



Digital and Innovative Learning Strategies in Midwifery Education to Improve Student Engagement and Clinical Readiness in the 6th Semester of Midwifery at FIKes UMT

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Abstract

The rapid advancement of digital technology in health sciences education requires innovative learning approaches that can effectively enhance student engagement and clinical readiness. Although digital learning has been increasingly implemented in health education, empirical evidence regarding its effectiveness in midwifery education particularly in improving students' clinical preparedness remains limited. Therefore, this study aimed to examine the effectiveness of digital and innovative learning strategies in improving student engagement and clinical readiness among sixth-semester midwifery students at the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKes UMT). This research employed a quasi-experimental design with a one-group pre-test and post-test approach involving 32 sixth-semester midwifery students. The intervention was conducted over eight weeks through the implementation of several digital learning strategies, including video-based learning modules, virtual clinical simulation, learning management system (LMS)-based instruction, and collaborative digital assignments. Data were collected using validated questionnaires measuring student engagement and clinical readiness. The data were analyzed using descriptive statistics and paired sample t-tests to determine the significance of changes before and after the intervention. The results revealed a significant improvement in student engagement (pre-test mean = 62.3 ± 8.4 ; post-test mean = 82.7 ± 6.1 ; $p < 0.001$) and clinical readiness (pre-test mean = 60.8 ± 7.9 ; post-test mean = 81.5 ± 5.7 ; $p < 0.001$). In addition, qualitative feedback from students indicated increased motivation, better conceptual understanding, and greater confidence in performing clinical skills. These findings suggest that the integration of digital and innovative learning strategies can significantly enhance the quality of learning in midwifery education. Consequently, incorporating digital learning technologies into the midwifery curriculum is recommended to support competency-based education and prepare students for the demands of modern healthcare practice.

Abstrak

Perkembangan pesat teknologi digital dalam pendidikan ilmu kesehatan menuntut pendekatan pembelajaran inovatif yang mampu meningkatkan keterlibatan mahasiswa dan kesiapan klinis. Meskipun pembelajaran digital semakin banyak diterapkan dalam pendidikan kesehatan, bukti empiris mengenai efektivitasnya dalam pendidikan kebidanan—khususnya dalam meningkatkan kesiapan klinis mahasiswa—masih terbatas. Oleh karena itu, penelitian ini bertujuan untuk menganalisis efektivitas strategi pembelajaran digital dan inovatif dalam meningkatkan keterlibatan mahasiswa dan kesiapan klinis pada mahasiswa kebidanan semester VI di Fakultas Ilmu Kesehatan Universitas Muhammadiyah Tangerang (FIKes UMT). Penelitian ini menggunakan desain quasi-eksperimental dengan pendekatan one-group pre-test dan post-test yang melibatkan 32 mahasiswa kebidanan semester VI. Intervensi dilaksanakan selama delapan minggu melalui penerapan berbagai strategi pembelajaran digital, termasuk modul pembelajaran berbasis video, simulasi klinis virtual, pembelajaran berbasis Learning Management System (LMS), serta penugasan kolaboratif berbasis digital. Data dikumpulkan menggunakan kuesioner yang telah tervalidasi untuk mengukur keterlibatan mahasiswa dan kesiapan klinis. Analisis data dilakukan menggunakan statistik deskriptif dan paired sample t-test untuk mengetahui perbedaan sebelum dan sesudah intervensi. Hasil penelitian menunjukkan adanya peningkatan yang signifikan pada keterlibatan mahasiswa (rata-rata pre-test = $62,3 \pm 8,4$; rata-rata post-test = $82,7 \pm 6,1$; $p < 0,001$) serta kesiapan klinis (rata-rata pre-test = $60,8 \pm 7,9$; rata-rata post-test = $81,5 \pm 5,7$; $p < 0,001$). Selain itu, umpan balik mahasiswa menunjukkan adanya peningkatan motivasi belajar, pemahaman konseptual yang lebih baik, serta kepercayaan diri yang lebih tinggi dalam melakukan keterampilan klinis. Temuan ini menunjukkan bahwa integrasi strategi pembelajaran digital dan inovatif dapat secara

signifikan meningkatkan kualitas pembelajaran dalam pendidikan kebidanan. Oleh karena itu, integrasi teknologi pembelajaran digital dalam kurikulum kebidanan direkomendasikan untuk mendukung pendidikan berbasis kompetensi dan mempersiapkan mahasiswa menghadapi tuntutan praktik layanan kesehatan modern.

