



# Development of Multimedia Learning Based on Digital Virtual Reality to Improve Students' Skills in Delivery Service



## ARTICLE INFO

### Article Type

Descriptive Study

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### How to cite this article

Rosmaria R, Heryani N. Development of Multimedia Learning Based on Digital Virtual Reality to Improve Students' Skills in Delivery Service. Health Education and Health Promotion. 2024;12(2):189-195.

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### Article History

Received: December 15, 2023

Accepted: April 5, 2024

ePublished: May 21, 2024

## ABSTRACT

**Aims** The development of virtual reality is increasingly vital in the field of education, aligning with the current digital era. It aims to cater to students' preferences, enhancing their interest in education by offering a comfortable and immersive digital experience. The growth of virtual reality-based educational tools in the digital age is significantly influenced by technological advancements that affect students' engagement in learning. Therefore, utilizing virtual reality as an instructional medium to enhance student learning outcomes represents a substantial and positive contribution to the educational process. This research aimed to develop multimedia learning based on digital VR to enhance students' skills in delivery service.

**Instrument & Methods** This descriptive study employed the research and development approach and followed the Analysis, Design, Development, Implementation, and Evaluation development model (ADDIE), which includes analysis, design, development, implementation, and evaluation stages. The subjects were 53 third-semester students from the DIII Midwifery Study Program. Data collection techniques included observation, questionnaire distribution, and testing. All data analyses were performed using SPSS 16.0.

**Findings** Virtual reality was successfully transformed into an effective learning medium. Both material experts (89%) and media experts (90%) agreed on the suitability of this medium for educational purposes. Furthermore, students' learning outcomes showed significant improvement after undergoing virtual reality-based training in childbirth assistance.

**Conclusion** Virtual reality media is a fitting and efficient tool for enhancing student learning outcomes.

**Keywords** Learning; Virtual Reality; Midwifery; Students

## CITATION LINKS

[1] Development of learning media using powtoon for elementary ... [2] The role of interactive media in learning pies for visual ... [3] Effect of e-module stage iv childbirth care with blended learning model on skills ... [4] A postgraduate optimum birth module to increase midwives' readiness ... [5] Phantoms in the classroom: Midwifery training ... [6] Simulation-based learning in nurse education ... [7] Effect of simulation training on students' childbirth skills ... [8] Virtual reality technology application for conservation ... [9] Application of augmented reality as a learning medium for the human ... [10] Smart hijaiyyah learning application based ... [11] Use of augmented reality ... [12] Effectiveness of labor cervical examination simulation ... [13] Medium-fidelity simulation in clinical readiness: A phenomenological ... [14] An exploration of student midwives' lived experiences regarding ... [15] The function and role of learning media as an effort to ... [16] Application of virtual reality technology in online ... [17] The influence of maternity care level III module toward ... [18] Design research and educational ... [19] Health research ... [20] Consideration of using virtual reality for teaching neonatal ... [21] Midwifery students' satisfaction with perinatal ... [22] Overview of student skills in phantom-based ... [23] Factors affecting nursing and midwifery students' attitudes ... [24] Simulation in midwifery education: A descriptive ... [25] The effect of mannequin fidelity on the achievement ... [26] The effect of courageous learning on the clinical practice ... [27] Transvaginal sonographic examination of the cervix ... [28] E-government with big data enabled through smartphone for public ... [29] Development of digital-based learning multimedia ... [30] Design of virtual learning media for the Grand ... [31] Promoting experiential learning through the use of ... [32] Development of augmented reality-based educational ... [33] Application of the guided inquiry learning model in the form ... [34] The effectiveness of augmented reality learning media in mastering ... [35] The role of augmented reality in increasing the visual ... [36] Computer network hardware learning media based on augmented ...

## Introduction

The development of educational multimedia, in general, requires adherence to visual principles<sup>[1, 2]</sup>. The acronym "visuals" encompasses characteristics such as visibility (easy to see), interest (captivating), simplicity (clear and straightforward), utility (providing valuable content), accuracy (factual and reliable), and legitimacy (reasonable). Moreover, there are several principles for crafting learning media, including aligning it with instructional structure (to facilitate the achievement of learning objectives), positioning learning media as a means to support student learning under the guidance of teachers, ensuring comprehensive media development by maximizing the potential and characteristics of various media elements (text, images, animation, or other audio-visual components), and maintaining the accuracy of the material while ensuring the appeal of media presentations in line with students' developmental characteristics<sup>[3, 4]</sup>.

