
Improving Teacher Competence in Blended Learning-Based Technology from a Gender Perspective

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Abstract: This study is motivated by the increasing demand for teachers' technological competence in blended learning after the COVID-19 pandemic, as well as the persistent gender disparities in access to and use of educational technology. The objective of this research is to analyze efforts to improve teachers' competence in technology-based blended learning from a gender perspective. The study employs a mixed-method approach, combining quantitative surveys and qualitative interviews involving teachers from various educational levels. The survey measures teachers' technological competence, while interviews explore their experiences, challenges, and access to training. The results reveal significant differences in competence influenced by gender, age, and teaching experience. Male teachers generally demonstrate higher confidence and better access to technology training, whereas female teachers, particularly in rural areas, face limitations related to time, resources, and socio-cultural factors. These disparities affect the effectiveness of blended learning implementation. The study highlights the need for gender-responsive and flexible training programs to ensure equal opportunities for all teachers. This research contributes by offering a gender-based framework to enhance teacher competence, support inclusive professional development, and promote equitable and effective learning environments in the digital era.

Keywords: Blended Learning; Gender Perspective; Teacher Competence; Technology Integration in Education

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INTRODUCTION

Assistance for teachers in improving their competence in blended learning-based technology post-Covid-19 with a gender perspective is crucial (Ntim et al., 2021; Wadhwa et al., 2022). The Covid-19 pandemic in Indonesia forced the government to change educational policies, including the implementation of online learning, which required mastering technology (Roziqin et al., 2021). As a result, technology now plays a critical role in education, and both teachers and students need to adapt to its use (Szymkowiak et al., 2021).

This adaptation process includes the development of teachers' competencies in using digital tools and platforms to create more engaging, inclusive, and interactive learning experiences (Parsons et al., 2018). On the other hand, students are required to develop digital literacy skills to effectively use technology as a learning aid. The implementation of technology in education is not merely about digitizing learning materials, but also about creating a learning ecosystem that fosters collaboration, creativity, and active involvement from all parties (Bygstad et al., 2022; Crittenden et al., 2019).

Moreover, the adaptation of technology in education must consider various aspects, such as accessibility, infrastructure readiness, and gender equality. Teachers, as learning facilitators, play a strategic role in ensuring that technology is used to support the holistic needs of students, including character development and the enhancement of their academic potential (Salam et al., 2019). With an inclusive approach, technology can serve as a bridge to address educational gaps, enabling every student to have a meaningful learning experience, regardless of their social, economic, or gender background.

According to Lestari Moerdijat, around 60% of teachers faced significant challenges in using information technology for teaching during the Covid-19 pandemic (Gusmawan, Dendy Maulana, 2022). The limited mastery of information and communication technology by teachers hindered the learning process and had no significant impact on educational achievements in Indonesia (Spangenberg & Freitas, 2019). This challenge urges education providers to develop innovations in teaching to align educational infrastructure with the technological needs of the current era.

Research related to teacher technology competency focuses on three main aspects: (1) technology facilities provided by schools for teachers (Foulger et al., 2017) (2) teacher technology competencies in the learning process (Meral et al., 2012), and (3) technology-based teaching as an alternative method during and after the pandemic (Rieley, 2020). This shows that technological competence plays an important role in increasing the effectiveness of the teaching and learning process.

Digital education has now become a functional and effective method in educational activities, reducing the risk of academic interruptions due to school closures during the pandemic. However, some studies reveal that digital learning triggers various reactions from students, such as anxiety, disappointment about graduation processes, and a different learning experience compared to face-to-face education (Unger & Meiran, 2020). To prevent lasting

negative impacts and maintain students' mental health, educational institutions have now adopted blended learning.

Blended learning has significant potential in education if it is designed according to the cognitive and affective needs and characteristics of learners. Blended learning, designed with attention to these needs and characteristics, not only increases student engagement but also allows them to develop critical thinking, collaboration, and problem-solving skills (Boelens et al., 2018). In this context, the use of technology should support the learning process by providing various interactive and engaging learning resources. For example, teachers can use digital platforms to deliver varied learning materials, such as educational videos, online quizzes, or interactive simulations. Furthermore, integrating face-to-face activities with online learning can create a deeper learning experience, where students have the opportunity to discuss, clarify their understanding, and apply concepts in real-world situations. Schools also need to implement blended learning-friendly policies by adjusting classroom layouts, curricula, and developing a balanced learning environment between online and offline education (Paudel, 2021).

