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Effectiveness of technology in midwifery education for enhancing knowledge and clinical skills

Yohana Filiberta Lumu Ladjar[1], Ari Indra Susanti[2]
[1,2]Universitas Padjadjaran, Sumedang, Indonesia
yohanalumuladjar@gmail.com[1], ari.indra@unpad.ac.id[2]

ABSTRACT

Multimedia has positively impacted knowledge transfer, emphasizing the importance of collaborative learning and interactive tools in improving educational outcomes. E-learning contributes significantly to knowledge transfer and skill enhancement among nurses and midwives. This study aims to determine the effectiveness of technology in midwifery education. This literature review uses a descriptive analysis approach. Article searches used keywords across three databases that met the inclusion criteria. As a result, 17 articles were selected as references for this study. The article specifically discusses the use of technology in education from three themes: knowledge enhancement, skill improvement, and clinical readiness of midwifery students. From the collected articles, six concluded that technology influences knowledge enhancement, ten agreed that technology can improve students' skills, and four believed that technology can increase students' clinical readiness. The study concludes that technology plays a vital role in equipping midwifery students with enhanced knowledge and skills and fostering their clinical practice readiness in maternal and child health care.

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ABSTRAK

Pemanfaatan multimedia menunjukkan dampak yang positif dalam transfer pengetahuan yang menekankan pentingnya pembelajaran kolaboratif dan alat interaktif dalam meningkatkan hasil pendidikan. E-learning memberikan kontribusi yang significan terhadap transfer pengetahuan dan peningkatan keterampilan diantara perawat dan bidan. Tujuan penelitian ini untuk mengetahui efektivitas penggunaan teknologi Pendidikan kebidanan. *Literature review* ini menggunakan pendekatan analisis deskriptif. Pencarian artikel dengan kata kunci pada 3 *database* yang memenuhi kriteria inklusi. Hasil penelitian didapatkan 17 artikel sebagai sumber rujukan dalam penelitian ini. Artikel ini membahas khusus tentang penggunaan teknologi dalam Pendidikan yang dilihat dari 3 tema yaitu peningkatan pengetahuan, peningkatan keterampilan dan kesiapan klinis mahasiswa kebidanan. Dari artikel yang dikumpulkan terdapat 6 artikel yang berkesimpulan bahwa teknologi mempengaruhi peningkatan pengetahuan, 10 artikel menyetujui bahwa teknologi dapat meningkatkan keterampilan peserta didik dan terdapat empat artikel yang meyakini bahwa teknologi dapat meningkatkan kesiapan klinis peserta didik. Simpulan penelitian ini teknologi berperan penting dalam mempersiapkan mahasiswa kebidanan untuk meningkatkan pengetahuan dan keterampilan, serta kesiapan praktik klinis dalam pelayanan Kesehatan Ibu dan Anak.

Kata Kunci: *kemampuan; pengetahuan; pendidikan kebidanan; teknologi*

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INTRODUCTION

Technology has an essential role in modern life today. This is inseparable from the utilization and use of technology in education, highlighting the need for an educator to use technology in learning effectively (Zubaidi & Velusamy, 2024). Educational technology involves using various tools and methods to improve the learning process, which aims to make learning more effective and exciting to achieve specific educational goals. In addition, educational technology helps increase learners' understanding and motivation (Joshi, 2023). Technology is revolutionizing healthcare education methods by allowing medical personnel to utilize virtual and augmented reality, simulation software, and telemedicine platforms to learn complex procedures without actual patients. This increases competency, reduces errors, and improves the quality and safety of patient care. In addition, electronic medical records, data analytics, and machine learning improve healthcare outcomes from diagnosis to follow-up care (Cao, 2022).

