Respondents' age

Figure 2 illustrates that the gender distribution of prospective instructors comprises more than 45% men and over 54% females.

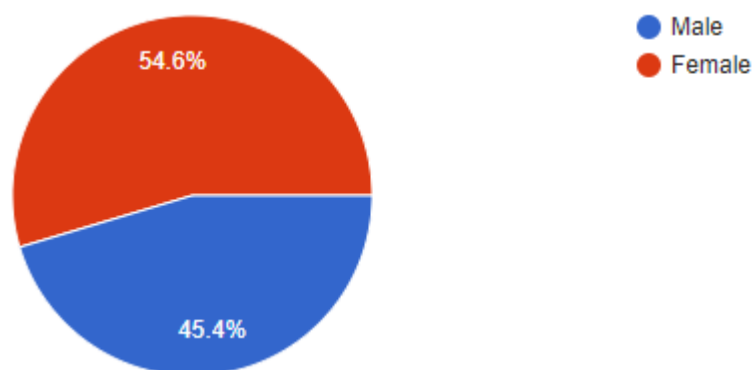


Figure 2. Respondents' gender

The respondents' language proficiency data reveals that just over 31% possess an intermediate level, whilst more than 25% exhibit a pre-intermediate level. Furthermore, over 28% possess an upper-intermediate proficiency, but only 15% attain an advanced level (see Figure 3 below).

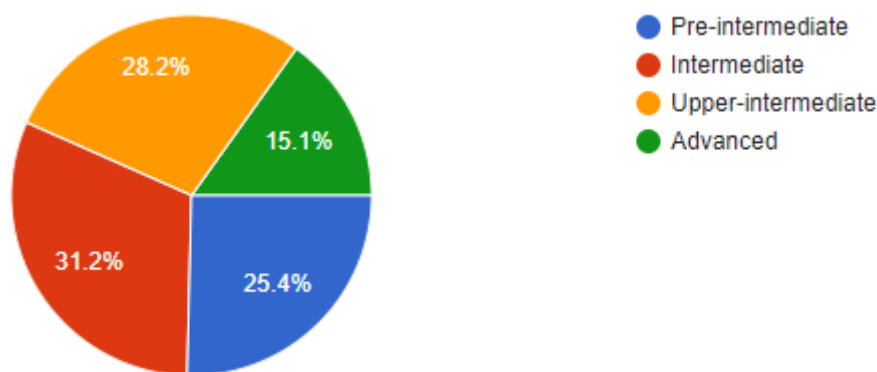


Figure 3. Respondents' level of language proficiency

Data collection instrument

This research employs a 20-item Multiple Choice Questionnaire, organized into four distinct sections. The survey was carried out with prospective educators from five universities in Uzbekistan, employing an online Google Forms software program. The survey is structured into three sections. The initial section gathers demographic data and learning profiles of the participants. The second part assesses their emotions, convictions, and motivations regarding L2 writing. The third section evaluates the competencies in digital literacy of both pre-service and in-service teachers. Finally, the fourth component assesses the frequency of obtaining feedback and making revisions.

The participants were asked to provide information regarding their writing proficiency levels. Figure 4 illustrates that over 40% of respondents view their writing skills as highly proficient, while more than 26% regard their writing as advanced. Furthermore, 29% of participants assess their writing as good, while only a small minority view it as weak.

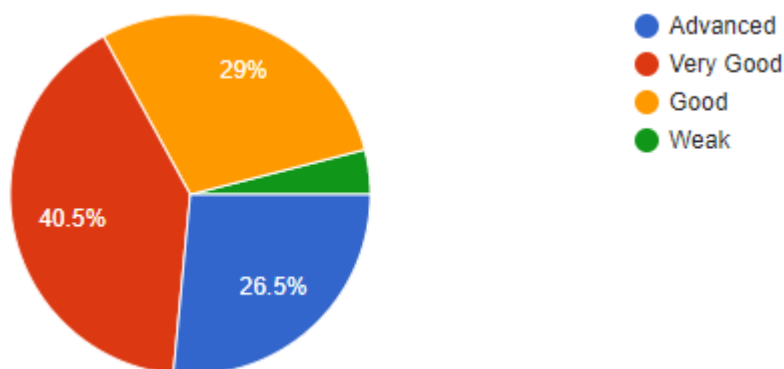


Figure 4. The level of their writing proficiency

To evaluate their understanding of research competence, participants were asked to indicate their familiarity level. Figure 5 illustrates that around 30% of respondents acknowledged familiarity with research competence, 43% demonstrated knowledge of the main concept, more than 20% had only a limited understanding, while the remaining 6.8% stated they had never encountered the term research competence.

