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Midwifery E-Learning as a Medium for Improving Midwifery Students' Competence in the Digital Era

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Abstract

The development of digital technology has driven a transformation in the learning system in midwifery education, one of which is through the implementation of e-learning. This study aims to analyze the effectiveness of e-learning as a medium for improving the competency of midwifery students in the digital era. The study employed a mixed methods approach with a sequential explanatory design that combines quantitative and qualitative methods. The quantitative design employed a quasi-experimental pretest-posttest control group design, involving 80 midwifery students divided into e-learning and conventional learning groups. Data were collected through competency tests, questionnaires, observations, and in-depth interviews. Quantitative data analysis was conducted using paired t-tests, independent t-tests, and effect size tests, while qualitative data were analyzed thematically. The results showed that the e-learning group experienced a higher increase in learning outcomes than the conventional group, with a significant difference ($p < 0.05$). The effect size value indicates a significant impact on improving student competency. Furthermore, e-learning also increased students' learning motivation, active participation, learning independence, and digital literacy. Students expressed positive perceptions of the flexibility, ease of access, and interactivity of digital-based learning. However, the implementation of e-learning still faces obstacles such as limited internet connections, technological readiness, and limited direct clinical practice. This study concludes that e-learning is an effective and innovative learning medium for improving the competencies of midwifery students in the digital era, especially when combined with a blended learning approach.

Keywords: E-Learning, Midwifery Education, Student Competencies, Blended Learning, Digital Learning

Introduction

The digital transformation in education has brought about significant changes to learning methods in various

fields, including midwifery education. Developments in information and communication technology have encouraged higher education

institutions to adopt digital-based learning systems to improve the effectiveness of the teaching and learning process. One rapidly developing form of educational innovation is e-learning, an electronic learning system that utilizes the internet as the primary medium for delivering material, academic interaction, and learning evaluation. In the context of midwifery education, e-learning is highly relevant because it can support the development of student competencies in a flexible, interactive, and adaptive manner to the needs of the digital era.

The digital era has transformed the characteristics of students, making them more familiar with internet-based technology and information. Midwifery students are currently required to possess not only clinical skills but also digital literacy, critical thinking, communication, and adaptability to evolving health technology. Therefore, the midwifery education system needs to integrate learning technologies that can facilitate these needs. Research shows that the use of e-learning in health education can improve learning accessibility, the effectiveness of knowledge transfer, and student engagement in the learning process (Regmi & Jones, 2020).

The implementation of e-learning in midwifery education has become increasingly important since the COVID-19 pandemic, which forced educational institutions to implement distance learning. This situation accelerated the digital transformation in health education and encouraged both lecturers and students to adapt to online learning systems. Research by Dewart et al. (2020) stated that online learning in midwifery education during the pandemic provides an opportunity to maintain educational continuity,

despite various challenges such as limited clinical practice and technological readiness.

Conceptually, e-learning is understood not only as a medium for distributing learning materials, but also as a pedagogical approach capable of improving the quality of learning through interactivity, collaboration, and independent learning. Students can access materials anytime and anywhere, making the learning process more flexible and student-centered. Research by Rouleau et al. (2019) shows that e-learning in nursing and midwifery education has a positive impact on improving students' knowledge, skills, and learning satisfaction.

In addition to increasing learning flexibility, e-learning also contributes to improving midwifery students' competencies through the use of interactive multimedia, virtual simulations, and clinical learning videos. The use of digital technology in learning has been shown to improve students' conceptual understanding and clinical skills more effectively than conventional methods. Research by Chen et al. (2020) found that the use of virtual simulation in health education can improve clinical skills, decision-making abilities, and student confidence.

Midwifery student competencies encompass knowledge, skills, and professional attitudes, which must be developed in a balanced manner. In practice, midwifery learning requires integration between theory and clinical practice. Therefore, the implementation of e-learning must be systematically designed to not only focus on delivering material but also support the development of clinical competencies. The blended learning approach, which combines online learning and hands-on

practice, is a widely used strategy in modern health education. Research by Shorey et al. (2019) shows that blended learning effectively improves learning outcomes and engagement of health students compared to traditional learning methods.