The use of multimedia positively impacted knowledge transfer, emphasizing the importance of collaborative learning and interactive tools in improving educational outcomes. E-learning contributes significantly to knowledge transfer and skill enhancement among nurses and midwives, although some areas, such as diagnostics and newborn care, show lower rates (Kahemela & Mwidunda, 2023). Using digital tools or technology offers new ways to improve education and care and deal with challenges such as limited resources. Building the capacity of midwives to apply digital competencies will help improve the quality of health services to be more accurate and timely. This aims to reduce maternal and neonatal mortality and strengthen midwives' practice through ICT access, which also improves communication and collaboration skills with patients and other health professionals (Perez-Chavolla et al., 2019).

The acceptance and attitudes of diverse learners also influence the various benefits of using technology in education. A study conducted during the pandemic found that 55.3% of nursing students had a negative attitude toward using e-learning, mainly due to inadequacies in clinical and laboratory practice (Güllü et al., 2024). However, the results of a systematic review of 72% gave a positive response that online learning had improved academic performance and clinical skills (Abdull-Mutalib et al., 2024). Evaluations conducted in undergraduate health education programs in low- and middle-income countries highlight the importance of curriculum planning, educator skills, and infrastructure to ensure quality e-learning education (Mutua & Nyoni, 2023). Overall, the utilization of technology in midwifery education not only improves the quality of learning and professional skills of midwives but also positively impacts health services. Hence, this review seeks to evaluate the effectiveness of implementing technology in midwifery education.

LITERATURE REVIEW

Knowledge Enhancement

Nowadays, technology plays an essential role in education by enhancing knowledge by changing the traditional learning process and environment or by learning that combines traditional and modern ways. This allows educators to use innovative tools and methods to center the learning process on learners (SCL) who are actively involved and get learning experiences through engaging media (Nadeem et al., 2024; Rosyiddin et al., 2023). Technological advances have enriched students' learning experiences through access to digital learning resources, distance learning, interactive media, and online collaboration. These support more effective teaching and transform educators into facilitators and supporters of student learning (Mubaroq, 2023). The emergence of blended education, which combines e-learning with face-to-face education, further expands the flexibility and accessibility of learning. It allows students to attend lectures and access educational resources from anywhere.

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Skill Enhancement

The use of hardware and software aspects of educational technology is essential in shaping students' skills in solving problems related to motivation and the learning process (Tulakpayeva, 2023). In higher education, utilizing technology has increased students' interest and ability to apply knowledge to the educational process and practice (Liao et al., 2022). Healthcare educators must adapt their practice by developing technical skills and effectively integrating technology into the curriculum. This benefits students as it has been shown to improve students' clinical and professional skills (Grimwood, 2020). The use of digital technology in health science education is likely to expand with advances in learning management systems, real-time feedback, adaptive learning, and offering personalized learning experiences, as well as achieving better learning outcomes (Dev & Schleyer, 2021). The FELLOWS project in Brazil exemplifies how active student participation and digital technologies in health education can improve students' leadership, communication, and teaching skills in line with national curriculum guidelines (Caramori et al., 2020).

Clinical Readiness

In health education, using technology during practice or clinical placements, such as mobile technology, offers rapid access to clinical guidance and decision assistance, essential for clinical reasoning and management. This is particularly relevant as medical students increasingly use mobile technology during placements, which enhances their learning and clinical practice (Thampy et al., 2017). Using simulated learning media provides a safe environment for students to practice and adapt to rare or dangerous clinical scenarios critical to students' readiness for real-world care delivery (Monkman, 2022). In addition, nursing students' adoption of Health Information Technology (HIT) has been associated with reduced healthcare costs, fewer clinical errors, and improved health outcomes. Although, there is still a need for customized training programs to address varying levels of technology readiness among students (Odlum, 2016). The advancement of healthcare education by incorporating cutting-edge equipment, such as simulators and computer software, has shifted students from passive learners to active critical thinkers who can apply theoretical knowledge in clinical environments, ultimately striving for high-quality and cost-efficient patient care (Kourakos, 2020).

