JURNAL KEPERAWATAN KOMPREHENSIF

OPEN ACCESS

Jurnal Keperawatan Komprehensif

(Comprehensive Nursing Journal)

A Journal of Nursing Values, Innovation, Collaboration, and Global Impact

Volume 11, Issue 4, October 2025

Published by STIKep PPNI Jawa Barat

ISSN 2354-8428, e-ISSN 2598-8727

Original Article

Development and Validation of a 3D Hologram-Based Learning Media for Emergency Preparedness in Islamic Boarding Schools

Tiara Kamila Dyanti [1], Andi Subandi[2], Rts Netisa Martawinarti[3] and Yosi Oktarina[4]

[1,2,3,4]Department of Nursing, Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi City, Indonesia

OPEN ACCESS

Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal)

Volume 11 (4), 592-600
https://doi.org/10.33755/jkk.v11i3

Article info

Received : October 15, 2025
Revised : October 21, 2025
Accepted : October 27, 2025
Published : October 31, 2025

Corresponding author

Andi Subandi*
Department of Nursing, Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi City, Indonesia
Phone : +62 853-7897-5570
email: andi.subandi@unja.ac.id

Citation
Dyanti, T. K., Subandi, A., Martawinarti, R. N., & Oktarina, Y. (2025). Development and validation of a 3D hologram-based learning media for emergency preparedness in Islamic boarding schools. Jurnal Keperawatan Komprehensif (*Comprehensive Nursing Journal*), 11(4), 592–600.

Website
https://journal.stikep-ppnijabar.ac.id/jkk

p-ISSN : 2354 8428
e-ISSN: 2598 8727

Abstract

Background: Islamic boarding schools (pesantren) have distinctive educational settings, yet emergency preparedness education remains limited by conventional learning methods.
Objective: This study aimed to develop and validate a three-dimensional (3D) hologram-based learning media on school safety zones and first aid for students in Islamic boarding schools.
Methods: This research employed a Research and Development (R&D) approach using the 4D model, consisting of the Define, Design, and Develop stages. Validation was conducted by two material experts and two media experts using standardized assessment instruments covering aspects of content accuracy, visual quality, and practicality. Data were analyzed descriptively to determine the feasibility level of the developed media.
Results: Validation by material experts yielded an average score of 93.33%, while media experts obtained 92.94%, both categorized as *very feasible*. These findings indicate that the 3D hologram-based learning media meets both substance and technical standards required for preparedness and first-aid education.
Conclusion: The developed 3D hologram-based learning media was declared *very feasible* based on expert validation, making it a valid and appropriate educational tool for future implementation in nursing and health education programs.

Keywords: 3D hologram; emergency preparedness; Islamic boarding school; learning media; validation.

INTRODUCTION

Emergency preparedness is an essential aspect of educational development, particularly within Islamic boarding schools (*pesantren*) that possess distinctive organizational and cultural characteristics. Adequate knowledge and skills in managing emergency situations are fundamental to minimizing the risk of injury and material loss. However, several studies have reported that the level of preparedness among students in Islamic boarding schools remains relatively low, especially in terms of practical knowledge and disaster response abilities (1,2).

The learning process in *pesantren* predominantly adopts teacher-centered methods such as *sorogan* and *bandongan* (3)Despite intensive learning schedules throughout the day, instructional media still rely heavily on conventional approaches such as lectures and printed materials. This pedagogical pattern limits

students' ability to understand contextual and applied topics, including disaster preparedness and first aid, which require interactive and experience-based learning. Within the field of nursing and health education, this limitation underscores the need for innovative learning media capable of visualizing procedures and real-life scenarios to enhance comprehension and retention.

The advancement of educational technology has opened new opportunities for improving learning effectiveness. One promising innovation is three-dimensional (3D) holographic technology, which has been shown to enhance learners' motivation, comprehension, and engagement with complex materials (4,5).

Furthermore, virtual reality (VR) and holographic-based media have been widely applied in health and disaster preparedness training, demonstrating significant improvements in knowledge retention, self-confidence, and readiness to respond during emergency situations (6) hese findings suggest that holographic learning tools can serve as valuable educational resources for nursing and health education, particularly in enhancing preparedness and procedural understanding (2)

Despite these developments, most existing studies have been conducted in general schools or higher education contexts, with limited application in Islamic boarding schools. The unique environment, infrastructure, and cultural characteristics of *pesantren* require specific adaptations when integrating technology into the learning process (7) Therefore, further empirical research is needed to contextualize technological innovation, ensuring that it aligns with the educational values and conditions of *pesantren* communities. Based on these considerations, this study aims to develop and validate a three-dimensional (3D) hologram-based learning media focusing on School Safe Zones (*Zona Aman Sekolah*, ZOSS) and First Aid in Accidents (*Pertolongan Pertama pada Kecelakaan*, P3K). Expert validation was conducted to assess the content accuracy, feasibility, and practicality of the developed media prior to broader implementation. This study contributes to the advancement of nursing and health education by introducing 3D holographic media as an innovative instructional tool that enhances students' preparedness and first aid competencies. The findings support the role of nurses as health educators in promoting emergency readiness within educational institutions, particularly in Islamic boarding schools. Moreover, this research provides an evidence-based framework for integrating interactive technology into nursing education, bridging the gap between traditional learning practices and modern educational innovations.