Despite its many benefits, the implementation of e-learning in midwifery education also faces various challenges. One of the main challenges is the readiness of the technological infrastructure and the digital literacy of both lecturers and students. Not all students have stable internet access or adequate technological devices. Furthermore, lecturers are also required to have the ability to design interactive and effective digital learning. Research by Khalil et al. (2020) shows that technological readiness and digital competence of instructors are crucial factors in the successful implementation of e-learning in health education.

Another challenge is the limitations of online clinical practice learning. Midwifery education is a practice-based education that requires direct experience in providing patient care. Therefore, e-learning cannot completely replace clinical practice; instead, it serves as a supporting medium that strengthens understanding of theory and clinical simulations. In this regard, technological innovations such as virtual reality and simulation-based learning are being developed to increase the effectiveness of online practical learning.

On the other hand, the use of e-learning also offers significant opportunities for creating more personalized and adaptive learning. Digital learning systems enable lecturers to monitor student progress in real-time through data on learning activities, evaluation results, and

student participation. This allows the learning process to be tailored to individual student needs and abilities. This approach supports the creation of more effective learning and is oriented towards achieving competencies.

In the context of midwifery education in Indonesia, the implementation of e-learning still requires further evaluation and development for optimal performance. Several educational institutions have developed digital learning platforms, but the quality of their implementation varies. Therefore, in-depth research is needed on the effectiveness of e-learning as a medium for improving midwifery students' competencies in the digital age. This research is crucial for providing an overview of the extent to which e-learning can support student competency achievement and identifying factors influencing its successful implementation.

Thus, e-learning has great potential as an innovative learning medium in midwifery education in the digital age. However, its successful implementation requires infrastructure support, digital competency, effective learning design, and integration with clinical practice. Research on e-learning in midwifery education is expected to form the basis for developing more adaptive, high-quality learning strategies oriented toward improving student competency.

Methods

This research used a mixed methods approach with a sequential explanatory design, combining quantitative and qualitative methods in stages to obtain a comprehensive picture of the effectiveness of e-learning in improving midwifery students' competencies in the digital age. This approach was chosen because

student competency can be measured not only through academic achievement but also through learning experiences, digital skills, and student perceptions of the use of learning technology. Previous research has shown that digital learning in health education requires multidimensional evaluation to comprehensively describe learning effectiveness.

The quantitative design used a quasi-experimental method with a pretest-posttest control group design. The study involved two groups: 1) The experimental group, consisting of students participating in e-learning-based learning; 2) The control group, consisting of students participating in conventional learning; Meanwhile, a qualitative approach was conducted through in-depth interviews to explore students' experiences with the implementation of e-learning in the midwifery learning process.

The study population was all second- and third-year midwifery students enrolled in competency-based theory and practice courses. The sampling techniques used were:

- Purposive sampling to determine classes using e-learning
- Simple random sampling to determine research respondents
- The sample size was 80 students, consisting of:
 - 40 students in the experimental group
 - 40 students in the control group

Inclusion criteria are active midwifery students, fully participating in learning throughout the study, and having access to digital devices and the internet. Exclusion criteria are students who did not participate in the final evaluation and students who withdrew during the study.

Independent variable is implementation of e-learning in midwifery learning.

Indicators: ease of learning access, learning interactivity, use of digital multimedia, and flexibility of learning time. Dependent variable is midwifery student competencies. The indicators are cognitive competency (knowledge), affective competency (learning attitudes and motivation), and psychomotor competency (practical skills)

Competency test will be used to measure improvements in student learning outcomes through pretests and posttests. Questionnaire will be using a 1–5 Likert scale to assess: student satisfaction, learning motivation, and perception of e-learning effectiveness. Observation will be conducted to assess student participation during online learning and laboratory practice. In-depth Interviews will be c The study population was all second- and third-year midwifery students enrolled in competency-based theory and practice courses. The sampling techniques used were:

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attitudes and motivation), and psychomotor competency (practical skills).