METHODS

This research is a comprehensive summary in the form of a literature review or literature research. It uses a descriptive analysis approach by collecting scientific sources that aim to build understanding or explore current research in a particular field (Graham, 2011). The first step is to identify research questions using the PEOs framework to manage and address the focus of the review.

Table 1. PEOs Framework

P (Population)	E (Exposure)	O (Outcome)	S (Study Design)
Midwifery students	Use of technology in midwifery education	Improvement of knowledge and clinical skills	All articles on the use of technology in midwifery education

Source: Research 2024

Based on this framework (in **Table 1**), the research question is: "Is the use of technology in midwifery education effective in improving the knowledge and clinical skills of midwifery students?" Next, the researcher conducts an article search using the keywords "Use of technology and midwifery education"

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across three databases: Google Scholar, PubMed, and ScienceDirect. The collected articles are identified using inclusion criteria, which are: 1) Articles published in the last 5 years (2019-2024), 2) Original research articles and not literature reviews, 3) Articles that provide free full-text access, 4) Articles using quantitative, qualitative, and mixed-method research approaches. Based on the PEOs framework, the keywords used in this research are "Use of technology and midwifery education." Next, the article selection uses the PRISMA flowchart, as shown in **Figure 1**. PRISMA flowchart. The final step is data charting, where relevant information from the articles is extracted and presented in **Table 2**.