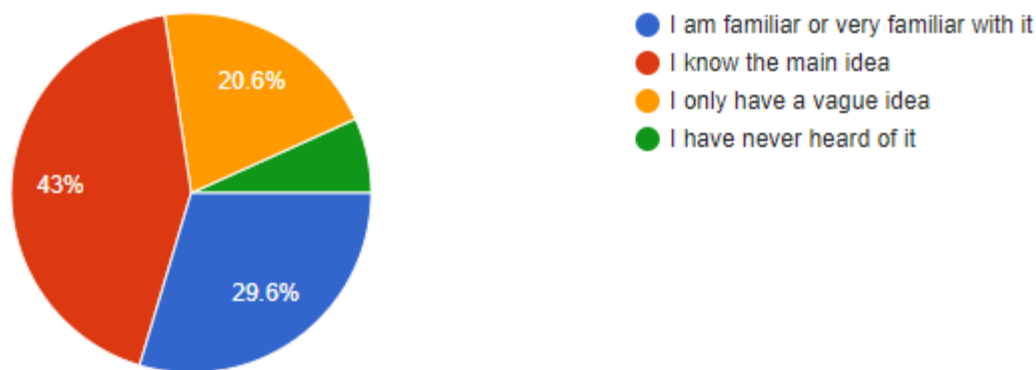


Figure 5. The knowledge about research competence

To identify the shortcomings or challenges in their academic writing, participants were instructed to indicate their selection by marking a checkbox next to the provided criteria for deficits or issues in academic writing. Figure 6 indicates that more than 30% of respondents encounter challenges with language use, whereas 26% face difficulties with coherence and cohesion. Furthermore, 25% encounter difficulties with paraphrasing and summarizing. The remaining respondents encounter a range of challenges, such as locating pertinent references, presenting statistical data, and composing introductions or conclusions.

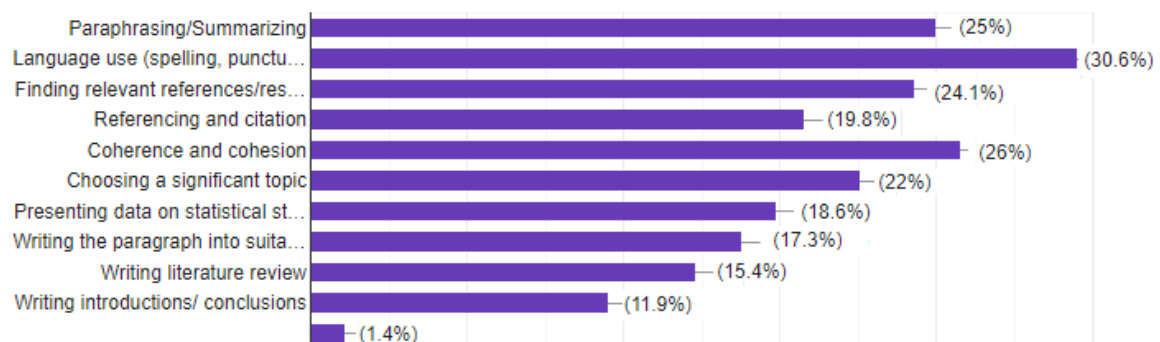


Figure 6. The weaknesses or difficulties in their academic writing

The participants were asked about the internal and external factors impacting their academic writing challenges. Their analysis revealed that internal factors contributing to their challenges included a lack of confidence (31%), self-motivation (42%), insufficient knowledge (38%), and feelings of pressure (28%).