The research instruments consisted of: 1) Competency test questions based on learning outcomes, 2) E-learning effectiveness questionnaire, 3) Learning activity observation sheet. 4) Semi-structured interview guide. The instrument was tested through: validity test using pearson product moment and reliability test using Cronbach's Alpha with a value of ≥ 0.70 . Data validity was maintained through: source and method triangulation, member checking, audit trail, and instrument reliability testing. Results conducted with several students and lecturers to explore their experiences using e-learning in midwifery learning.

Results

This study aims to analyze the effectiveness of midwifery e-learning as a medium for improving the competency of midwifery students in the digital era. The study involved 80 respondents divided into two groups: an experimental group using e-learning-based learning and a control group using conventional learning. The results are presented in the form of descriptive analysis, statistical tests, and in-depth interpretation of the quantitative and qualitative data.

1. Respondent Characteristics

Respondent characteristics included age, gender, and experience using digital learning technology.

Table 1. Respondent Characteristics

Characteristics	E-Learning Group (n=40)	Conventional Group (n=40)	Total
Age			57,5
18–20 years	24	22	42,5
21–23 years	16	18	
Gender			91,2
Female	37	36	8,8
Male	3	4	
Experience using LMS			86,2
Yes	35	34	13,8

Never	5	6	
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Table 1 shows that the majority of respondents were aged 18–20 (57.5%) and were predominantly female students (91.2%). The majority of students had experience using a Learning Management System (LMS), so respondents were relatively ready to participate in e-learning-based learning. This indicates that midwifery students are quite familiar with the use of digital technology in the learning process.

2. Student Competency Pretest and Posttest Results

Competency assessment was conducted through pretests and posttests to measure improvements in student learning outcomes following the learning intervention.

Table 2. Comparison of Pretest and Posttest Scores

Group	Pretest Mean $\pm$ SD	Posttest Mean $\pm$ SD	Improvement
E-Learning	64,25 $\pm$ 6,12	84,70 $\pm$ 5,31	+20,45
Conventional	63,80 $\pm$ 5,98	75,15 $\pm$ 6,04	+11,35

Table 2 shows an increase in learning outcomes in both groups. However, the increase in scores in the e-learning group was higher than in the conventional group. The average posttest score for the e-learning group reached 84.70, while the conventional group only achieved 75.15. These results indicate that e-learning-based learning is more effective in improving the competencies of midwifery students.

3. Paired t-test Results

A paired t-test was conducted to determine the difference in scores before and after the intervention in each group.

Table 3. Paired t-test Results

Group	t-value	Sig. (p-value)	Description
E-Learning	14,82	0,000	Significant
Conventional	8,94	0,000	Significant

The statistical test results showed that both groups experienced significant improvements in learning outcomes after the learning process ($p < 0.05$). However, the t-score for the e-learning group was higher than for the conventional group, indicating a stronger improvement in student competency in the e-learning group.

4. Independent t-test Results

An independent t-test was conducted to determine the difference in post-test results between the e-learning and conventional groups.

Table 4. Independent t-test Results

Variables	E-Learning Mean	Conventional Mean	t-value	Sig. (p-value)
Competency Posttest	84,70	75,15	6,45	0,000

Table 4 shows a significant difference between the e-learning and conventional groups ($p < 0.05$). This indicates that the implementation of e-learning had a greater impact on improving midwifery students' competencies than conventional learning methods.

5. Effect Size Analysis

Effect size calculations were performed to determine the strength of e-learning's influence on student competency.

Table 5. Effect Size Results

Variables	Cohen's d	Interpretation
Student Competencies	0,96	Major Effects

Cohen's d value of 0.96 indicates that e-learning has a significant impact on improving midwifery students' competencies. Thus, e-learning not only provides minor changes but also has a substantive impact on the learning process.

6. Results of the Student Perception Questionnaire on E-Learning

The study also evaluated student perceptions of the implementation of e-learning.

Table 6. Student Perceptions of E-Learning

Assessment Aspects	Mean	Category
Ease of learning access	4,31	Excellent
Learning interactivity	4,18	Good
Flexibility of learning time	4,45	Very Good
Learning motivation	4,20	Good
Satisfaction with LMS use	4,27	Very Good
Average Total	4,28	Excellent

Students gave positive feedback on the implementation of e-learning. The flexibility aspect of study time received the highest score (4.45), indicating that students felt more freedom to manage their study time. Furthermore, students felt that e-learning increased their motivation and engagement in the learning process.