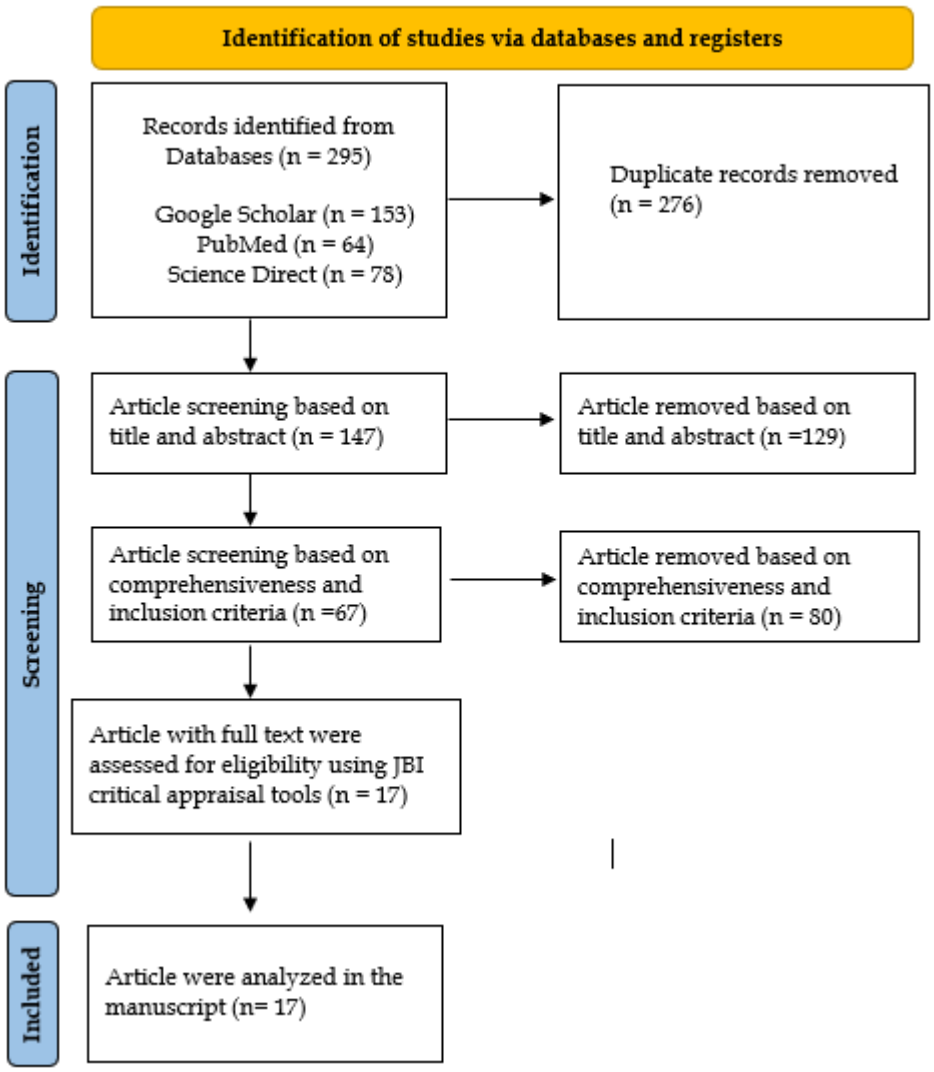

Figure 1. PRISMA *Flow Chart*
Source: Tricco (2018)

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RESULTS AND DISCUSSION

Table 2. Results of Data Synthesis

No.	Author(s)	Title	Country	Destination	Methods	Results	Conclusion
1.	Nehleh, Parandavar. Rita, Rezaee, Lili, Mosallanejad,at all (2019)	Designing a blended training program and its effects on clinical practice and clinical reasoning in midwifery students	Iran	For the effect of the blended training program on practice and clinical reasoning of midwifery students	A quasi-experimental method that divided midwifery undergraduate students into 2 groups.	There was an increase in the average clinical practice score but no significant change in the clinical reasoning score.	Blended training programs can improve clinical practice skills compared to conventional education, but improving clinical reasoning skills requires more effort.
2.	Samira, Mohamadi-Bolbanabad,at all (2019)	The effect of virtual education on midwifery students' knowledge of child sexual training	Iran	To examine the effect of virtual education on midwifery student performance	This was a clinical trial on a control group and an intervention group on midwifery students at two universities in Tehran, Iran.	Virtual education significantly increases midwifery students' knowledge in child sexual education and can be an alternative to traditional learning.	Virtual education has an important role in improving the knowledge and skills of midwifery students, especially in traditional learning with challenges and obstacles such as limited funds and resources.
3	Firoozeh, Firoozehchian, Morvarid, Ghasab, Shirazi, Zahra, Atrkarroushan. (2019)	The effects of video podcast on learning among midwifery students: A randomized controlled trial	Iran	To compare the effect of video *podcasting* and lectures on midwifery students' learning and assess their satisfaction with *podcasting*.	RCT *crossover* study on 5th semester midwifery students divided into 2 groups	Learners are satisfied with the use of video podcasting but use it ofnly as a supplement not a substitute for traditional lectures.	Video podcasting can be a valuable addition to traditional lectures, offering an educational method o delivering content that can be a different method of learning and potentially increase student engagement and satisfaction.
4	Eka, Ratnasari, Wiryawan, Permadi, Dany, Hilmanto. (2019)	E-monitoring interaktif meningkatkan refleksi diri, motivasi belajar dan hasil belajar mahasiswa DIII kebidanan	Indonesia	To determine the effect of Interactive *E-Monitoring* on self-reflection, motivation and student learning outcomes.	A quantitative study utilizing a quasi-experimental design with pre-test and post-test measurements.	Shows an increase in self-reflection, learning motivation and learning outcomes.	Using interactive E-monitoring has an effect on increasing self-reflection, motivation, and learning outcomes in midwifery DIII students.