Figure 7. The internal factors contributing to difficulties in academic writing

The reported external factors are instructors' teaching style (36%), complicated content (40%), inadequate corrective feedback (33%), sporadic classroom environment concerns (30%), and unresponsive educators (18%).

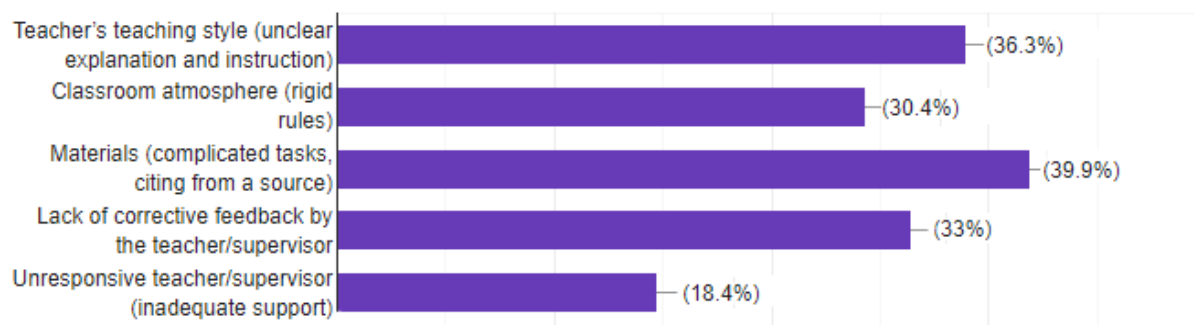


Figure 8. The external factors contributing to difficulties in academic writing

To get insight into the digital tools used in academic writing, we presented the following question (see to Figure 9 below). Approximately 32.9% of prospective instructors use Google as their primary search engine. Furthermore, around 31% use Internet grammar checkers, and 29% employ Google Dictionary. The remaining folks use many supplementary platforms, including QuillBot, Turnitin, Mendeley, Zotero, numerous internet domains, anti-lag.uz, and YouTube videos.

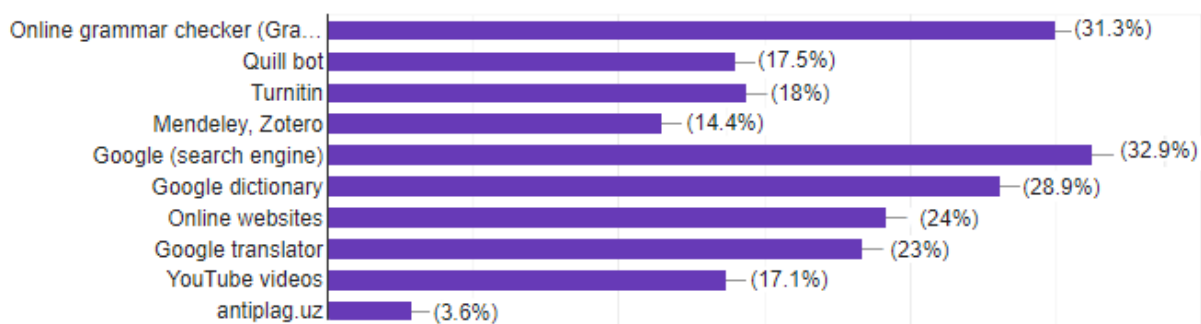


Figure 9. The digital tools that they use in academic writing

To ascertain the frequency of digital tool use in academic writing, we asked the following question (see to Figure 10 below). The study indicates that 41% of respondents use them consistently. Furthermore, 35% use them seldom, 7% employ them with high frequency, and 15% do not utilize them at all.

