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The Effect of Augmented Reality Learning Media on Increasing Knowledge and Skills in Midwifery Students

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ABSTRACT

Objective: Increase the Knowledge and Skills of Midwifery Students using Augmented Reality learning media.

Method: The literature review approach is based on national and international scientific journals related to the effect of augmented reality learning media on increasing knowledge and skills in midwifery students, the literature used is published between 2019-2024 in several databases such as; Pub-Med, Science-Direct, Sci-lit, Google Scholar, and Semantic Scholar. This literature review was compiled through searching scientific articles with the keywords "augmented reality learning media, knowledge and skills, midwifery students**".** Based on the search results, 250 related articles were found, then filtered based on the year of publication, namely the 2019-2024 period, 104 related articles were obtained. The next process is selection related to abstract, full text, open access type of research, and duplication and obtained 34 articles. In these 34 articles, researchers read carefully and thoroughly so that 30 eligible and relevant articles were obtained.

Results: Some of the benefits of Augmented Reality (AR) as learning media in this LR are; increasing knowledge and skills, making learning more interesting and interactive, and encouraging students to actively participate in the learning process.

Conclusion: The use of Augmented Reality (AR) learning media on knowledge and skills can improve student understanding, retention, and skills as well as more interactive learning and a better learning experience.

Keywords: *Augmented Reality (AR), Knowledge and skills, midwifery students*

1. INTRODUCTION

Technology is something that cannot be separated from human life, because it can help human activities[12] . One of the fields affected by the rapid development of technology is the field of education and health[3] . Increasingly with the development of the era, teachers are required to facilitate the learning process in the classroom using technological media. Technology that can be used in the form of devices and computers[45] . The present era expects educators to provide integrated and distance learning, with learning management systems such as Blackboard and Module that provide online educational resources, see the extent of student engagement, and facilitate assessment. If the interaction between educators and students runs smoothly, it can facilitate an effective learning process[56]

Midwifery education is a field of science that requires practised clinical skills. Women-centred care is the core of midwifery skills that must be honed[7] . The main competence of midwives is to be able to carry out midwifery care in pregnant women, maternity women, postpartum women, infants and provide contraceptives to increase patient confidence in midwives[1,89] . On the other hand, the demands of the 21st century, midwives must also master technology that can be applied in providing education. One of them is that midwives must also be able to create and develop educational media[10] . Media to be Used Media (plural)/medium (singular) in general is a communication channel, which is everything that carries information from the source of information to be conveyed to the recipient of the message. The purpose of using media in general is to facilitate communication[11] . The use of innovative and interactive learning media in an era of increasingly advanced technology is

very important to improve the knowledge and skills of midwifery students. Practical learning methods using video media, mannequins, simulations, virtual reality, computer technology and strings have a significant effect on the quality of midwifery services[10512]

The Industrial Revolution 4.0 is having a major impact on education with more and more technology-based learning environments[139] . Current technology promotes efficiency and effectiveness in learning, providing convenience and willingness of midwifery students in the learning process so as to achieve more effective results[6] . Teachers must continue to update teaching materials to keep up with technological developments and provide convenience for students in the learning process.[514] . One of the technologies that began to be applied and began to show its impact in the world of education at this time is Augmented reality as a digital learning media[1514] proven to increase learning motivation, including positive responses and improve student skills and knowledge, and make it easier for lecturers to provide a real picture of the material on the learning object provided[1617] . Augmented reality is enhanced with virtual objects that can create an authentic context for students to apply and practice knowledge and skills. Augmented reality can be used to increase positive student responses such as student attention learning motivation, material relevance, increased confidence, and student satisfaction, better learning, positive responses and improve student skills and knowledge[188]