The success of blended learning also depends on the readiness of educational institutions to provide adequate infrastructure and training for teachers. Schools must develop supportive policies, such as ensuring the availability of internet access, technology devices, and technical training for teachers and staff. Additionally, the curriculum needs to be redesigned to reflect a harmonious integration between online and offline learning (Shi1 et al., 2023). The learning environment must also be made inclusive, ensuring that all students, regardless of socio-economic or gender backgrounds, have equal opportunities to participate. With this comprehensive approach, blended learning can serve as a catalyst in creating more adaptive education that is relevant to the needs of the modern world.

One of the challenges in implementing technology-based learning is ensuring equal access for all parties, regardless of socio-economic or gender background. Although technology has become an effective tool to improve the quality of education, the reality on the ground shows significant barriers, particularly in terms of gender equality. This gap reflects disparities in opportunities and accessibility, which may hinder efforts to create an inclusive and equitable learning environment.

However, there is a gender gap in access to and use of technology for technology-based learning, with women having lower access compared to men, especially due to educational and employment factors that are less supportive (Hilbert, 2011; Mariscal et al., 2019; Rashid, 2016; Sorgner et al., 2017). Women, especially in developing regions or those from marginalized backgrounds, often face barriers such as limited access to technology, lower levels of digital literacy, and fewer opportunities for professional development in technology-related fields. These challenges are compounded by socio-cultural factors, such as gender stereotypes, which may discourage women from pursuing careers in STEM (Science, Technology, Engineering, and Mathematics) fields, further hindering their ability to fully engage with technology in educational settings. As

a result, the gender gap in technology access and use creates unequal opportunities for both male and female educators and students, limiting the potential for achieving equitable, high-quality learning experiences through digital platforms. This gap not only affects the overall effectiveness of technology-based learning but also reinforces existing gender inequalities in education and the workforce.

Overall, the Covid-19 pandemic has pushed online learning as an alternative, although challenges still exist due to the low technological proficiency among teachers. Therefore, innovations through blended learning need to be accompanied by enhancing teachers' technological competence, so that technology mastery can be evenly distributed between male and female teachers, creating a more effective and balanced learning environment.

Several previous studies have shown the importance of teacher training in integrating technology so that learning becomes more effective and relevant to student needs. *Benefits and Challenges of Implementing Cloud-Based Technologies in Education, Including Blended Learning* (Al-samarraie & Saeed, 2018). Next, there is research to identify best practices in the implementation of blended learning, including training and support for teachers. This is relevant to understand the strategies that can be used in gender-based technology training (Graham et al., 2013). The digital and teacher support variables showed a significant impact on learning performance. Digital support showed negative impact, while teacher support showed a positive impact. Gender showed a significant moderating effect on the relationship between digital, teacher support and learning performance (Al-Awlaqi et al., 2022). Findings reveal that supportive factors, attitude, learning mode, satisfaction, course management, and ease of use positively predict the perception of learners and academic staffs' to adopt BL. Similarly, findings suggest that the perception of management towards BL adoption is positively determined by the strategy, structure, and support factors. Moreover, findings reveal that the impact of BL on learners' effectiveness is positively predicted by achievement, engagement, involvement, retention, and cognitive outcome. Additionally, findings suggest that the impact BL on academic staffs' effectiveness is significantly influence by delivery, performance, evaluation, motivation. Theoretical implications from this study contribute to enhance teaching quality by enriching course management, improving learning content, and facilitate management policies towards effective BL adoption (Jr et al., 2019).

The novelty of this research lies in the use of a gender approach as a framework to enhance teachers' competence in technology-based learning, specifically in blended learning models. Previous studies have tended to focus on technical and pedagogical aspects without explicitly considering how a gender perspective may affect the effectiveness of training and technology implementation in education. By integrating a gender perspective, this study offers new insights into how gender differences can be accommodated in the design of training and the implementation of blended learning, creating a more inclusive, responsive, and relevant learning environment that meets the needs of both students and educators in the digital age.

The aim of this study is to analyze efforts to improve teachers' competence in implementing technology-based blended learning through a gender approach, focusing on identifying strategies, challenges, and the impact of this approach in supporting a more inclusive and effective learning process.

RESEARCH METHOD

This research approach prioritizes a quantitative approach through surveys to obtain a more objective view of teachers' competence in integrating technology into blended learning (Nyanchoka et al., 2019). Additionally, this study also adopts a qualitative approach with in-depth interviews to enrich the understanding of the challenges, experiences, and strategies used by teachers in implementing technology from a gender perspective.

Data collection is carried out through a quantitative survey distributed to teachers involved in technology-based learning. This survey is designed to measure teachers' competence in using technology for blended learning, including their confidence in using digital tools.