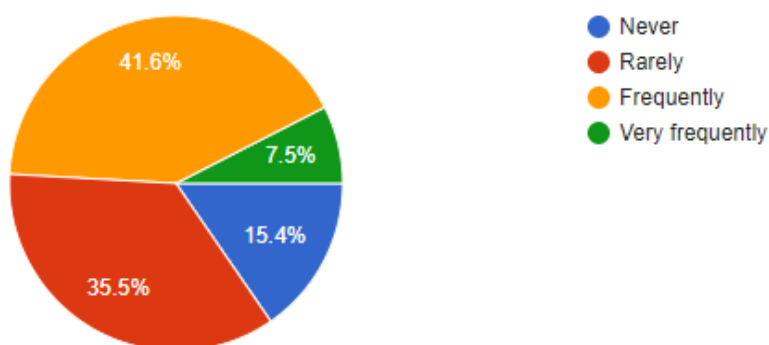


Figure 10. The frequency of using digital tools in academic writing

Methods to Strengthen Research Competencies of Prospective Educators

We conducted an inquiry regarding the specific objectives for which the aforementioned digital tools are utilized, and we obtained the following results (see Figure 11 below). Their primary focus was clearly on the importance of crafting well-structured sentences, employing accurate vocabulary, and effectively organizing thoughts.

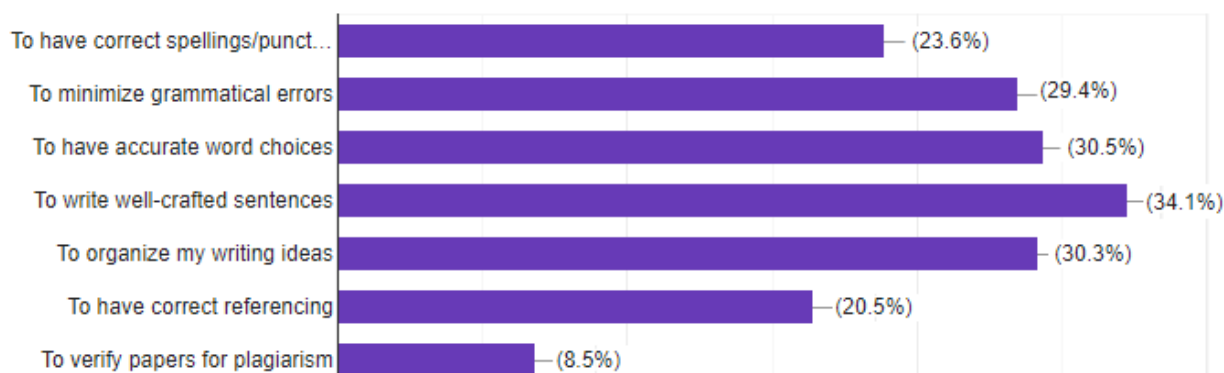


Figure 11. The purpose of using digital tools in academic writing

Result and Discussion

The study revealed that more than 40% of participants regarded their writing skills as extremely proficient, whilst 26% classified them as advanced. This result aligns with the research of Mogonea and Remus, which indicates that organized academic settings markedly enhanced writing abilities in pre-service educators (Mogonea & Mogonea, 2019). Conversely, Cuayzon noted that a limited proportion of high school graduates exhibited advanced academic writing skills, indicating a possible deficiency in skill development between secondary and university education (Cuayzon, 2024).

Approximately 43% of people exhibited a comprehensive comprehension of research competence, while 30% showed a rudimentary acquaintance. The findings correspond with Darling-Hammond's definition of research competence as a complex skill set necessitating organized educational interventions (Meadows et al., 2018). Conversely, a study by Tamban and Maningas (2020) revealed a diminished core comprehension of research abilities among public-school instructors, perhaps attributable to varying curricular focuses.

The main issues highlighted were language usage (30%), coherence and cohesion (26%), and paraphrasing/summarizing (25%). The results align with the comprehensive research of Castillo-Martínez and Ramírez-Montoya, which identified analogous difficulties as essential domains for focused educational interventions (Castillo-Martínez & Ramírez-Montoya, 2021). Mogonea and Remus presented integrative measures to tackle these difficulties, including using scaffolding techniques to enhance coherence and linguistic precision (Mogonea & Mogonea, 2019).