Augmented reality (AR) is a type of learning media that has been used in various disciplines. It is a technology that can incorporate digital information into a real environment, allowing students to see and interact with the material they are learning directly[19] . In midwifery education, AR can help students understand complex concepts and improve their practical ability in performing midwifery actions[8] . Advances in information and communication technology have greatly influenced education. In the learning process, augmented reality (AR) is one of the technological innovations that are increasingly used. AR combines the real world with computer-generated virtual elements, making learning more interactive and engaging. The use of AR in education allows traditional teaching methods to be refined and learning methods to be more effective.[20]

AR technology has developed significantly in cell and computer technology over the past few years, integrating virtual information with the physical world, using multi-media, 3D modelling, real-time recording, and interactive software. One of the benefits of AR is that it visualizes objects that are normally invisible to the naked human eye[21] . AR technology enhances user perception and provides benefits for analyzing, and comparing different environments. AR also plays an important role in teaching and research practices, helping to create an effective and interesting learning environment, while improving the effectiveness and efficiency of teaching methods[2223] .which in self-directed learning and Laboratory practice[24] . AR provides collective performance of Research laboratory practice with learners deprived of teacher support.[23] In addition, the two-dimensional pictures in textbooks are often difficult for students to understand, especially when explaining complex cell structures. Using AR technology, students can see three-dimensional visualizations of these cells interactively, which can help them better understand the structure and organization of cells[25]

The application of Augmented Reality as a supporting medium in helping students to better understand material related to the nervous system and its parts, namely the brain organ where the props or objects discussed or studied can be simulated and applied using 3D objects and animations with the help of smartphones which are now very common use, so that students can interact directly with objects contained in the Augmented Reality application[4,18,25] . Augmented reality (AR) offers a revolutionary way to study the anatomy and physiology of the nervous system, combining advanced technology with medical education to create a more interactive and immersive learning experience[25–27] . It is a virtual dissection of layer-by-layer views of neural structures, from the outer layers of the brain to individual neurons. Apps such as Anatomy 4D, "Complete Anatomy", and "Human Anatomy Atlas" provide 3D models and simulations that can be used with AR devices such as tablets and smartphones[16]

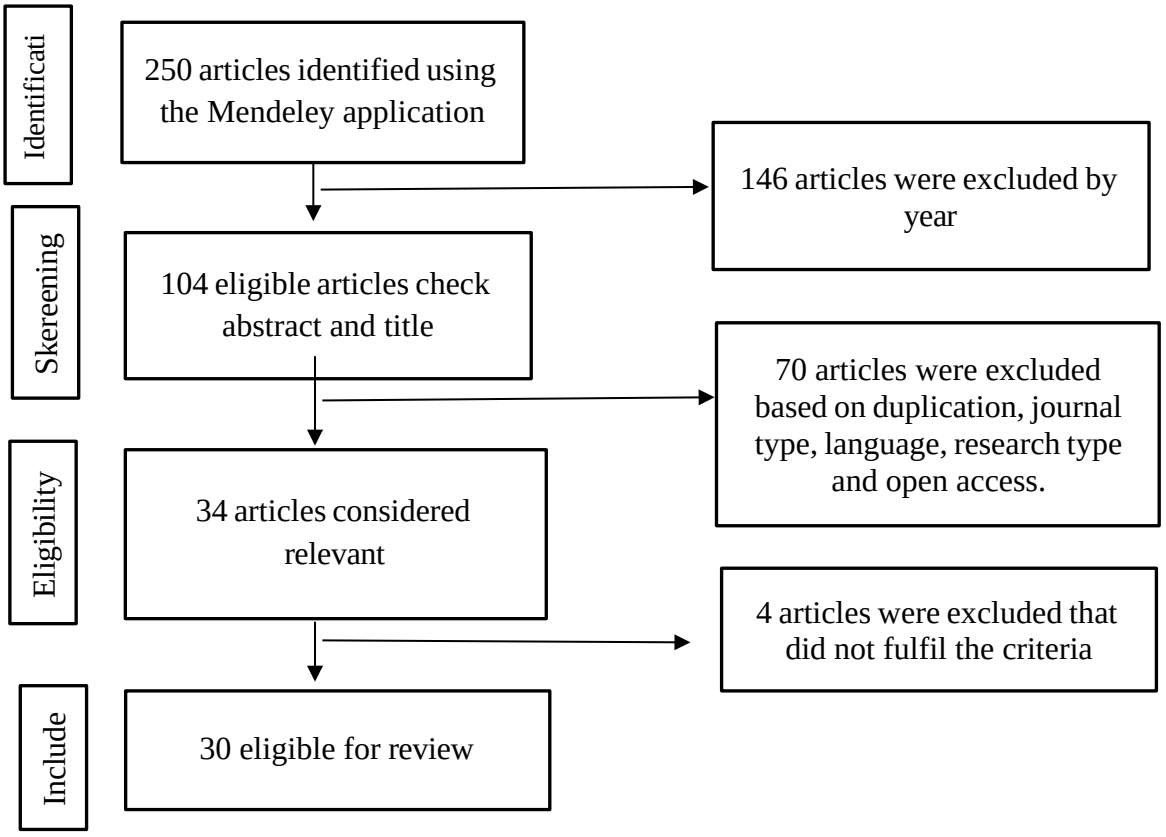
Some studies such as Huang and Alkhattabi show that Augmented Reality (AR) technology provides positive benefits in learning, such as improving interaction and learning outcomes, making information easier to understand, promoting independent learning, and increasing student engagement. AR can also be used to test difficult or dangerous scenarios in a safe environment. Therefore, the use of AR and VR technology in education is growing due to its great benefits. Some estimates even predict the VR, AR, and Mixed Reality (MR) market will grow to more than USD 30 billion by 2030 and that 14 million American employees will probably use AR smart glasses every day by 2025.[28] Based on the explanation above, this study aims to increase the Knowledge and Skills of Midwifery Students using Augmented reality learning media.