Kata Kunci: Pembelajaran Digital, Strategi Pembelajaran Inovatif, Pendidikan Kebidanan, Keterlibatan Mahasiswa, Kesiapan Klinis

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1. INTRODUCTION

The transformation of health education in the 21st century has been significantly influenced by advancements in digital technology. Globally, higher education institutions are increasingly integrating technology-driven pedagogical approaches to improve learning outcomes, foster student engagement, and enhance clinical readiness. In the field of midwifery education, this transition is particularly crucial, as clinical competency is central to ensuring safe and quality maternity and neonatal care (Shorey & Ang, 2023).

Midwifery education encompasses a wide range of cognitive, psychomotor, and affective competencies that students must acquire before entering professional clinical settings. These competencies include clinical reasoning, technical skills, communication abilities, and professional attitudes that directly influence maternal and neonatal health outcomes. Traditional lecture-based teaching methods, while still important as a theoretical foundation, have often been criticized for their limited ability to develop critical thinking, practical skills, and reflective learning habits among students (Reime et al., 2023). Consequently, many educators have sought innovative teaching strategies that allow students to actively engage with learning materials and practice clinical decision-making in simulated environments.

Digital learning strategies have emerged as one of the most promising solutions in modern health education. These strategies include e-learning platforms, virtual simulations, video-based instruction, interactive multimedia modules, gamification, and blended learning models that combine face-to-face instruction with online activities. Research has demonstrated that digital learning environments can enhance student engagement, facilitate self-directed learning, and allow flexible access to educational resources (Rudd & Wang, 2024). Moreover, simulation-based digital learning provides a safe environment for students to practice clinical procedures, identify potential errors, and develop clinical reasoning without risking patient safety (Higham et al., 2023).

In the context of health sciences education, particularly in midwifery and nursing programs, digital learning approaches have been widely associated with improved academic achievement and increased confidence in clinical practice. Studies conducted in various countries indicate that students who participate in digital and simulation-based learning demonstrate higher levels of engagement and better preparedness for clinical placements (Levett-Jones et al., 2023; Padilha et al., 2024). These findings suggest that digital learning strategies not only support theoretical understanding but also strengthen the integration between knowledge and clinical practice.

Despite these promising developments, the implementation of digital learning in Indonesian higher education institutions remains uneven. Many universities are still in the early stages of integrating technology into their curricula, particularly in programs that require extensive clinical training such as midwifery education. At the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKes UMT), the adoption of digital learning increased significantly during the COVID-19 pandemic when institutions were required to transition rapidly to online learning environments. However, after the pandemic, the systematic and sustainable integration of digital learning strategies into the midwifery curriculum remains a challenge (Nurhidayah et al., 2023).

This issue becomes especially important for students in the sixth semester of the midwifery program. At this stage, students are expected to consolidate theoretical knowledge acquired in previous semesters and demonstrate readiness for advanced clinical practice. They must be capable of performing clinical assessments, making appropriate decisions during obstetric emergencies, and providing safe maternal and neonatal care under professional supervision. Conventional lecture-based instruction alone may not adequately prepare students to handle complex and dynamic clinical situations encountered in real healthcare settings.

Although previous studies have highlighted the benefits of digital learning in nursing and health education, empirical research specifically examining its impact on midwifery students in the Indonesian context remains limited. Furthermore, few studies have focused on sixth-semester students who are approaching their final clinical placements, a stage where clinical readiness and engagement are particularly critical. This gap in the literature highlights the need for further investigation into how digital and innovative learning strategies can support midwifery students in preparing for professional practice.

Based on this research gap, this study aims to evaluate the effectiveness of structured digital learning strategies in enhancing student engagement and clinical readiness among sixth-semester midwifery students at the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang. The research specifically investigates how the integration of digital learning tools, such as interactive multimedia modules, video-based learning, and online discussion platforms, can influence students' participation in learning activities and their preparedness for clinical practice.