Technological advancements and innovations in visualization have reached a remarkable stage in terms of the realism of content that can be presented. Virtual reality (VR) emerges as a significant development in the realm of visualization. Visual devices hold great promise for users as they can encompass entertainment, information, and simulation content. This visual technology signifies a remarkable milestone in the ongoing evolution and progress of the visualization field<sup>[5, 6]</sup>.

VR has become an integral part of contemporary lifestyles, continuously evolving and captivating audiences. The allure of VR technology lies in its capacity to transcend worldly limitations, enabling the representation of tasks that are arduous or even impossible to accomplish in reality through virtual media. VR technology immerses users, allowing them to experience a wide range of sensations and interactions<sup>[3, 7]</sup>.

According to Bahar<sup>[8]</sup>, the term "virtual reality" signifies an environment perceived through sensory faculties but does not physically exist in the real world. Essentially, VR is a technology that creates a substitute for actual spaces, events, objects, or environments that humans can perceive as genuine and immersive experiences. With the increasing technological advancements, educational media has taken on a pivotal role in making learning contextual, engaging, and contemporary. Learning media refers to tools, methods, or techniques used in the learning process with the aim of enhancing communication (interaction) between educators and students, ultimately fostering more effective learning experiences<sup>[9, 10]</sup>.

Learning media is designed to stimulate students' thoughts, feelings, interests, attention, and motivation during learning activities<sup>[11]</sup>. Furthermore, it not only encourages and stimulates

but also has the potential to increase interest and focus students' attention<sup>[12]</sup>. This learning media serves to provide and present learning resources in a clear and informative manner. The development of VR has become increasingly significant in the field of education. This development aligns with the demands of the current digital era and aims to adapt to students' characteristics, fostering their interest in the realm of education while ensuring comfort and compliance with ongoing digital advancements<sup>[13, 14]</sup>. The emergence of VR-based media in the digital age is significantly influenced by the ubiquity of technology, which, in turn, affects students' engagement with learning<sup>[15]</sup>. Consequently, utilizing VR as a learning medium to enhance student learning outcomes represents a noteworthy achievement. The use of VR media can significantly contribute to improving student learning outcomes throughout the learning process. In light of this, the education sector must aim to achieve learning objectives by accommodating evolving student characteristics. To this end, the educational realm should strive to establish innovative, engaging, diverse, and creative learning environments<sup>[16]</sup>.

Childbirth education poses a challenge for students to grasp, leading to relatively low learning outcomes in this course. Furthermore, students' practical proficiency in assisting with childbirth remains modest. According to Hilinti *et al.*'s findings<sup>[17]</sup>, initial surveys indicate a low pass rate on the birth care skills exam, with only 36.6% of students passing. These outcomes emphasize the need for concerted efforts to enhance student learning outcomes<sup>[17]</sup>. Supporting this, Lestari *et al.*<sup>[1]</sup> assert that student learning outcomes significantly improve when appropriate learning multimedia is utilized.

This study aimed to develop multimedia learning based on digital VR to enhance students' skills in delivery service.

## Instrument and Methods

### Design

This descriptive study employed the research and development approach. In the realm of development research, the researchers employed the analysis, design, development, implementation, and evaluation (ADDIE) model developed by Rusdi in 2018<sup>[18]</sup> to create video-based learning media, which underwent a series of stages, including validation, testing, and revision.

The content featured in this media, conceived by the researchers, centers around the topic of childbirth. The ADDIE's systematic framework for organizing research activities makes it the most widely adopted and popular choice<sup>[18]</sup>. This research primarily focused on creating animated videos and digital practicum instructions to serve as educational tools for childbirth courses. These procedures essentially comprised two main objectives, including product

development and product feasibility testing. In simpler terms, the primary goal pertains to the development function, while the secondary goal revolves around validation.