METHODS

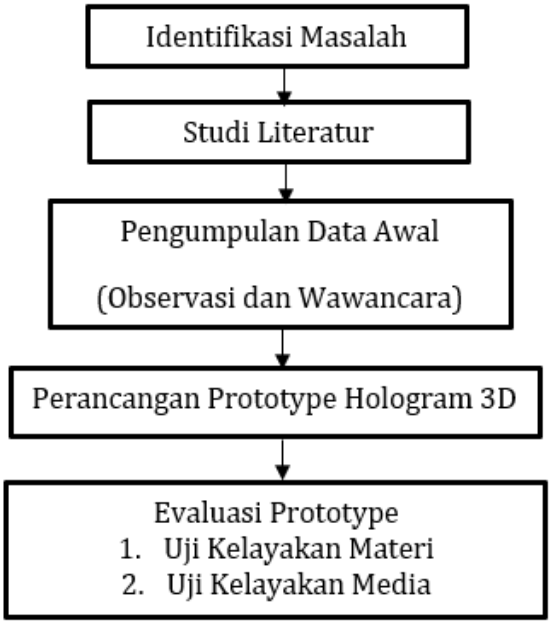
Study Design

This study applied a research and development (R&D) design using the 4D model, which consists of *Define, Design, Develop,* and *Disseminate* stages. The research was limited to the *Develop* phase. The main objective was to produce and validate a three-dimensional (3D) hologram-based learning media on School Safe Zones (*Zona Aman Sekolah*, ZOSS) and First Aid (*Pertolongan Pertama pada Kecelakaan*, P3K) for students in Islamic boarding schools (*pesantren*).

The *Define* stage began with problem identification and needs analysis. Observations and interviews with teachers and supervisors revealed that students had limited knowledge and skills related to emergency preparedness, particularly regarding ZOSS and P3K, when taught using conventional lecture methods. These findings indicated the necessity for innovative and interactive learning media suited to the pesantren context.

A literature review was then conducted to support the theoretical foundation of the media development. Previous studies have shown that traditional learning models relying on printed materials and lectures often lead to decreased motivation and comprehension of practical content (2,8). In contrast, multimedia-based and interactive learning tools have been proven to enhance students' conceptual understanding, engagement, and retention (9–11). The principles of Cognitive Load Theory were adopted to ensure that the design maintained a balance between information complexity and students' processing capacity (12,13).

During the *Design* stage, storyboards and educational scripts were developed to visualize ZOSS and P3K content. The 3D hologram prototype was designed to be visually engaging, contextually relevant, and easily understandable for pesantren students. The prototype underwent iterative refinement based on feedback from initial reviews and was then prepared for expert validation.



Source: Adapted from Thiagarajan et al. (1974)

Figure 2. Development Stages of 3D Hologram-Based Learning Media (4D Model up to the Develop Stage)

Source: Author's illustration, adapted from Thiagarajan et al. (1974)

Participants

Participants in this study consisted of two groups of experts selected through purposive sampling: material experts and media experts. The material experts were nursing lecturers specializing in emergency and community health, while the media experts were professionals in instructional technology. Each expert had a minimum of three years of relevant experience in their respective fields and prior involvement in learning media assessment.

Instruments

Two structured validation instruments were used to assess the feasibility of the developed media.

1. The material validation instrument evaluated the content in terms of accuracy, completeness, clarity, cultural appropriateness, and innovation.
2. The media validation instrument assessed visual design, audio quality, interactivity, accessibility, and technical performance.

Both instruments used a five-point Likert scale (1 = very poor to 5 = excellent). The instruments were reviewed for content validity by independent assessors before distribution to the experts.

Data Collection Procedure

Data were collected in two stages. The first stage involved direct observation and face-to-face interviews with teachers and supervisors to identify students' level of preparedness and the learning patterns related to emergency situations. The findings from this stage served as the basis for designing the 3D hologram-based learning media.