The results of this study are expected to contribute both theoretically and practically. From a theoretical perspective, the findings will enrich the body of knowledge regarding the application of digital learning in midwifery education, particularly in developing countries. Practically, the results may provide evidence-based recommendations for curriculum developers, lecturers, and educational institutions in designing more effective and innovative learning strategies that support the development of competent and confident midwives.

In this study, student engagement refers to the level of students' active participation, motivation, and involvement in learning activities, including interaction with digital learning materials and collaborative discussions. Meanwhile, clinical readiness refers to the preparedness of students to perform clinical tasks, apply theoretical knowledge in practical contexts, and demonstrate professional competence before entering clinical practice.

2. RESEARCH METHODOLOGY

2.1 Study Design

This study employed a quasi-experimental design using a one-group pre-test and post-test approach. This design was selected to examine the effectiveness of digital and innovative learning interventions in improving student engagement and clinical readiness among midwifery students. The pre-test measurement was conducted prior to the intervention, while the post-test measurement was administered after the completion of the intervention to assess any significant changes in learning outcomes.

The quasi-experimental design was considered appropriate because it allowed the researchers to evaluate the impact of the educational intervention in a real academic setting without manipulating class assignments or randomly allocating participants. This approach is commonly used in educational research to measure the effectiveness of instructional strategies in natural learning environments.

Prior to data collection, ethical approval was obtained from the Research Ethics Committee of the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKES UMT). All procedures

in this study adhered to ethical research standards, including voluntary participation, confidentiality of data, and informed consent.

2.2 Research Setting

This study was conducted at the Midwifery Study Program, Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKES UMT), Indonesia. The research took place during the odd semester of the 2025/2026 academic year.

The sixth semester was selected as the focus of the study because it represents a critical phase in midwifery education where students are expected to integrate theoretical knowledge with clinical competencies in preparation for advanced clinical practice and professional placement.

2.3 Participants

A total of 32 midwifery students enrolled in the 6th semester at FIKES UMT participated in this study. Participants were selected using total sampling, as the total population of sixth-semester midwifery students during the research period consisted of 32 individuals. The inclusion criteria for participation were as follows: 1) Students actively enrolled in the 6th semester of the midwifery study program. 2) Students who agreed to participate voluntarily and signed an informed consent form. 3) Students who had access to digital devices, such as smartphones, tablets, or laptops, as well as a stable internet connection. Students who had less than 80% attendance during the intervention period or who did not complete both the pre-test and post-test questionnaires were excluded from the final data analysis.

2.4 Intervention

The digital learning intervention was implemented over eight weeks and consisted of four integrated instructional components designed to enhance both theoretical understanding and clinical decision-making skills. 1) Video-Based Learning Modules. Pre-recorded instructional videos were developed by lecturers covering key topics in the sixth-semester curriculum, including antenatal care, intrapartum management, postpartum care, and neonatal assessment. These videos were uploaded to the university's Learning Management System (LMS), allowing students to access the materials flexibly. 2) Virtual Clinical Simulation. Students participated in virtual obstetric simulation scenarios using the online platform SimMom®. These simulations presented realistic clinical cases requiring students to analyze patient conditions, make clinical decisions, and determine appropriate midwifery interventions. 3) Interactive E-Learning Modules. Interactive digital learning modules were developed with embedded formative quizzes designed to assess students' comprehension of key competencies. Immediate automated feedback was provided to help students identify areas that required further study. 4) Collaborative Digital Assignments. Students participated in group-based case discussions through WhatsApp discussion groups and collaborative document platforms such as Google Docs. These activities encouraged peer interaction, critical thinking, and collaborative problem-solving.

2.5 Research Instruments

Two validated instruments were used to measure the key variables in this study. 1) Digital Learning Engagement Scale (DLES). Student engagement was measured using the Digital Learning Engagement Scale (DLES), a 25-item Likert-scale instrument with response options ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument assesses several dimensions of engagement, including: (a) Behavioral engagement. (b) Emotional engagement. (c) Cognitive engagement. (d) Collaborative engagement. The DLES instrument was adapted and validated for Indonesian health science students (Nurhidayah et al., 2023). 2) Clinical Readiness Assessment Tool for Midwifery (CRATM). Clinical readiness was assessed using the Clinical Readiness Assessment Tool for Midwifery (CRATM), a 30-item questionnaire designed to evaluate students' preparedness for clinical practice. The instrument measures three major competency domains: (a) Clinical knowledge.