METHODS

This review is a literature review approach based on national and international scientific journals related to augmented reality (AR) that can improve knowledge and skills in midwifery students. Published between 2019-2024 in several databases, namely the Pub-Med database, Science-Direct, Sci-lit, Google Scholar, and Semantic Scholar with keywords using Indonesian and English with keywords Augmented Reality (AR), Knowledge and skills, midwifery students. This literature review was compiled through a search for scientific articles with the keywords "Augmented Reality (AR) Knowledge and skills, Midwifery Students" obtained as many as 250 articles. After filtering the year of publication, namely 2019-2024, 104 articles were obtained. Furthermore, selection is carried out regarding abstracts, full text, open access research types, and duplication obtained 34 articles. The final process is to read and select articles that are eligible based on the criteria obtained

30 relevant articles (Figure 1). Articles were evaluated based on:

- Inclusion criteria
  - Articles Discussing Augmented Reality Learning Media on Increasing Knowledge and Skills in Midwifery Students
  - Publication year 2019-2024
  - International and National Publications
  - National journals have ISSN
  - Articles in English and Indonesian
  - Original article, abstract, full text and open access
- Exclusion Criteria
  - Type of research literature review



The article search strategy can be seen in Figure 1.

2. RESULTS

The literature review is synthesized using a narrative approach by grouping similar extracted data according to the outcomes measured to achieve the objectives. Abstracts of research journals are included in the table according to the formula above. To further clarify the analysis, the abstract and full text of the review will be read and reviewed. The evaluation summary will then be analyzed based on the content contained in the research objectives and research results/findings.