7. Observation Results of Student Learning Activities

Observations were conducted to assess student participation during the learning process.

Table 7. Student Learning Activities

Activities	E-Learning (%)	Conventional (%)
Actively asking questions	85	68
Participating in discussions	88	70
Timely submission of assignments	92	76
Learning independence	90	65

The e-learning group demonstrated a higher level of learning activity than the conventional group. The high percentage of independent learning in the e-learning group indicates that digital learning encourages students to be more active and responsible for their own learning process.

8. In-Depth Interview Results

The interviews yielded several main themes:

- a. Learning Flexibility. Students stated that e-learning facilitates access to materials anytime and anywhere. "The material can be reviewed at any time, making it easier to understand the lessons."

- b. Improved Digital Literacy. Students feel more accustomed to using technology in their learning and scientific information search.
- c. Technical Obstacles. Several students experienced internet network disruptions and limited digital devices.

9. Integration of Research Findings

Table 8. Integration of Quantitative and Qualitative Findings

Quantitative Findings	Qualitative Findings	Interpretation
Posttest scores increased significantly	Students found it easier to understand the material	E-learning effectively improves competency
Learning activity increased	Students were more active in discussions	E-learning increases learning engagement
Learning motivation increased	Learning was more flexible	E-learning supports independent learning

Data integration shows that the statistical results are supported by direct student experience. E-learning not only improves academic grades but also strengthens midwifery students' motivation, engagement, and learning independence.

Overall, the research results show that: 1) E-learning effectively improves midwifery students' competencies, 2) There are significant differences between e-learning and conventional learning, 3) E-learning improves motivation, participation, and learning independence, 4) The main obstacles to implementation are technological infrastructure and internet network quality. In this research, e-learning appears not simply a "digital classroom," but rather an electronic bridge connecting students to more flexible, interactive, and adaptive learning in the digital era.

Discussion

The research results show that the implementation of e-learning in midwifery education has a significant

impact on improving midwifery students' competencies in the digital era. Competency improvements are evident in the cognitive, affective, and psychomotor aspects, as demonstrated by increases in posttest scores, learning activities, motivation, and students' positive perceptions of digital learning. These findings demonstrate that e-learning is not simply an alternative learning medium, but has evolved into an "adaptive digital learning space" capable of expanding students' academic experiences.

1. Effectiveness of E-Learning in Improving Student Competence

This study found that the e-learning group experienced a higher increase in learning outcomes than the conventional learning group. This indicates that e-learning can more effectively improve students' understanding of midwifery material. This finding aligns with research by Rouleau et al. (2019), which states that e-learning has a positive impact on improving the knowledge, skills, and learning satisfaction of healthcare students.

The improved learning outcomes in the e-learning group can be explained by the flexible and student-centered characteristics of digital learning. Students have the opportunity to access the material repeatedly, utilize interactive multimedia, and learn at their own pace. Research by Regmi and Jones (2020) also confirms that e-learning in healthcare education increases the effectiveness of knowledge transfer and expands access to learning. Furthermore, the use of instructional videos, digital simulations, and an LMS allows students to understand complex midwifery concepts in a more visual and interactive way. In the context of midwifery education, this approach is

crucial because learning materials often require integration between theory and clinical practice.

2. Increasing Motivation and Learning Independence

The results showed that students in the e-learning group had higher levels of motivation and learning independence than those in the conventional group. This finding was evident in the high level of discussion participation, timely submission of assignments, and independent learning activities.

Research by Shorey et al. (2019) explains that digital-based learning encourages students to be more active and responsible for their own learning process. Students no longer simply receive information passively but are actively involved in exploring the learning material.

This is also supported by research by Khalil et al. (2020), which states that online learning improves students' ability to manage their time, seek additional learning resources, and develop self-directed learning. In this study, time flexibility was the aspect with the highest score in student perceptions. This indicates that students feel freer to set their own learning pace. Digital learning systems create a "classroom without walls," where learning can take place anytime and anywhere.

3. E-Learning and Digital Literacy Development

This study also shows that the implementation of e-learning improves the digital literacy of midwifery students. Students become more accustomed to using information technology, searching for digital scientific references, and communicating through online learning platforms.