Participants recognized inadequate motivation (42%) and a deficiency in confidence (31%) as major internal obstacles. The aspects discussed correspond with Cuayzon's (2024) research on psychological obstacles that hinder the development of writing skills. External factors, such as inadequate corrective feedback (33%) and intricate materials (40%), align with

the conclusions of Tamban and Maningas (2020), who emphasized the significance of adaptive teaching methodologies and contextualized resources.

The most often used digital tool was Google, with 32.9% of utilization, followed by grammar checkers at 31% and online dictionaries at 29%. These strategies were mostly used to construct cohesive sentences and ensure grammatical accuracy. Levchenko (2020) said mastering these tools is essential for developing independent research skills, particularly in digitally-focused academic settings. This research indicates a better degree of digital competence than Tamban and Maningas's results, which identified inadequate digital literacy among their participants, perhaps due to regional or institutional disparities in technology availability (Tamban & Maningas, 2020).

The findings of this study align with international studies on improving academic writing and research competencies, particularly in recognizing contemporary challenges and reliance on digital resources. This study focuses on Uzbekistan, emphasizing the influence of educational reforms and language factors on skill development.

This study highlights the distinct challenges encountered by Uzbek pre-service teachers, particularly their insufficient exposure to advanced academic writing skills in their native language, in contrast to research by Castillo-Martínez and Ramírez-Montoya which examines global trends (Castillo-Martínez & Ramírez-Montoya, 2021). This gap highlights the need for tailored approaches in curriculum creation. The survey underscores the importance of digital technology, highlighting a key trend noted by Levchenko whereby technological ability is deemed essential for academic performance (Levchenko, 2020).

Implications and Recommendations

The results of this study provide substantial practical and theoretical insights intended to enhance the academic writing and research competencies of pre-service teachers, particularly within the context of higher education in Uzbekistan.

Enhancing feedback systems in higher education is crucial. Higher education institutions must provide systematic feedback mechanisms, allowing instructors to provide comprehensive, constructive, and prompt evaluations of students' academic work. These systems may include input from both peers and teachers to enrich the diversity of opinions. This study's explanation reveals that over 33% of respondents identified inadequate corrective feedback as an impediment [26,27]. [16] asserts that targeted, practical feedback fosters self-reflection and improves writing abilities. Application examples include educators using digital tools such as Turnitin or Grammarly to pinpoint areas needing improvement, supplemented by individualized feedback to aid with revisions.

Secondly, we should prioritize the enhancement of the curriculum in academic writing and research proficiency. Consequently, academic writing modules should emphasize skills such as paraphrasing, coherence, and cohesiveness, which were identified as problems by 26–30% of participants. Research competency should be included throughout several disciplines instead of confined to certain courses, ensuring that students consistently engage with these vital abilities. The curriculum must include examples and tasks relevant to the Uzbek

educational and linguistic setting, hence improving its significance and application for pupils. Finally, digital literacy training must be included in these sessions, emphasizing using research tools such as Zotero for citation, Grammarly for linguistic precision, and Turnitin for verifying originality.

Thirdly, it is essential to establish seminars and training programs that explicitly tackle internal difficulties, such as the deficiency of motivation (42%) and confidence (31%). Furthermore, topics may include time management, coping with academic pressure, and confronting the fear of failure in writing. The organization needs to include several forms, including interactive sessions that enable students to actively refine their work with assistance and group talks designed to alleviate tension and provide a friendly atmosphere. Cuayzon (2024) asserts that the results demonstrate that focused workshops lead to quantifiable improvements in writing quality and self-efficacy.

Conclusions

Improving the research capabilities of prospective educators necessitates a comprehensive strategy that incorporates research into teacher training, promotes critical analysis, leverages technology, and facilitates cooperation. Integrating research-focused activities into curriculum, fostering inquiry-based learning, and granting access to digital research tools enable teacher education programs to prepare future educators with essential research competencies. These tactics guarantee that pre-service teachers evolve into reflective practitioners who may enhance educational progress and refine instructional methodologies.