No.	Author/year	Title	Journal	Results
1	(Rosmaria et al, 2024)	Effectiveness of Phantom-Based Modified Mannequins in Improving Midwifery Students' Toucher Vaginal Examination Skills	Journal of Holistic Nursing and Midwifery	Participants had a mean age of 21.6±2.2 years in the modified mannequin group and 21.3±2.4 years in the factory mannequin group. There was no significant improvement in the students' performance after using the factory mannequins, but the modified mannequins improved their skills, as there was a significant difference in VT exam performance before and after using the modified mannequins (mean difference=3.97, P=0.001). The ANCOVA results showed a significant difference in the mean post-test scores between the factory mannequin group and the modified mannequin group (mean difference=1.59, ÿ2 =0.299, P<0.05).
2	(cheung et al 2023)	Medical students' perceptions of the application of virtual reality training models to acquire vaginal examination skills	Obstretric Gynaecology	Sixty-five sixth-year medical students completed the VR training and feedback questionnaire: 55 (84.7%) of them reported the training instructions were clear and 60 (92.4%) found the training useful in remembering the details of the tasks. It was also reported that VR technology can facilitate learning and understanding, interaction, and learning motivation in 80.1% and 66.2% of medical students, respectively.
3	(Hikmandayani et al, 2021)	Learning media based on augmented reality (AR) improves the physical examination skills of the integumentary system of pregnant women in midwifery students	Gac Sanit	The results showed a difference in the measurement of skill improvement in the control and intervention groups before and after the intervention was given. More significant skill improvement occurred in the intervention group with p-value
4	(Z et al., 2021)	The effectiveness of Augmented Reality (AR) based learning media on improving the physical examination system of pregnant women	Gac sanit	There was an increase in skills in the control and intervention groups with a statistical significance of P (0.05) However, the results showed that the average skill improvement in week I of learning results in the intervention group given AR learning media had a higher percentage of skill improvement (72.6%) when compared to the control group given the lecture method and demonstration method (36.7%). Similarly, the average skill improvement in the second week of learning in the intervention group had a higher percentage of skill improvement (91.9%) compared to the control group given the lecture and demonstration method (66.7%),

				although in the third week all respondents in the control group and intervention group became skilled in performing a physical examination of the urinary system of pregnant women.
5	(Bestari & Wiwaha, 2021)	Advantages of Using Augmented Reality (AR) Technology in Midwifery Education: A Literature Review	Atlantis press	A total of 12 relevant articles (2012-2018) have been found according to the relevant criteria. AR applications have benefits for medical students including 1. improve students' knowledge retention, 2. improving students' learning motivation
6	(Lestari et al, 2023)	Development of a Simple Sabvida (I Can Check Inside) Trainer as a Supporting Tool for Practical Internal Examination in Maternity Mothers	Malahayati Nursing Journal	The results of the product validation test by a team of experts showed an average score of 4 which means agree/worthy. For small and large group field trials, the same average score was obtained, namely 4, which means agree / feasible. So that this Sabvida props can be used as support in student practicum.
7	(Nurwicaksono & Swalaganata)	Analysis and design of Android-based human anatomy Augmented Reality application	Journal of Information System and Application Development	Analysis and design of Android-based human anatomy Augmented Reality application
8	(Bf et al, 2024 [8]	Augmented reality simulation-based training for midwifery students and its impact on knowledge, confidence, and perceived skills in managing critical incidents	Midwifery	Students rated their competence significantly better after the survey than before the survey (p=<0.05) Simulation impacts self-assessment of professional knowledge, confidence, and practical skills in emergency situations. It improved students' procedural knowledge and practical skills in complex contexts, complementing subject knowledge and building confidence.
9	(Sanders et al., 2023)	Analyse arts-based practice in midwifery education	Nurse education in practice	Twenty-two texts were included in the synthesis. Four themes were generated from the data; 1) What is an offering - More than a lecture; exploring educator and student exchanges and learning environments; 2) Working in parallel - examining changes in dynamic and collaborative partnership teaching; 3) Journeying towards holism - focusing on the integration of students in the learning process; and 4) Stepping into the professional world - understanding how creativity can help students develop a sense of themselves as professionals. This highlighted increased levels of confidence, professional development and emotional intelligence in midwifery students.
10	(Orlaith Hernon a, edel	Use of educational technology in	Professional Nursing	Sixty studies were drawn from sources that met the eligibility criteria of this review. The