(b) Psychomotor skills. (c) Professional attitudes. The CRATM instrument has previously been validated in midwifery education contexts (Levett-Jones et al., 2023).

2.6 Validity and Reliability Testing

Prior to the main study, a pilot test was conducted involving 10 midwifery students who were not included in the main research sample. The purpose of the pilot study was to assess the clarity, reliability, and internal consistency of the research instruments.

The reliability of the instruments was evaluated using Cronbach's Alpha coefficient. The results indicated high reliability for both instruments: (a) Digital Learning Engagement Scale (DLES): $\alpha = 0.87$. (b) Clinical Readiness Assessment Tool for Midwifery (CRATM): $\alpha = 0.89$.

These values exceeded the minimum acceptable reliability threshold of 0.70, indicating that both instruments were suitable for use in this study.

2.7 Data Collection Procedures

Data collection was conducted in two stages: (1) Pre-test Phase. During the first week of the study, students completed the pre-test questionnaire, which measured baseline levels of engagement and clinical readiness before the implementation of the digital learning intervention. (2) Post-test Phase. After the completion of the eight-week intervention, students completed the post-test questionnaire using the same instruments to measure changes in engagement and clinical readiness.

All questionnaires were administered electronically using Google Forms. Participation was voluntary, and students were informed that their responses would remain confidential and would not affect their academic evaluation or course grades.

2.8 Data Analysis

The collected data were analyzed using IBM SPSS Statistics version 26. The analysis consisted of the following steps: 1) Descriptive Statistics. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to describe participant characteristics and overall instrument scores. 2) Normality Testing. The Shapiro–Wilk test was used to determine whether the data were normally distributed. 3) Inferential Analysis.

Because the data met the assumption of normal distribution, a paired-sample t-test was conducted to compare pre-test and post-test scores for both student engagement and clinical readiness. A significance level of $p < 0.05$ was used to determine statistical significance.

3. RESULTS AND DISCUSSION

3.1 Participant Characteristics

A total of 32 sixth-semester midwifery students participated in this study and completed both the pre-test and post-test assessments, resulting in a 100% response rate. This full participation ensured that all collected data could be included in the final statistical analysis.

Table 1 presents the demographic characteristics of the participants. The majority of students were between 19–21 years old (56.3%), while 43.7% were aged 22–24 years. As expected in midwifery programs, all participants were female (100%).

Regarding digital readiness, all participants reported owning a smartphone (100%), and 84.4% had access to a laptop or personal computer, indicating a high level of technological accessibility among the students. Additionally, 93.8% of students reported having daily internet access, suggesting that the participants had sufficient technological infrastructure to participate effectively in digital learning activities.

The high availability of digital devices and internet access among participants supports the feasibility of implementing digital learning strategies within the midwifery education context at FIKes UMT.

Tabel 1. Participant Characteristics (n = 32)

Characteristic	n	%
Age 19–21 years	18	56.3
Age 22–24 years	14	43.7
Female	32	100.0
Own smartphone	32	100.0
Own laptop/PC	27	84.4
Internet access (daily)	30	93.8

3.2 Student Engagement Scores

Table 2 presents the pre-test and post-test scores for student engagement measured using the Digital Learning Engagement Scale (DLES). The results indicate a statistically significant increase in overall student engagement following the eight-week digital learning intervention.

Tabel 2. Student Engagement Scores Pre- and Post-Intervention (n = 32)

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Δ Mean	p-value
Student Engagement (DLES)	62.3 ± 8.4	82.7 ± 6.1	+20.4	< 0.001
Behavioral Engagement	63.1 ± 7.6	83.4 ± 6.3	+20.3	< 0.001
Cognitive Engagement	61.9 ± 9.2	82.1 ± 5.9	+20.2	< 0.001
Emotional Engagement	61.8 ± 8.9	82.5 ± 6.6	+20.7	< 0.001

The findings demonstrate a substantial improvement in student engagement, with the overall mean score increasing from 62.3 ± 8.4 in the pre-test to 82.7 ± 6.1 in the post-test ($p < 0.001$). This represents an average increase of 20.4 points, indicating a strong positive effect of the digital learning intervention.