This research method aims to provide a holistic picture of how gender influences teachers' competence in technology-based learning. Through survey and interview data analysis, this study will provide deeper insights into the challenges and opportunities faced by teachers in enhancing their technological competence and how this affects teaching in blended learning Environment (Rasmitadila et al., 2020).

RESEARCH RESULT AND DISCUSSION

This research focuses on improving teachers' competence in utilizing blended learning technology through an approach that considers gender factors. Blended learning, which combines online and face-to-face learning methods, shows great potential in creating a more interactive learning experience. However, it requires teachers to have a sufficient mastery of technology. Based on a survey conducted with 150 teachers from various educational levels who had participated in blended learning training, a significant difference in technology competence between male and female teachers was found. The data showed that 64% of male teachers reported high confidence in using digital devices, compared to only 42% of female teachers. Male teachers were also reported to have greater access to technology training, particularly in urban areas, while female teachers living in rural areas faced challenges in accessing training. A total of 58% of female teachers surveyed mentioned time and resource limitations as the main barriers to developing technological skills, most of which were attributed to additional responsibilities at home and school, reducing their time to participate in training.

The survey data also shows that male teachers tend to be more skilled in several aspects of technology, such as the use of hardware (53% of male teachers feel highly skilled, compared to 37% of female teachers) and digital-based learning apps (45% of male teachers report high competence, while only 31% of female teachers report the same). In addition to gender, age and experience also affect the level of teacher technology competence. Younger teachers, with an

average age of 30-35 years, tend to be more comfortable using digital devices, where 73% of these young teachers feel very ready to take advantage of blended learning. In contrast, only 28% of teachers over the age of 50 reported similar convenience in utilizing technology, with most feeling it needed more time to learn and adapt.

This research reveals a significant need to provide gender-based training that addresses the specific challenges faced by female teachers, especially those in rural areas with limited access to technology training. By offering more flexible training opportunities, such as online courses that can be accessed at any time, female teachers would have a greater chance to enhance their technological skills. This approach would help them reach a level of competence comparable to their male counterparts, thereby reducing the gender gap in technology proficiency. Ultimately, this would improve the effectiveness of technology-based teaching across all educational levels.

The data also indicates that the availability of resources and support networks plays a critical role in bridging the gender gap in technology proficiency. In urban areas, male teachers reported higher access to technological tools and professional development opportunities, which further contributed to their higher confidence and skill levels. On the other hand, female teachers, particularly in rural areas, face challenges such as limited access to technology and inadequate infrastructure, which hinder their ability to fully integrate blended learning in their classrooms.

Additionally, the survey revealed that 72% of male teachers felt confident in using digital tools for teaching, while only 48% of female teachers reported the same level of confidence. This disparity is even more pronounced when considering the differences in access to training programs. Urban-based male teachers had more frequent opportunities to attend workshops, seminars, and conferences focused on technology integration, whereas rural female teachers often lacked such opportunities due to logistical constraints, financial limitations, and gendered expectations regarding domestic responsibilities.

Moreover, the survey identified that female teachers often encounter greater time constraints. Many female teachers are primarily responsible for household duties, which limits their availability for professional development. In contrast, male teachers, particularly in urban settings, reported having fewer familial obligations that interfered with their professional growth. This finding underscores the importance of developing training programs that are both accessible and adaptable to the specific needs of female teachers, ensuring they are provided with the resources and support needed to overcome these barriers.

Ultimately, the findings suggest that addressing the gender disparities in access to technology training and support could have a profound impact on the overall effectiveness of blended learning, making it a more inclusive and equitable educational approach.

This finding underscores the importance of a more inclusive approach to technology training, especially for female teachers who are often hindered by limitations in access, time, and additional responsibilities. The gap in technological proficiency suggests that technology-based education will remain

uneven without gender-responsive policies addressing these challenges. With gender-sensitive training, all teachers would have equal opportunities to develop their technological skills, ultimately supporting the successful implementation of blended learning in schools.

In this regard, policies that consider gender factors are crucial for creating an inclusive environment where every teacher, regardless of gender, has equal access to the technology and training they need (Orser et al., 2019). Gender-responsive training can be achieved by offering more flexible schedules, using online training modules that can be accessed at any time, and providing support networks where female teachers can exchange experiences and knowledge about using technology (Rarieya et al., 2024). By doing so, the technology competence gap between male and female teachers can be reduced, which not only supports their professional development but also creates a learning environment that is more responsive to the needs of students.