	Mcsharry, lain Maclaren & A, 2023)	teaching and assessing clinical psychomotor skills in nursing and midwifery education		technologies on which most of the studies were conducted include; simulation, video and virtual reality. The most common research designs noted included randomised or quasi-experimental studies. Most studies (n=47) did not elaborate on whether educational theory guided them, whereas from the remaining thirteen studies, eleven theoretical frameworks were reported.
11	(Connor et al., 2022)	Theory informs technology enhanced learning in nursing and midwifery education	Nurse Education Today	Thirty-three studies were included, incorporating twenty-nine different learning theories from the behaviorist, cognitive, constructivist and social cognitivist domains, with constructivism being the most widely used. Kolb's Experiential Learning Theory and Driscoll's Constructivist Learning Theory were the most frequently reported theories. The learner population was predominantly undergraduate nursing students using a variety of online, mobile, blended or computerized learning, virtual reality, or digital forms of simulation, primarily in a university setting. Theories are used to inform technology-enhanced learning interventions or to help explain how these can improve student learning.
12	(Neri et al, 2024)	Dissecting the learning process of human anatomy through anatomy education with augmented reality	Anatomical sciences education (Wiley)	Specifically, this study suggests that incorporating AR into medical education alongside traditional methods may prove beneficial to students' academic and professional endeavours in the future. In this regard, this study contributes to the increasing quest of emphasizing the potential role of AR in shaping the future of medical education.
13	(Era & Industry, 2020)	Technology-Based Learning Media as a Learning Innovation in the Era of Industrial Revolution 4.0	Proceedings of the National Education Conference	Many benefits can be felt with the existence of technology-based learning media, in addition to attracting students' interest in learning can also improve learning achievement results. Therefore, technology-based learning media is expected to be utilized in the learning process.
14	(Reality et al, 2021)	Augmented Reality in Anatomy Education and Design of Augmented Reality Application for Skeletal System Learning	Makala Conference	A mobile augmented reality application for skeleton system training was designed. In the application, appropriate menus are placed to hold mobile devices, 3D animation models are used, and text and voice explanations are given. The designed application was compared with an augmented reality anatomy training application and the differences in design and usability were emphasized.
15	(Andis Indrawan et al,.2021)	Augmented Reality as Interactive Education Media in	Scientific Magazine of Electrical	This media is quite exclusive and interactive and can still be developed in terms of content. This technology can be a fun learning media solution that can be learned

		Covid-19 Pandemic	Technology	from home as a form of realization of study from home in the ongoing Covid-19 Pandemic.
16	(Sudirman et al., 2024)	Training on the Use of Augmented Reality Media and Educational Techniques for Midwives in an Effort to Improve the Quality of Education on Midwifery services	IKRAITH-ABDIMAS Journal	The results obtained showed that there were 34 participants (85%) with good knowledge and 6 participants (15%) with sufficient knowledge. The activity was carried out in an orderly manner according to the activity plan.
17	(Ekayogi, 2023)	Application of Problem Based Learning assisted by Augmented Reality Media to Improve Learning Outcomes and Independence	Journal of Elementary Education Didactics	The results of observations of learning independence in cycle I meeting 1 were categorized as "low" and meeting 2 were categorized as "medium", while in cycle II meeting 1 and meeting 2 were categorized as "high". It can be concluded that the application of problem-based learning model assisted by augmented reality media can improve learning outcomes and learning independence of class III students.
18	(hamzah & Kurniadi, 2019)	Development of Augmented Reality-based Network Hardware Learning Media on the Android Platform	Journal of Vocational Technical Informatics and Informatics	With this learning media, students can easily learn WAN technology network hardware anywhere and anytime. The feasibility test shows that this learning media is very practical (95.45%) and very valid (94.7%). This media is equipped with an explanation of the parts of the device displayed in the form of text, images and audio.
19	(Apryanto & Pangaribuan, 2023)	Designing Augmented Reality as an Android-based Human Anatomy Lesson	Comasie Journal	This Augmented Reality application helps teachers to overcome problems in using books and presentations as learning media, so that learning becomes effective and helps students understand the material provided by the teacher.
20	[18] (Prasetya et al., 2024)	Impact of augmented reality learning experience based on motivational design model	Open Social Sciences & Humanities	This study revealed the existence of different interactions, which emphasizes the need for thoughtful planning in utilizing AR learning as a transformative technology-based pedagogical medium. The findings clearly show that AR technology attracts students' attention, ensures material relevance, increases confidence, and improves student satisfaction.
21	[14] (Hussain et al., 2021	Effectiveness of virtual and augmented reality to improve medical students' knowledge and skills	BMJ open	Outcomes from educational practice include improving the delivery of digital education, and ensuring that investments in digital technologies, including VR and AR, for medical schools, are justified. Institutions will be better informed when exploring such devices, and will be able to ensure that they are customized and tested, according to the needs of their students.