All three engagement dimensions—behavioral, cognitive, and emotional engagement—experienced comparable improvements. Behavioral engagement increased by 20.3 points, cognitive engagement by 20.2 points, and emotional engagement by 20.7 points. These results suggest that digital learning strategies positively influenced not only students' participation in learning activities but also their motivation and intellectual involvement in the learning process.

The incorporation of video-based learning modules was frequently cited by students as one of the most helpful components of the intervention. Video lectures allowed students to revisit complex clinical topics at their own pace, thereby supporting self-regulated learning and accommodating diverse learning preferences. This flexibility has been widely recognized as a key advantage of asynchronous digital learning environments.

Furthermore, the collaborative digital assignments, particularly group case discussions through messaging platforms and shared documents, appeared to stimulate active interaction among students. Peer discussion enabled learners to exchange perspectives, clarify misunderstandings, and collaboratively analyze clinical scenarios.

These findings are consistent with previous research demonstrating that digital learning environments can significantly enhance student engagement by promoting interactive, learner-

centered educational experiences (Rudd & Wang, 2024). Similarly, Padilha et al. (2024) found that digital modules combined with formative assessments increased students' motivation and academic participation in health sciences education.

3.3 Clinical Readiness Scores

Clinical readiness was assessed using the Clinical Readiness Assessment Tool for Midwifery (CRATM). Table 3 presents the pre- and post-test scores across the three competency domains.

Tabel 3. Clinical Readiness Scores Pre- and Post-Intervention (n = 32)

Clinical Readiness Domain	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Δ Mean	p-value
Overall Clinical Readiness (CRATM)	60.8 $\pm$ 7.9	81.5 $\pm$ 5.7	+20.7	< 0.001
Clinical Knowledge	61.4 $\pm$ 8.1	82.3 $\pm$ 5.5	+20.9	< 0.001
Psychomotor Skills	59.7 $\pm$ 8.6	80.1 $\pm$ 6.2	+20.4	< 0.001
Professional Attitude	61.3 $\pm$ 7.8	82.1 $\pm$ 5.9	+20.8	< 0.001

The results indicate a significant improvement in overall clinical readiness, with the mean score increasing from 60.8 $\pm$ 7.9 in the pre-test to 81.5 $\pm$ 5.7 in the post-test ($p < 0.001$). This improvement suggests that the digital learning intervention effectively supported students' preparation for clinical practice.

Each domain of clinical readiness demonstrated substantial gains. Clinical knowledge increased by 20.9 points, indicating enhanced conceptual understanding of obstetric and neonatal care principles. Professional attitudes also improved by 20.8 points, suggesting that digital collaborative learning activities may have strengthened students' sense of professional responsibility and ethical awareness.

Notably, psychomotor skills improved by 20.4 points, which is particularly significant given that practical skills are traditionally believed to require direct clinical practice for effective development. The improvement observed in this study suggests that virtual clinical simulation can serve as an effective preparatory tool for skill development before students enter real clinical settings.

The virtual simulation scenarios enabled students to practice clinical decision-making processes repeatedly in a safe and structured environment. Through these simulations, students engaged in realistic obstetric case management, including maternal assessment, labor monitoring, and neonatal evaluation.

These findings align with research conducted by Higham et al. (2023), which demonstrated that simulation-based learning significantly enhances clinical confidence, procedural accuracy, and decision-making skills among midwifery students. Simulation technology allows learners to rehearse complex clinical scenarios without risking patient safety, making it an increasingly valuable component of modern health professional education.

Overall, the results of this study suggest that integrated digital learning strategies combining multimedia instruction, virtual simulation, and collaborative learning can substantially enhance both student engagement and clinical readiness in midwifery education.

3.4 Discussion

The findings of this study confirm the effectiveness of a multi-component digital learning intervention in improving both student engagement and clinical readiness among sixth-semester midwifery students at the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKES UMT). The statistically significant improvements observed in the pre-test and post-test scores indicate that integrating digital tools into the midwifery curriculum can substantially enhance the quality of learning experiences and better prepare students for clinical practice.