The research initiation involved an analysis of students' learning needs to identify any challenges they encountered. This process aimed to pinpoint issues faced by students and subsequently generate ideas or solutions in the form of educational media products to aid the childbirth course learning process.

Criteria for the feasibility of media and animated video material by experts and their scores included strongly valid, no need for revision (85.1-100), valid, usable, but needs minor revisions (70.01-85), less valid, usable, major revision (50.1-70), and invalid, should not be used (1-50).

### Participants

This research involved 53 third-semester students from the DIII Midwifery Study Program. The selection of these participants was done randomly, considering the inclusion criteria, including their status as third-semester students, ownership of an Android cellphone, and their agreement to participate. Students who did not own or use an Android cellphone were excluded from this study. The research was conducted at the Midwifery Department of the Health Polytechnic, Ministry of Health, Jambi, spanning from January to September 2023. Since there is only one institution offering a midwifery program in this city, we chose Jambi Health Polytechnic as the location for our development study. This decision was made due to the necessity of direct supervision and evaluation by researchers, which is a crucial consideration. Additionally, Jambi Health Polytechnic serves as a pilot institution for several health facilities in the western region, boasting comprehensive laboratory equipment and a competent teaching staff. Moreover, its central location in Jambi city ensures faster and more reliable internet access.

### Sample size

According to Masturoh & Anggita [19], a total of 38 students were calculated using Slovin's formula considering  $\alpha=0.05$ , and the final sample size was 53 people.

$$n = \frac{N}{1+Nd^2}$$

n=Number of samples

N=Statistical population

d=Precision

### Data collection

Data collection techniques included observation, questionnaire distribution, and testing. An 11-item questionnaire was used to gather insights into students' attitudes, motivation, and the perceived relevance of their learning experiences. At baseline,

we evaluated the validity and reliability of the questionnaire. Based on the assessments, the questionnaire exhibited both validity and reliability. Notably, all items displayed significant correlations in the Pearson correlation test ( $p<0.05$ ), and the overall reliability, assessed through Cronbach's Alpha, was determined to be 0.845. Testing methods were implemented to collect data on learning outcomes and student evaluations, both before and after their engagement with YouTube video-based learning content. Evaluating the effectiveness of YouTube media in learning was a crucial aspect of data collection.

### Statistical analysis

Data analysis was conducted during expert validation tests, user validation tests, as well as trials in small and large groups. A Likert scale was used to measure the results of the questionnaires. The scoring on this Likert scale is as follows: a response of strongly agree is assigned a score of 5, agree is assigned a score of 4, undecided is assigned a score of 3, disagree is assigned a score of 2, and strongly disagree is assigned a score of 1. The presentation of validation outcomes and results from small and large group trials involved the use of percentages and assessment scores. To assess the impact of learning media on student grades, a paired t-test was employed. All data analyses were performed using SPSS version 16.0 software, with statistical significance set at  $p<0.05$ .

### Findings

The VR development product was validated on August 15, 2023, by media experts (IT) to assess the suitability of the VR created and its appropriateness for learning purposes (Table 1).

**Table 1.** Media expert's evaluation of the developed media

No. of questions	Assessment scale					Total
	5	4	3	2	1	
1	5					5
2			3			3
3			3			3
4				2		2
5			5			5
6		4				4
7			3			3
8		4				4
9	5					5
10	5					5
11		4				4
<b>Total</b>						43
<b>Maximum score</b>						55
<b>Evaluation result regarding validity and usability</b>						78%

According to Table 1, the media expert's evaluation result of the developed content was 78%. This implies that the media is valid and usable, albeit requiring minor revisions, particularly in the VR aspect, before being employed as a learning tool. After the revisions were made, it underwent reevaluation by media experts and received a score of 90%.

**Table 2.** Material expert's assessment of the developed media

No. of question	Score scale					Total
	5	4	3	2	1	
1	5					5
2		4				4
3			3			3
4		4				4
5	5					5
6		4				4
7		4				4
8			3			3
9		4				4
10		4				4
11	5					5
<b>Total</b>						45
<b>Maximum score</b>						55
<b>Evaluation result regarding validity and usability</b>						81%

The material expert's evaluation result of the developed media was 81%, signifying its validity and potential use. However, minor revisions are needed, specifically focusing on revising the VR component before it can be utilized as a learning medium (Table 2).