22	[29] (Hafiz et al, 2020)	Enhancement of Human Anatomy and Nervous System Learning using Mobile Augmented Reality Application	International Journal of Engineering and Advanced Technology	This study presents the concept, application development and pilot test results. The test was conducted by medical students from different medical colleges in Bangladesh. We have conducted this trial to get the user experience from a technical point of view. Based on this test we can conclude that students are satisfied with this application in terms of features, usability, feasibility and comprehension.
23	[21]	Challenges and Perspectives of Integration Between Virtual and Augmented Reality and Manual Therapy	Frontiers in Neurology	VR and AR can also engage and alter the somatosensory neural maps that the brain uses to cope with environmental stressors. Therefore, combining MTs with VR and AR may define an overall mind-body intervention that uses psychological, interoceptive, and exteroceptive stimulation to rebalance somatosensory integration, distorted perceptions, including visual, and body images. Regarding the technology needed to integrate VR and AR with MTs, a head-mounted display could be the most suitable device due to its low cost, also allowing patients to follow VR therapy at home.
24	[30] (Rahmita Wirza, 2020)	Media comparison study dominates comparative research on augmented reality in Education	Computers and Education	Over the years, since 2009, more media comparison studies have been published than any other type of research. We summaries why media comparison studies are problematic and discuss future directions of AR research in education. This research moves from the question of whether AR can be used in teaching to the more important question of how and when learning and teaching with AR is successful.
25	[17] (Cheng et al, 2022)	Ten years of augmented reality in education: A meta-analysis of (quasi) experimental studies to investigate its impact	Computers and Education	However, meta-regression results indicate treatment duration as a significant factor that may be associated with variations in the impact of AR on education. In addition, AR used to support language or social studies learning is likely to be associated with positive learner responses such as higher motivation or learning attitude than AR used for science learning. The meta-regression results suggest that the use of 3-D visualization in AR needs to be carefully designed and evaluated. The implications of using AR to support learning, the design of AR learning environments, and future research directions are discussed.
26	[23] (Deaf 2020)	Experience Fleming's rule in the use of Augmented Reality Electromagnetism	Procedia Computer science	The results of this study showed that the AR application helped improve students' educational achievement in learning procedures compared to the use of traditional learning methods. In this paper, the Fleming Left Hand Rule Diagnostic tool (LHR-DT)