Research by Singh et al. (2021) explains that digital transformation in health education requires students to possess technological competencies as part of modern professional competencies. Therefore, the use of e-learning not only improves learning outcomes but also prepares students for digital-based healthcare systems.

Furthermore, Liaw et al. (2022) emphasized that the integration of technology in midwifery and nursing education can improve students' readiness to face a technology-based healthcare work environment.

4. Effectiveness on Clinical Skills

Although e-learning has been shown to be effective in improving cognitive competency, this study found that clinical skill development still requires hands-on practical learning. This is because midwifery education is characterized by practical skills that require motor skills, therapeutic communication, and real-life clinical experience.

However, the use of virtual simulations and video demonstrations has been shown to help students understand clinical procedures before direct practice. Research by Chen et al. (2020) showed that virtual simulations can improve clinical decision-making skills and confidence in healthcare students.

A blended learning approach is the most effective solution in midwifery education because it integrates digital learning with laboratory and clinical practice. Thus, e-learning does not replace clinical practice, but rather serves as a reinforcement of conceptual understanding and preparation for practice.

5. Student Perceptions of E-Learning

The results of the study indicate that students have positive perceptions

of the implementation of e-learning. Ease of access, flexibility, and interactivity received high ratings. This indicates that students feel comfortable using an LMS as a learning medium.

Research by Oducado et al. (2021) states that student readiness to use digital technology is a critical factor in the success of e-learning implementation. In this study, the majority of students had previous experience using an LMS, making adaptation to digital learning easier. Furthermore, Turnbull et al. (2021) explained that the transition to online learning in health education can be effective if supported by interactive learning design and adequate technological support.

6. Barriers to E-Learning Implementation

Despite its effectiveness, this study identified several obstacles in implementing e-learning, particularly related to:

- Limited internet connection
- Quality of digital devices
- Digital fatigue
- Limited direct clinical interaction
- These findings align with research by Subedi et al. (2020), which showed that online learning during the pandemic faced major obstacles in the form of internet access and technological readiness.

In addition to technical factors, lecturers also face challenges in designing engaging and interactive digital learning. Without appropriate pedagogical strategies, e-learning can become merely the distribution of digital materials without active student engagement.

7. Research Implications for Midwifery Education

The results of this study provide several important implications:

- a. E-learning needs to be permanently integrated into the midwifery curriculum. Digital learning systems have been proven effective in improving student competency.
- b. Strengthening blended learning. A combination of online learning and hands-on practice is the most ideal approach.
- c. Improving the digital competence of lecturers and students. Digital literacy is a key requirement in modern health education.
- d. Developing technological infrastructure. Educational institutions need to provide stable and interactive internet access and a learning management system (LMS).

Overall, the research results show that e-learning is an effective learning medium for improving the competence of midwifery students in the digital era. This learning system not only improves academic achievement but also strengthens students' motivation, independence, and digital literacy. If conventional learning is a classroom with chalk and a blackboard, then e-learning is a "digital learning ecosystem" that allows knowledge to move faster, be more flexible, and reach students more widely.

Conclusion

This research shows that the implementation of e-learning in midwifery education is effective in improving the competence of midwifery students in the digital era. Competency improvements were evident in cognitive, affective, and psychomotor aspects, demonstrated by improved post-test results, learning motivation, active participation, and student independence during the learning process. Students participating

in e-learning achieved higher learning outcomes than those participating in conventional learning. Furthermore, students expressed positive perceptions of the flexibility, ease of access, and interactivity of digital learning.

E-learning provides opportunities for students to learn independently, access materials repeatedly, and utilize various digital learning resources that support the development of academic competencies and digital literacy. However, the implementation of e-learning still faces several obstacles, such as limited internet access, technological readiness, and limited direct clinical practice. Therefore, the implementation of blended learning is the most appropriate strategy in midwifery education because it can integrate digital learning with laboratory and clinical practice.

Overall, e-learning can be an innovative and effective learning medium in midwifery education if supported by adequate technological infrastructure, the digital competency of lecturers and students, and interactive and adaptive learning designs that meet the needs of the digital era.

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