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No.	Author(s)	Title	Country	Destination	Methods	Results	Conclusion
5	Rika Apripan (2021)	Hubungan antara pemanfaatan internet sebagai sumber belajar dengan prestasi belajar konsep kebidanan mahasiswa tingkat I Akademi Kebidanan Sentral tahun 2019	Indonesia	To determine the relationship between the utilization of the internet as a learning resource with the learning achievement of Midwifery Concepts for first year students of the Central Midwifery Academy.	Quantitative research using the correlational method	there is a significant relationship between the category of internet utilization in a week with learning achievement.	the more often respondents use the internet in a week, the greater the likelihood of the respondent experiencing improved learning outcomes at level I of the Central Midwifery Academy.
6	Jonas, Blattgerste, at all. (2020)	Project Heb@ AR: Exploring handheld Augmented Reality training to supplement academic midwifery education.	Australia	To explore the feasibility and benefits of using handheld AR in education and its usefulness in improving the skills of student midwives.	Exploration of handheld *Augmented Reality* (AR) as an additional tool for practical training in midwifery education.	The implementation of handheld AR serves as an effective supplementary tool for practical training in midwifery education, offering participants guidance and contextual feedback that enriches the learning experience.	Handheld augmented reality (AR) can enhance the quality and effectiveness of midwifery training, paving the way for future research and development in medical education
7	Juliana, Halapiry,at all. (2020)	Children's midwifery learning media application about early detection of android-based growth in improving midwifery students skills	Indonesia	Analyzing the effect of using learning media on the growth of toddlers aged 6-12 months based on android on midwifery students' skills.	Pre-experimental research design with one-group pre-test and post-test to measure participants' skills before and after the intervention.	After using Android learning media, midwifery students' skills in detecting growth disorders in toddlers 6-12 months old increased.	The use of learning media has a significant positive impact on midwifery student skills
8	Musmir, Haeriah, Mardiana, Ahmad, Wardihan, Sinrang, Syafruddin, Syarif. (2020)	The use of partograph bugis midwives application as a learning media for normal labor care by lecturers and land preceptor	Indonesia	To discuss the design of the *web-based* Bugis Midwives application as an APN learning media for lecturers to improve their skills in providing APN, completing education, and SOAP before going into the field.	*Research and Development* (R&D) research type. Test analysis using the experimental design model *One Group pretest-posttest Design*	Based on the analysis of the test results, student learning outcomes in the *post-test* scores increased, so the *web-based* Bugis *Midwives* learning media application is more effective in improving student knowledge and skills.	Bugis *Midwife* learning media is considered suitable as a web-based learning tool that has proven effective in improving student knowledge and skills.

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No.	Author(s)	Title	Country	Destination	Methods	Results	Conclusion
9	Michiko, Oguro, Yaeko, Kataoka, Akiko, Hiruta. (2020)	Evaluation of an educational program for midwifery students to enhance clinical judgement about perinatal abnormalities. Journal of Japan Academy of Midwifery	Japan	Measuring the effectiveness of a mixed education program for midwifery students by assessing knowledge and clinical judgment in responding to high-risk pregnancies.	Quantitative methods	This program significantly increased midwifery students, especially in premature placental abruption/eclampsia.	a blended learning program effectively improved midwifery students' clinical judgment and readiness to manage high-risk pregnancies, with benefits persisting for at least four months after program completion.
10	Ann, Peacock., Christine, Slade., Christine, Brown, Wilson (2022)	Nursing and midwifery students' perspectives of using digital systems on placement: a qualitative study	Australia	To explore nursing and midwifery students' perspectives on using digital patient education in clinical placements.	A qualitative study will explore nursing and midwifery students' perspectives on using digital patient systems for clinical placements.	Students identified the benefits and challenges of paper and digital records. Paper reporting is more efficient for some processes, but digital technology allows for more things, like confidentiality and consolidation of patient data.	Nursing and midwifery students chose to prepare in digital recording by using simulation and interactive modules before practicum.
11	Jusmawati, Mardiana, Ahmad, Prastawa, Budi, Hamdiah, Ahmar. (2021)	E-Module development for midwifery care of childbirth first stage on partograph documentation system success improvement	Indonesia	To determine the effect of labor *e-modules* on the success of learning educational documentation for DIII midwifery students using the Magguru application.	Quasi Experiment method, with a sample size of 90 people taken using total sampling technique. Observation of this design was carried out twice, namely before treatment and after treatment.	The use of e-modules (Magguru application) significantly improves the learning outcomes of midwifery students in understanding documentation on partographs, especially in groups that use e-modules alone and e-modules and demonstration groups.	The combination of electronic module intervention and demonstration method significantly improved the learning success of educational documentation in midwifery students.
12	Humaira, Khan. Luisa, Cescutti-Butler. (2021)	Enhancing undergraduate midwifery: Using drug and alcohol baby simulators in education	English	The two main objectives of this study were to ascertain whether students could recognize the physical effects of teratogens in the early	Qualitative research involving midwifery students by conducting simulation-based teaching with baby simulators that mimic life scenarios,	Simulators are a useful pedagogical tool to increase students' knowledge about teratogenesis and fetal effects.	The neonatal simulator can engage undergraduate midwifery students and enhance their learning and knowledge.