The findings of this study indicate that the participants had positive perceptions of their research competencies and academic writing abilities. Several respondents acknowledge specific obstacles in their academic writing; nonetheless, they have considerable confidence in their general writing skills. The quantitative data collected from respondents illustrates their research proficiency, revealing varying levels of engagement in research activities, such as studying, evaluating publications, and sometimes creating papers. Moreover, they exhibit a proficient mastery of digital tools for study, enabling them to use technology efficiently in their scholarly pursuits and inquiries.

References

- Ab Majid, M. H., Ibrahim, A. B., Abdullah, Y., Yahya, M. F., Suhaimi, S., & Abadi, S. (2024). STEMbot: An open source-based robotic kit as a middle school STEM education interest catalyst. *Przegląd Elektrotechniczny*, 8. <https://doi.org/10.15199/48.2024.08.54>
- Abadi, S., Muhamad Hariz Muhamad Adnan, Sri Redjeki, & Citrawati Jatiningrum. (2023). Using Analytical Hierarchy Process for Double Auction to Optimize Financial Performance of Private Higher Education Institutions. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 31(3 SE-Articles), 13–24. <https://doi.org/10.37934/araset.31.3.1324>

- Adnan, M. H. M., Mohamed, S. F., Ahmad, N. F., Annual, N. N. B., Abadi, S., & Husain, N. M. (2023). AI Meets Entrepreneurship: A Framework of Web Platform for Enhancing Skills, Streamlining Finance and Identifying Multiple Intelligence. *2023 International Conference on Disruptive Technologies (ICDT)*, 318–324. <https://doi.org/10.1109/ICDT57929.2023.10150606>
- Azmi, N. A. B. M., & Daud, N. B. (2019). A relationship between research skills and autonomous learning among postgraduate students. *International Journal of Business and Education Leadership*, 8, 45-52. Retrieved from https://www.ijbel.com/wp-content/uploads/2019/03/KLIISC_8_017.pdf
- Botirovna, M. A. (2024). Improving the quality of research with the help of new educational platforms. *Multidisciplinary Journal of Science and Technology*, 4(4), 159–164.
- Bryman, A. (2016). *Social research methods*. Oxford university press.
- Castillo-Martínez, I., & Ramírez-Montoya, M.-S. (2021). Research Competencies to Develop Academic Reading and Writing: A Systematic Literature Review. *Frontiers in Education*, 5. <https://doi.org/10.3389/feduc.2020.576961>
- Creswell, J. W. (2015). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. pearson.
- Cuayzon, M. L. (2024). *Research Writing Competence of Grade 12 Students: Towards Research Culture Improvement*. 2, 22–31. <https://doi.org/10.69569/jip.2024.0311>
- Dornyei, Z. (2007). *Research methods in applied linguistics*. Oxford university press.
- Eraut, M. (2002). *Developing professional knowledge and competence*. Routledge.
- Godfrey-Smith, P. (2003). *Theory and Reality: An Introduction to Philosophy of Science*. *Bibliovault OAI Repository, the University of Chicago Press*. <https://doi.org/10.7208/chicago/9780226300610.001.0001>
- ISTIANAH, F., HIDAYAT, A., HANDAYANTO, S. K., UTAMA, C., SUSILAWATI, A. A. Y., & ABADI, S. (n.d.). *DEVELOPMENT OF SCIENCE VIRTUAL LABORATORY (SCIVLAB) TO DEVELOP CRITICAL THINKING SKILLS IN ELEMENTARY SCHOOLS ON THE TOPIC OF CHANGES IN THE STATE OF SUBSTANCES*.
- Johnson, K. E., & Golombek, P. R. (2016). *Mindful L2 teacher education: A sociocultural perspective on cultivating teachers' professional development*. Routledge.
- Julmukya, T., Sujarwati, I., & Sofyan, D. (2025). The correlation between writing attitude and academic writing competence at state university in Bengkulu city. *Indonesian Journal of Educational Development*, 6(1), 96-108. <https://doi.org/10.59672/ijed.v6i1.4678>
- Khairuddin, Z., Daud, K., Anuar, N., Satimin, O., Yusof, F. H. M., & Sabri, S. (2024). Relationship between perceived students' critical thinking skills and academic writing skills. *International Journal of Research in Social Sciences and Humanities*, 8(3), 4709-4721. <https://dx.doi.org/10.47772/IJRIS.2024.803343S>
- Kyndt, E., et al. (2021). The role of academic competences and learning processes in thesis grades. *Studies in Higher Education*. <https://doi.org/10.1016/j.stueduc.2021.101012>
- Levchenko, I. (2020). Pedagogical conditions for the formation of research competence in future specialists in labour protection. *Збірник Наукових Праць ЛОГОС*, 104–107. <https://doi.org/10.36074/13.03.2020.v2.36>