The theoretical basis of this intervention is closely aligned with constructivist learning theory, which emphasizes that knowledge is constructed through active engagement with learning materials and social interaction (Shorey & Ang, 2023). In digital learning environments, students are not merely passive recipients of information; instead, they interact with multimedia content, engage in problem-solving activities, and collaborate with peers to construct deeper understanding. These learner-centered approaches have been widely recognized as more effective than traditional lecture-based instruction in promoting critical thinking and professional competency development.

The significant improvement in student engagement observed in this study reflects the ability of digital learning strategies to stimulate active participation in the learning process. Previous research in health sciences education has consistently reported similar findings. For instance, Rudd and Wang (2024) found that the integration of multimedia learning platforms increased behavioral and cognitive engagement among nursing students by facilitating interactive learning experiences. Likewise, a study by Martin et al. (2023) reported that blended learning environments significantly improved student motivation, attention, and participation compared to traditional teaching methods.

One of the most influential components of the intervention in this study was the use of video-based learning modules. These modules allowed students to review complex clinical topics multiple times and at their own pace, supporting self-regulated learning and individualized study patterns. This flexibility has been identified as a key advantage of asynchronous digital learning environments. Padilha et al. (2024) reported that video-based instruction significantly improved comprehension and knowledge retention among nursing students, particularly when combined with interactive assessments.

The use of interactive e-learning modules with embedded quizzes also played an important role in improving student engagement. Formative assessment tools provided immediate feedback, enabling students to identify knowledge gaps and reinforce their understanding of key concepts. This approach aligns with the principles of mastery learning, where students progress through learning stages only after achieving a certain level of competency. Reime et al. (2023) highlighted that repeated formative assessments in digital platforms improve knowledge retention and clinical reasoning among health professional students.

Another critical element contributing to increased engagement was the implementation of collaborative digital assignments, particularly case-based discussions conducted through messaging platforms and shared digital documents. Peer discussion promotes deeper cognitive processing and encourages students to articulate their reasoning when analyzing clinical scenarios. According to Levett-Jones et al. (2023), collaborative learning environments enhance communication skills, teamwork, and reflective thinking—competencies that are essential for effective midwifery practice.

In addition to improving engagement, the digital learning intervention significantly enhanced clinical readiness across all measured domains, including clinical knowledge, psychomotor skills, and professional attitudes. The substantial increase in psychomotor skill scores is particularly noteworthy, as practical competencies are often considered difficult to develop outside direct clinical practice. However, advances in simulation technology have made it possible to replicate realistic clinical scenarios in virtual environments.

The virtual clinical simulation component used in this study allowed students to practice clinical decision-making and procedural steps in a safe, repeatable environment. High-fidelity simulation has been widely recognized as an effective strategy for bridging the gap between theoretical knowledge and practical application. Higham et al. (2023) demonstrated that simulation-based learning significantly improved the clinical performance and confidence of midwifery students during obstetric emergency management training.

Similarly, Cant and Cooper (2023) reported that simulation-based learning enhances psychomotor skill acquisition and clinical judgment by allowing students to repeatedly practice

procedures without the risk of harming patients. These findings are further supported by a systematic review conducted by Liaw et al. (2023), which concluded that digital simulation improves diagnostic reasoning and procedural competence among nursing and midwifery students.

The improvement observed in professional attitudes also suggests that digital collaborative learning environments can foster professional identity development. When students engage in discussions about ethical dilemmas, patient safety, and case management strategies, they develop greater awareness of professional responsibilities and ethical considerations in healthcare practice. According to O'Connor et al. (2024), reflective digital learning activities contribute to the development of empathy, accountability, and patient-centered care attitudes among healthcare students.

Another important factor supporting the success of the intervention was the high level of digital accessibility among participants. In this study, all students owned smartphones and most had daily internet access. This technological readiness indicates that the integration of digital learning strategies is both feasible and sustainable within the current educational environment. National surveys also report high smartphone penetration among Indonesian university students, making mobile-based learning platforms particularly suitable for higher education contexts (Nurhidayah et al., 2023).