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				postnatal period when interacting with the simulator and to find out whether midwifery students understood their role as future midwives when dealing with pregnant women who may abuse such substances.	especially focusing on the effects of drug and alcohol exposure on neonates.		
13	Kremena Miteva (2022)	Digital media literacy in the training of student Midwives	Spain	To determine the role and importance of midwifery students' digital media literacy in acquiring professional competence.	The anonymous survey, which was conducted on 73 midwifery students from December 2021 to January 2022, was conducted between December 2021 and January 2022.	Students' confidence in their ability to search for and find adequate information relevant to the educational process's goals and objectives is relatively good.	Develop digital media literacy to improve the effectiveness of educational activities and the competency profile of modern midwives.
14	Nurul Aini Suria Saputri (2022)	Efektivitas multimedia interaktif dalam meningkatkan pengetahuan fisiologi menstruasi mahasiswi semester I DIII Kebidanan Poltekkes Kemenkes Surakarta	Indonesia	to determine the effectiveness of interactive multimedia in improving female students' knowledge about menstrual physiology.	*mixed methods research* with *embedded design*. The research sample was female college students from non-regular first-semester Midwifery Department	Interactive multimedia effectively improves the knowledge of menstrual physiology of first-semester female students with a t count of -13.903.	Interactive multimedia is effective in improving knowledge, but the effectiveness of This is supported by respondents' responses regarding the use of interactive multimedia in learning menstrual physiology
15	Arweni Puspita Sari, Nilawati Usman, Mardiana Ahmad, Prastawa Budi, Sutinah Made,	Effect of the Cooperative Learning Model through E-Module regarding Third Stage of Labor Care on the Increase in Knowledge, Skills and Learning Motivation	Indonesia	To determine the effect of the cooperative learning model through the e-module of childbirth care at stage III on improving knowledge, skills and learning	Quantitative research with a pre-experimental approach using a two-group pre-test- post-test design.	The results showed that most respondents experienced improvements in knowledge, skills and motivation to learn.	A cooperative learning model with an Android-based e-module on childbirth care in stage III increases knowledge, skills, and learning motivation in D-III midwifery students. Thus,

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No.	Author(s)	Title	Country	Destination	Methods	Results	Conclusion
	Syafruddin Syarif, Jufriadi (2023)	among Midwifery D-III Students		motivation in D-III midwifery students.			e-modules can be used as one of the learning media.
16	Badriani Badawi. (2023)	The influence of e-learning-based learning methods in midwifery courses on midwifery undergraduate students' learning motivation	Indonesia	To find out the effect of *e-learning* based learning methods in midwifery care courses on student learning motivation.	Analytic study with case control method.	*E-learning* has an effect of 0.070 times on students' motivation to learn compared to those who did not.	*E-learning* based learning on midwifery care courses have an effect on student learning motivation .
17	Ari Indra Susanti, Ariyati Mandiri (2024)	Evaluation of antenatal care competency with Objective Structure Examination Blended Learning (OSCE-BL)	Indonesia	knowing the learning outcomes of midwifery students with OSCE *Blended Learning* (OSCE BL) in pregnancy care (ANC) module.	descriptive method with *cross sectional* using OSCE scores from 2020, 2021, and 2022 with a total sample size of 92 people	The OSCE *Blended Learning* method specifically on the skills of history taking, 2nd and 3rd trimester physical examination, laboratory examination and counseling showed that only a few students did not pass the exam.	It can be said that *blended learning* is as effective as conventional learning. The OSCE BL method can be used to evaluate the competence of pregnancy care before midwifery students practice clinical practice on the practice field.