				and interview method were used as data collection tools.
27	[31] (Aripin & Suryaningsih 2019)	Development of Biology Learning Media Using Android-Based Augmented Reality (AR) Technology on the Concept of the Nervous System	Science journalmat	he results showed that the AR-based Biology learning media developed according to expert assessments were feasible (valid) to use with very good categories for media aspects, good categories for content aspects, and very good categories for pedagogical aspects. Based on the results of implementation in learning Biology, the AR media developed is classified as effective and can increase the achievement of student learning completeness by 76%.
28	[32] (Prasetyo et Al, 2024)	Development of Augmented Reality Application as Learning Media for Android-Based Human Body Anatomy	Indonesian Journal: Informatics and Communication Management	an android-based human body anatomy learning application by utilizing augmented reality technology which is expected to facilitate understanding in learning the human body anatomy system.
29	[33] (Zhao & Wang 2024)	Applying multimedia augmented reality technology to build a translation platform and teaching system	Heliyon	The results of this paper present new pedagogical scenarios for learners, propose technical solutions for other technical disciplines and provide a theoretical foundation and application model for a new generation of experimental demonstration platforms.
30	[15] (a ET AL, 2024)	Augmented reality training to improve learning ability Dedy	Heliyon	AR-based approaches can increase knowledge acquisition by about 18% for traditional AR and almost 25% for enhanced AR compared to paper-based approaches. Although all training systems achieved relatively equivalent results for short-term retention tests, trainees using the enhanced AR training system statistically outperformed trainees in the paper-based group for long-term retention tests.

3. DISCUSSION

Augmented Reality (AR) is a technology that combines digital elements with the real world through devices such as smartphones, tablets, or AR glasses[1934] . AR technology is used to enhance user perception and benefit us to hear, see, and feel the real environment in a different way[2316] . This research uses the UNITY game engine to build an Android-based application with Augmented Reality technology, accompanied by a book containing markers that when directed by the application can display 3-dimensional objects[19,27,35] . This application can be utilized by high school and university students. Based on the results of marker testing, there are 3 markers that can display 7 three-dimensional objects. Based on compatibility testing, the application can work well on Android devices with a minimum version of 4.2.2, namely jellybean[8,19,28,36,37] . The results of pretest and post-test testing, students rated their competence significantly better after the survey than before the survey ($p=<0.05$). The simulation had an impact on self-assessment of professional knowledge, confidence, and practical skills in emergency situations. It improved students' procedural knowledge and practical skills in complex contexts, complementing subject knowledge and building confidence.[8,38]

Based on AR, educators can design innovative learning environments that visualize the unseen, provide interactive and immersive experiences, and engage learners in gamified and motivating learning scenarios[22] . AR enables interactive and three-dimensional visualization, which can help students improve their skills better[23123910,40] . The use of AR in learning for midwifery students includes midwifery care in pregnant women, delivery women, postpartum women, infants and provision of contraceptives, obstetric emergencies and their management[16] . The Learning Process requires 3D that can be rotated, and

zoomed. This provides a deeper understanding than using phantoms, videos, two-dimensional images that require student imagination, while not all can do it.[101925] . With AR, students can see how anatomical structures connect and function in the context of the human body[20]

Knowledge and skills of midwifery students in managing every thing Changes experienced by humans require a unique approach using methods and multimedia, one that can be used interactively is Augmented Reality (AR) which is currently experiencing rapid progress and development, AR has touched various kinds of life, especially in the field of education. Various fields are created using AR technology, by utilizing hardware and webcam cameras that are used in capturing objects and images that have been designed also along with current developments with the application on smartphones, it will be easier to translate them into applications that will be designed later.The reason for using AR is because the process is interactive, interesting, simple, effective, efficient, and has great potential to be used in training media.AR applications use cameras that are able to detect markers that have been made and display a combination of real and animated images[3940]

Clinical practice learning is a student learning process that proprieties skills, in the form of real practice. using learning media in the form of props and guided by laboratory instructors and teaching lecturers. The laboratory of the D-III Midwifery Study Program has a phantom, but the phantom has weaknesses[10] , where Pantom is quite expensive for students, and there are no details of the anatomical parts of the human body. Design and analysis of Android-based Augmented Reality (AR) applications for learning human body anatomy practicum, The aim is to analyse the effectiveness of AR technology in improving human body anatomy practicum learning and identify problems that may occur when implementing the technology[37]