During the small group trial stage, the student

assessments indicated that the media was suitable for use without requiring revisions, with an assessment score of 90% (Table 3). This suggests that the VR media was appropriate for use as a learning tool for childbirth.

At the large group trial stage, based on student assessments, the media was deemed suitable for use without revisions, achieving an assessment score of 92% (Table 4). This indicates that the VR media was fitting for use as a learning medium for childbirth courses.

Prior to the introduction of VR media to the students, their skills in performing childbirth practices were classified as unskilled, accounting for 60.5%. However, after the integration of VR media, the results revealed that students demonstrated proficiency in executing childbirth practices (86.8%). The mean pre-test score was 75.08, while the mean post-test score was 79.45, and the difference between the mean pre-test and post-test scores was 4.41 (p-value=0.000), indicating that VR was effectively used as a learning medium.

**Table 3.** Small group trial stage

Criteria	No. of questions	Scoring scale					Number of respondents	Total score	Result
		5	4	3	2	1			
Presentation of material	1	5	1				6	29	97
	2	4	2				6	24	80
	3	5	1				6	29	97
	4		6				6	24	80
Media/display	5	5	1				6	29	97
	6	5	1				6	29	97
	7	1	5				6	25	83
	8	2	4				6	24	80
Learning with virtual reality media	9	5	1				6	28	93
	10	4	2				6	28	93
	11	5					6	28	93
<b>Evaluation result</b>									90%

**Table 4.** Large group trial stage

Criteria	No. of questions	Scoring scale					Number of respondents	Total score	Result
		5	4	3	2	1			
Presentation of material	1	34	3	1			38	185	97
	2	3	34	1			38	154	81
	3	33	4	1			38	184	96
	4	4	33	1			38	155	81
Media/display	5	30	5	3			38	179	94
	6	29	3	6			38	175	92
	7	33	4	1			38	184	96
	8	30	3	3			38	165	86
Learning with virtual reality media	9	34	3	1			38	185	97
	10	33	3	2			38	183	96
	11	32	3	3			38	181	95
<b>Evaluation result</b>									92%

## Discussion

This study aimed to develop multimedia learning based on digital VR to enhance students' skills in delivery service. The findings revealed that the development of VR multimedia adhered to the systematic ADDIE stages, which include analysis, design, development, implementation, and evaluation. This systematic approach is crucial for achieving optimal results in creating VR learning multimedia. An essential step in this process is

conducting a needs analysis to ensure that the final product aligns with the users' requirements.

The research results emphasized the importance of a needs analysis. Before initiating the development process, it was noted that students primarily relied on simplistic learning materials, which often led to feelings of disengagement and boredom during lessons. To address these issues, the development of learning materials was customized to meet the specific needs of the students. This needs analysis

considered curriculum requirements and learning objectives, ensuring alignment with the users' needs [18].

The needs analysis further identified a significant challenge in the learning process: a lack of student interest, particularly in childbirth courses, which many found challenging to comprehend. In response, an innovative approach was adopted to enhance the quality of learning. Previously, instructors attempted to engage students by making learning enjoyable.

The importance of needs analysis cannot be overstated, as it plays a pivotal role in determining students' multimedia requirements according to their preferences. This analysis encompasses various aspects, including material needs and essential skills required to operate the intended product. Consequently, it enables development to proceed in a more targeted direction aligned with user demands [16].

The outcomes of the needs analysis highlight the students' requirement for learning media that can improve their knowledge and skills in assisting childbirth. Consequently, the development of VR is highly suitable for addressing these educational challenges. In contemporary education, VR has emerged as an exceptionally engaging medium for learning, capable of influencing behavior through individual interaction with the surrounding environment [20]. Thus, education serves not only as a means to acquire knowledge but also as a medium for shaping human character [21].

The development of VR multimedia, guided by contextual needs, adheres to specific specifications identified during the needs analysis, including pedagogical aspects. It is designed using a learning model aimed at enhancing metacognitive skills, thereby ensuring the creation of high-quality products [18]. The product development process involves crafting prototypes that synergize and integrate experience, knowledge, and expertise to yield products that meet predefined specifications, as envisioned in the VR design [22].