Source: Research 2024

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The results of searching for articles (in **Table 2**) that match the research keywords obtained 17 articles, which are original research with quantitative (9), qualitative (7), and mixed-method (1) research designs. The articles obtained came from several countries, namely Indonesia (9), Iran (3), Australia (2), Spain (1), England (1) and Japan (1). The samples in the articles collected were midwifery students who, in the learning process, utilized certain technologies to improve their knowledge, skills, and clinical readiness. Of the 17 articles, five discussed the use of technology in improving knowledge, five looked at the use of technology in improving student skills, and two articles discussed the use of technology by students to improve clinical abilities. Three articles look at the benefits of technology in knowledge and skills, and two examine the improvement of students' clinical skills and readiness.

Discussion

The utilization of technology in midwifery education, such as virtual education, the use of the web, e-modules, podcasts, and various applications, has been shown to increase knowledge (Apripan, 2021; Firoozehchian et al., 2019). The effectiveness of its use and utilization is supported by student responses to using multimedia as a learning resource (Saputri, 2022). The technology in nursing and midwifery education continues to evolve to meet student expectations and support the development of knowledge and skills more interestingly (Szara, 2024). In addition to knowledge, blended learning programs positively impact student skills, such as when conducting clinical risk assessments and documentation of midwifery care (Oguro, 2020; Jusmawati et al., 2021). Other researchers concluded that blended learning and simulators can improve student engagement, knowledge, and clinical practice skills (Khan, 2021; Mohebi et al., 2018). This aligns with research that blended learning improves academic outcomes and prepares students to meet the increasing demands for quality health services, especially in midwifery, which is essential for reducing maternal and infant mortality (Janes et al., 2023).

Virtual education has an essential role in improving knowledge and skills and significantly impacts student skills (Halapiry et al., 2020; Mohamadi-Bolbanabad et al., 2019). This statement is supported by research on web-based learning, which proved effective in improving students' knowledge and skills (Haeriah et al., 2020). It is also an additional tool for practical training that can provide contextualized instruction and feedback in midwifery education (Vogel et al., 2024). A case study conducted on using 3D web games in midwifery training provides a learning experience critical to mastering decision-making skills in a clinical setting. The system provides various scenarios that midwifery students need to improve real-world clinical practice in a risk-free environment (Chitongo, 2019).

Educational technology is also used to evaluate midwifery competency before clinical practice (Susanti et al., 2024). The use of E-monitoring not only improves learning outcomes but also increases self-reflection and student learning motivation (Badawi, 2023; Ratnasari, 2019). The use of digital media can also increase students' confidence in finding information according to learning objectives to develop the competency profile of modern midwives (Miteva, 2022). Using digital simulation approaches, such as AR, in midwifery training significantly improved student midwives' self-assessment of professional knowledge, confidence, and practical skills in managing emergencies (Vogel, 2024).

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CONCLUSION

Technology plays an essential role in preparing health students, especially midwifery, to improve knowledge, skills, and readiness for clinical practice by increasing learning experiences, motivation, confidence utilizing various learning media, practical skills, and adaptability to the challenges of midwifery care. Further research is needed to compare the effectiveness of various learning technologies (e.g., e-modules, AR/VR simulations, web-based learning) in enhancing midwifery students' knowledge, skills, and clinical readiness.

AUTHOR'S NOTE

The authors declare that there is no conflict of interest related to the publication of this article. The authors emphasize that the data and content of the article are free from plagiarism.

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