The purpose of using Augmented Reality (AR) technology in learning includes several aspects that can improve the effectiveness and quality of education in midwifery.AR aims to cover several aspects that can improve the effectiveness and quality of education[1,7–9,12] . AR makes learning more interesting and interactive, encouraging students to actively participate in the learning process. Students can learn independently by using AR applications to improve students' knowledge and skills[8,33,37] . AR creates a more immersive learning experience, which can improve information retention. AR helps students connect theory with clinical practice through simulation and contextual visualization[6,8] . AR allows students to learn without having to rely on real specimens, which may be limited and expensive[9,10,12,16,41]

The impact of AR on student motivation and interest in improving student knowledge and skills is that AR offers a more interactive and engaging learning experience, which can increase student involvement in the learning process[39,42] . Students tend to be more motivated when they can interact with the subject matter directly. AR creates an immersive learning environment, allowing students to explore anatomical and physiological structures in detail. This experience makes learning more fun and engaging. Students can see real-time simulations of body functions and physiological processes, which makes them more interested and eager to understand how the body works.[8,9,12,43,44]

Effectiveness in Learning Studies show that students using AR have a better understanding of the structure and function of human anatomy compared to traditional learning methods[16,19,25,32,37,40,44] . AR helps in improving long-term retention of information due to higher visual and interactive engagement. According to research shows that students who use AR in learning achieve better results in tests and have a deeper understanding[20,30,45–47] . Because of its complex nature, midwifery learning material needs to be facilitated by the use of 3D media that makes it easier for students to understand, namely through Augmented Reality-based media, for this reason it is necessary to develop a media using AR technology that has feasibility in terms of content, reliability and ease of use in terms of its use and suitability to the characteristics of students. So that the development of learning applications with AR technology made is packaged in the Android version so that it can be used by many users and can be accessed anytime and anywhere[9,13–19,21,23–25,32–34,39,40,43,44,48,49]

4. AUGMENTED REALITY FUNCTION

The function of Augmented Reality (AR) in midwifery student learning media is to improve student learning knowledge and skills in ways that are more interactive, in-depth, and effective[508–10] . Here are some of the main functions of AR in **:**

1. Visualisation of Anatomical Complexity
    a. 3D models: AR enables the presentation of learning structures in a realistic three-dimensional form, helping students understand the spatial relationships between various components.
    b. Microscopic Details: Students can zoom in and explore microscopic details such as Human Anatomy.[51]
2. Interaction and Exploration
    a. Model Manipulation: Students can rotate, zoom, and interact with models of Maternal Handling, Maternity, birth control insertion allowing for deeper exploration and better understanding.
    b. Physiological Simulation: AR can simulate physiological processes, such as the transmission of parts of maternal anatomy, which helps students improve clinical knowledge and skills.[52]

3. More Engaging Learning:
    a. Engagement: The use of AR makes learning more interesting and engaging, which can increase student motivation and engagement.
    b. Immersive Experience: AR creates an immersive learning experience, making students feel more involved in the learning process.[53]
4. Facilitating Conceptual Understanding:
    a. Contextualisation: AR helps students improve their knowledge and skills in learning
    b. Interactive Explanations: Students can view interactive explanations that accompany the anatomical model, providing additional context and explanation as needed.
5. Flexible Access to Learning:
    a. Material Availability: AR enables access to learning materials anytime and anywhere, supporting independent and flexible learning.
    b. Out-of-Class Usage: Students can use AR technology to learn outside the classroom, extending the range and duration of learning.

5. CONCLUSIONS

The use of AR technology in Midwifery student learning media aims to improve student understanding, retention, and skills through interactive visualisation and a more engaging and immersive learning experience. This not only facilitates more effective learning, but also prepares students with the practical skills required in a career.

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