Subsequently, a VR learning design is crafted, starting with the creation of a storyboard. This storyboard serves as a visual and narrative tool for conveying story ideas and illustrating the flow of the VR application. It's important to note that a prototype represents a design and serves as a standard example of the product under development. It is not a final product ready for user deployment [23].

The data validation results clearly indicated that VR-based learning media for childbirth and newborn courses received high suitability ratings. These ratings stem from the comprehensive validation process involving both media and material experts. The validation outcomes affirm the media's feasibility, with the analysis techniques meticulously following predetermined formulas [24].

VR technology itself serves as a means to present three-dimensional images, commonly referred to as

3D. This process harnesses computer components, resulting in highly realistic visuals complemented by essential tools. Consequently, student users experience an immersive sensation, as though they are physically present within a predefined environment [25].

The integration of VR technology into the learning process is expected to facilitate a more interactive and user-friendly educational experience. This is further enhanced by the widespread use of smartphones, which play a pivotal role in deploying learning media. It is noteworthy that recent research conducted by several scholars has shown that individuals can explore the realm of VR with just a smartphone and the assistance of Google Cardboard [26].

Before the introduction of VR, student learning outcomes in the childbirth and newborn courses were notably deficient and categorized as unskilled. However, following the implementation of VR media, students made significant improvements, reaching a skilled level [27].

According to Anshari & Lim [28], the essence of VR technology greatly enhances students' sense of immersion, enabling them to perceive a lifelike environment with clarity and realism. Moreover, sharing information via VR presentations offers an enriched and interactive experience for users. The adaptability of virtual world design within VR content constitutes a notable advantage for its educational application. Various settings, such as buildings, classrooms, laboratories, and offices, can be faithfully recreated in the form of VR, aiming to captivate students' interest and evoke a classroom-like atmosphere during offline learning sessions [29].

According to research conducted by Zakiyan *et al.* [30] on learning media utilizing VR technology, it is a solution to various problems across different domains, particularly in the context of introducing and teaching activities related to specific subjects. Their findings highlight that the implementation of VR technology in the learning process consistently garners a highly positive response and enthusiasm from students when compared to traditional learning media.

Moreover, the learning process becomes notably engaging and enjoyable due to the efficient nature of VR-based learning. This efficiency is attributed to the fact that VR can be utilized anywhere and at any time, transcending spatial and temporal constraints while connected to the internet. VR technology has the capacity to create lifelike environments, presenting dynamic images and videos that immerse students in a pseudo-world, making the learning experience highly captivating. Consequently, VR is regarded as a promising solution in the field of education, particularly because most students are already familiar with virtual media [31].

The development of VR is considered highly significant in the realm of education, as emphasized

in numerous studies. VR technology has been demonstrated to contribute positively to achieving various educational objectives. These studies indicate that VR can enhance student learning outcomes [2, 8], boost students' interest in learning [32, 33], improve the grasp of complex concepts [33, 34], enhance visual perception [35], facilitate comprehension of learning materials [36], and yield various other achievements in education.

This research was constrained by the limited number of respondents and its focus on a single campus. Future studies should strive to incorporate larger and more diverse groups of students to augment the variability and robustness of research findings.

## Conclusion

VR is an effective learning medium for enhancing students' skills in childbirth services.

**Acknowledgments:** We extend our sincere gratitude to the Chairperson of Jambi Health Polytechnic, for invaluable support in providing the necessary research facilities.

**Ethical Permissions:** No economic incentives were offered or provided for participation in this study. The study protocol matched the Declaration of Helsinki's ethical guidelines for clinical studies. This research was approved by the Health Research Ethics Commission of the Health Polytechnic of the Jambi Ministry of Health (LB.02.06/2/277/2023).

**Conflicts of Interests:** The authors declared no conflicts of interests.

**Authors' Contribution:** Rosmaria JI (First Author), Introduction Writer/Methodologist/Main Researcher/Discussion Writer/Statistical Analyst (60%); Heryani N (Second Author), Introduction Writer/Methodologist/Assistant Researcher/Discussion Writer/Statistical Analyst (40%)

**Funding/Support:** This research did not receive financial support from any party.

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