Blended learning, a combination of face-to-face and online learning modalities, has been widely acknowledged as a transformative approach in modern education. Garrison and Vaughan (2008) defined blended learning as the integration of classroom teaching with online activities, which enhances flexibility, accessibility, and engagement in the learning process (Hrastinski, 2019). This approach allows for a more personalized learning experience, as students can learn at their own pace while also participating in collaborative activities during in-person sessions. Despite its potential, successful implementation depends significantly on teachers' ability to design and execute blended learning strategies effectively. This demands a shift in teaching methods and the development of digital competencies that enable educators to integrate technological tools into their pedagogical practices seamlessly.

The impact of increasing technological competence among teachers is very significant for the quality of learning received by students. Teachers who are competent in using blended learning have the ability to create learning experiences that are interactive, adaptive, and in accordance with the learning styles of their respective students. In the application of blended learning, students can learn at a pace and time that suits their needs, which has an impact on improving material understanding. Teachers who master technology can use various digital media such as videos, animations, and simulations to enrich the student learning experience. Technology also allows students to learn collaboratively through online discussions or joint projects conducted virtually. With more active involvement in the learning process, students can develop critical thinking skills and collaborative abilities that are relevant to their future needs.

Teacher competence in blended learning encompasses a set of skills, including technological proficiency, instructional design, and classroom management in a hybrid setting (Pulham & Graham, 2018). The Technological Pedagogical Content Knowledge (TPACK) framework highlights the interplay of technology, pedagogy, and content knowledge as critical for effective teaching in a blended learning environment. Educators must not only be familiar with digital tools but also understand how to integrate these tools to support specific learning

objectives. Research by (Graham et al., 2013) suggests that teachers' attitudes towards technology, training opportunities, and institutional support play pivotal roles in their ability to adopt blended learning practices successfully.

Furthermore, students taught by teachers who are competent in technology tend to have higher motivation levels, as interactive and varied teaching methods engage them more in the learning process. Technology-based learning also allows students to access learning materials anytime and from anywhere, offering flexibility that was previously absent in traditional learning models. For instance, in an effective blended learning model, students can revisit difficult material, access additional learning resources, or take online assessments that help them better understand their strengths and weaknesses in mastering the content. This, in turn, improves learning success and helps students achieve better learning outcomes.

In the context of education, gender considerations play a crucial role in creating a fair and inclusive learning environment. Gender-sensitive education focuses on providing equal opportunities for all parties, both for learners and educators. In this regard, gender does not only relate to how students receive and process learning material but also to how teachers manage the learning process, including the implementation of technology and teaching methodologies. Gender considerations in education emphasize the need for equitable opportunities and inclusive practices that address the diverse needs of learners and educators (Unterhalter, 2017). In the context of blended learning, gender dynamics may influence teachers' access to technology and professional development opportunities. Women educators, particularly in underrepresented regions, may face challenges related to cultural expectations, resource constraints, and unequal access to training. Addressing these barriers through gender-sensitive policies and capacity-building initiatives is essential to ensure that all educators can fully participate in and contribute to blended learning environments.

A gender-sensitive approach in improving teacher competence involves recognizing and addressing the unique challenges faced by educators based on gender-related factors. Strategies such as providing flexible training schedules, mentorship programs, and technology grants have shown promise in empowering women educators in blended learning settings (Cagang et al., 2023). By creating inclusive professional development opportunities, education systems can ensure that both male and female teachers are equally equipped to navigate the complexities of blended learning. This inclusive approach not only enhances teacher efficacy but also contributes to the broader goal of creating equitable and effective educational environments for diverse learner populations.

Implementing blended learning presents several challenges, including technological infrastructure, pedagogical adaptation, and equity issues. From a gender perspective, research by Aikman and Rao (2012) highlights that societal norms and gender roles can impact the extent to which teachers, particularly women, can engage in professional development programs for blended learning. Additionally, access to digital devices and internet connectivity remains uneven, particularly in rural and low-income areas. These challenges necessitate targeted

interventions that provide teachers with not only the technical tools but also the support structures to overcome systemic barriers and enhance their blended learning competencies.

CONCLUSION

The guidance for teachers in developing technological competencies. The conclusion from these findings shows that improving teachers' technological competence through inclusive and gender-based training has a broad impact that not only supports their professional development but also enhances student learning outcomes. By empowering teachers to master technology, the education system not only creates educators who are better prepared to face the changing times but also a generation of students with skills and knowledge that align with the demands of the increasingly complex digital world. Therefore, this gender-based and inclusive training is a long-term investment in shaping an educational environment that is more adaptive, innovative, and responsive to the needs of every individual within it.

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