- LW, A., DR, K., PW, A., KA, C., Mayer, R., PR, P., Rath, J., & MC, W. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*.
- Majid, M. H. A., Abadi, S., Razali, A. A. S., Harnaningrum, L. N., & Dewi, D. A. (2024). Plant watering system–Internet of Ythings. *Przegląd Elektrotechniczny*, 7. <https://doi.org/10.15199/48.2024.07.30>
- Meadows, V. S., Arney, G. N., Schwieterman, E. W., Lustig-Yaeger, J., Lincowski, A. P., Robinson, T., Domagal-Goldman, S. D., Deitrick, R., Barnes, R. K., & Fleming, D. P. (2018). The habitability of Proxima Centauri b: environmental states and observational discriminants. *Astrobiology*, 18(2), 133–189. <https://doi.org/10.1089/ast.2016.1589>
- Mogonea, F., & Mogonea, F. (2019). The pedagogical research project - an essential tool for the development of research competencies in the field of education. *Educatia* 21, 49–59. <https://doi.org/10.24193/ed21.2019.17.05>
- Muhamad Adnan, M. H., Abadi, S., Jatiningrum, C., Hanafi, H. F., Binti Mohd Zulkefli, N. A., & Dewi, D. A. (2024). Multi-Criteria Decision-Making in SMEs Venture Capital Allocation: Analytic Hierarchy Process and Double Auction Approach. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 54(1 SE-Articles), 80–90. <https://doi.org/10.37934/araset.54.1.8090>
- Musoeva, A. (2021). THE IMPORTANCE OF COMPETENCIES IN IMPROVING THE PROFESSIONAL SKILLS OF FUTURE FOREIGN LANGUAGE TEACHERS. *Asian Journal of Multidimensional Research (AJMR)*, 10, 89–95.
- Nur Ali Amri, Septi Wulandari, Tedy Agung Cahyadi, Inmarlinianto, & Satria Abadi. (2023). Distance of Drill-Hole Determination based on Global Estimation Variance of Coal Resources Classification. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 33(1 SE-Articles), 267–274. <https://doi.org/10.37934/araset.33.1.267274>
- Rangga Firdaus, Yusri Abdullah, Satria Abadi, Muhamad Hariz Muhamad Adnan, Sri Rezeki Candra Nursari, & Deshinta Arrova Dewi. (2024). Wireless Local Area Network and Analytical Hierarchy Process: Technology Acceptance Model for Increasing Use of Online Learning. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 47(1 SE-Articles), 29–38. <https://doi.org/10.37934/araset.47.1.2938>
- Rohmiyati, Y., Tengku Wook, T. S. M. T. W., Ashaari, N., Hanawi, S., & Abadi, S. (2024). Enhancing Accessibility: A Heuristic Evaluation of Social Presence Interface Design for E-Resources in University Libraries. *TEM Journal*, 2025–2035. <https://doi.org/10.18421/TEM133-30>
- Tamban, V., & Maningas, O. (2020). RESEARCH CAPABILITY OF PUBLIC SCHOOL TEACHERS: A BASIS FOR RESEARCH CAPABILITY ENHANCEMENT PROGRAM. *PEOPLE: International Journal of Social Sciences*, 6, 222–235. <https://doi.org/10.20319/pijss.2020.61.222235>
- Zulkifli, C. Z., Ismail, R., Ibrahim, A. B., & Boonsong, W. (2022). Performance analysis of proactive routing protocol based on different network load in mobile ad-hoc network (MANET). *Evolution of Information, Communication and Computing System*, 46–53.