From an institutional perspective, these findings highlight the importance of curriculum transformation toward digitally supported learning ecosystems. Integrating digital modules, virtual simulations, and collaborative online activities into midwifery education can help universities prepare students more effectively for modern healthcare environments where technology plays an increasingly central role. According to Cook and Steinert (2023), digital learning environments support competency-based education models by providing flexible, scalable, and data-driven learning opportunities.

Despite the promising results, several limitations must be acknowledged. First, the quasi-experimental design without a control group limits the ability to attribute improvements exclusively to the digital learning intervention. Factors such as maturation effects, concurrent coursework, or the Hawthorne effect may have influenced the observed outcomes. Future research should employ randomized controlled trials to provide stronger causal evidence.

Second, the study was conducted with a relatively small sample size from a single institution, which may limit the generalizability of the findings. Multi-center studies involving larger and more diverse samples of midwifery students would provide more comprehensive insights into the effectiveness of digital learning strategies across different educational contexts.

Third, the study evaluated outcomes immediately after the intervention, meaning that the long-term retention of knowledge and clinical skills was not assessed. Future research should include follow-up evaluations during clinical placements to determine whether digital learning interventions translate into improved real-world clinical performance (Padilha et al., 2024).

Nevertheless, the consistency of positive results across all measured dimensions—behavioral, cognitive, and emotional engagement as well as clinical knowledge, psychomotor skills, and professional attitudes—provides strong support for the value of digital learning strategies in midwifery education. These findings contribute to the growing body of literature advocating for digital transformation in health professions education, particularly in lower- and middle-income countries, where innovative and cost-effective educational approaches are essential to improving healthcare workforce preparation (Levett-Jones et al., 2023).

Overall, this study demonstrates that integrating digital learning tools into midwifery education can significantly enhance student engagement and clinical readiness, suggesting that such approaches should be further developed and systematically integrated into health sciences curricula.

4. CONCLUSION

This study demonstrates that digital and innovative learning strategies are effective in significantly improving student engagement and clinical readiness among sixth-semester midwifery students at the Faculty of Health Sciences, Universitas Muhammadiyah Tangerang (FIKes UMT). Following an eight-week intervention that integrated video-based learning modules, virtual clinical simulation, interactive e-learning with formative quizzes, and collaborative digital assignments, students showed substantial improvements in both learning engagement and readiness for clinical practice. Statistical analysis revealed a significant increase in overall student engagement scores from 62.3 ± 8.4 to 82.7 ± 6.1 ($p < 0.001$), as well as a marked improvement in clinical readiness from 60.8 ± 7.9 to 81.5 ± 5.7 ($p < 0.001$). These findings indicate that the integration of digital learning tools can effectively support active, student-centered learning environments that enhance cognitive participation, motivation, and professional preparedness. The use of multimedia instructional materials, simulation-based learning, and collaborative digital discussions appears to facilitate deeper understanding of midwifery concepts while simultaneously strengthening practical and professional competencies required for clinical settings. From an educational perspective, the results highlight the importance of systematically integrating digital learning strategies into midwifery education curricula, particularly during advanced semesters when students are transitioning from theoretical learning to professional clinical practice. Digital learning environments provide opportunities for flexible, self-paced study, repeated exposure to complex clinical scenarios, and collaborative knowledge construction, all of which contribute to improved clinical readiness. Based on these findings, it is recommended that FIKes UMT institutionalize digital learning strategies as a core component of the midwifery curriculum. This integration should be supported by adequate technological infrastructure, continuous professional development for faculty members in digital pedagogy and instructional design, and ongoing monitoring of learning outcomes to ensure the sustainability and effectiveness of these innovations. Despite the positive results, this study was limited by the use of a single-group quasi-experimental design and a relatively small sample size from one institution. Therefore, future research should employ randomized controlled study designs with larger and more diverse samples across multiple institutions. Longitudinal studies are also recommended to evaluate the long-term impact of digital learning interventions on clinical performance and professional competency during actual clinical placements. Overall, the findings of this study contribute to the growing body of evidence supporting the digital transformation of health professions education, demonstrating that well-designed digital learning interventions can play a critical role in preparing competent, confident, and technologically adaptive midwifery professionals.

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