The second stage was expert validation, conducted in person with both material and media experts. Prior to assessment, the experts were informed about the study's purpose and procedures. They evaluated the prototype using a five-point Likert validation form and provided comments and suggestions for improvement. All assessments were analyzed and used to refine the

media before it was declared feasible for further implementation.

Data Analysis

Data from expert validation were analyzed using descriptive statistics. The feasibility percentage was calculated using the formula:

$$\text{Feasibility (\%)} = \frac{\text{Total Score Obtained}}{\text{Maximum Possible Score}} \times 100$$

The results were interpreted according to the criteria adapted from Riduwan (14) and Akbar (15), where 85–100% indicates *very feasible*, 70–84% *feasible*, 55–69% *less feasible*, and below 55% *not feasible*. Qualitative feedback provided by the experts was also reviewed and used to refine and finalize the 3D hologram-based learning media.

Ethical Considerations:

This research focuses on the development and validation test of learning media without directly involving human subjects. Ethical principles are maintained through providing explanations to material experts and media experts about the purpose and procedures of research before validation. Consent is obtained voluntarily, and all data is kept confidential.

RESULTS

This research produces a three-dimensional hologram-based interactive learning media developed to support increasing understanding of emergency preparedness in the pesantren environment. The main materials contained include School Safe Zones (ZOSS) and First Aid in Accidents (P3K). This media is in the form of a 3D hologram video that can be displayed through a simple hologram device, so that it is easy to operate by students without significant technical obstacles.

Development Stages (4D Model)

The media development process follows a 4D model (16), which in this study was carried out to the Develop stage. Each stage plays an important role in ensuring the suitability of the media to the learning objectives and user characteristics.

1. *Define* (Definition/Needs Analysis)
   The initial stage is focused on analyzing the needs of students and learning characteristics in Islamic boarding schools. The ZOSS material focuses on crossings, road markings, and traffic signs, while the P3K material includes the handling of fainting, choking, minor injuries, nosebleeds, fractures, and sprains. The analysis shows the need for interactive media that is interesting, simple, and easy to understand, considering the limitations of students' initial understanding of this topic.
2. *Design*
   Transitioning from needs analysis, this stage focuses on *storyboarding* and 3D hologram content development. Each scene is concisely composed from the introduction of ZOSS to the simulation of P3K actions. 3D objects are created with *Blender*, arranged in *Canva*, and edited in *CapCut* before being converted to hologram format via *3D Circle*. This approach ensures that the media appears dynamic, informative, and visually appealing.

Table 1. Steps of Designing a 3D Hologram Medai

Step	Brief Description
Script Drafting	The narrative manuscript is prepared based on ZOSS and P3K materials.
2D Element Creation	Visual elements are created in Canva and Blender.
Convert to 3D	The 2D elements are converted into 3D models.
Composition in Canva	Elements are combined according to the storyboard.
Editing in CapCut	Addition of sound, effects, and tempo.
Final Conversion	The video is converted to 3D hologram format via 3D Circle.

Table 2. Media Design Devices and Outputs

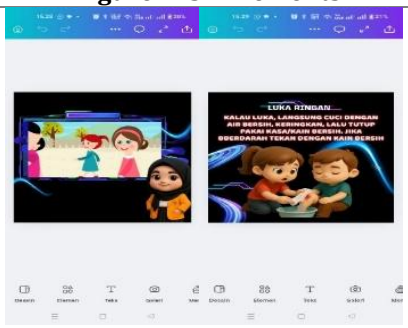
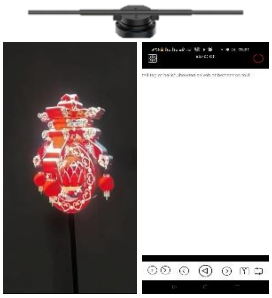
Device	Output Produced
Word	Narrative script per scene
Canva/Blender	 **Figure 3. 2D animation elements**
3D Conversion Apps	 **Figure 4. 3D Elements**
Canva	 **Figure 5. 3D hologram video composition**
CapCut	

	Figure 6. Final pre-conversion video
3D Circle	Prototype of 3D hologram video ready for trial  **Figure 7. Holographic LED FAN 3D Circle**   **Figure 8. 3D Hologram**

3. *Develop* (Development/Implementation)
Building from the design, this stage integrates all video elements according to *the storyboard guidelines*, including animation synchronization, text, narration, and visual effects. Testing is carried out using *blackbox testing* to ensure each component functions optimally without technical interference. This stage marks the media's readiness for further evaluation.

A. Material Expert Qualification Results
Subject matter experts in emergency experts, assess aspects of scientific truth, completeness, ease of understanding, socio-cultural relevance, and innovation.

Table 3. Results of Material Expert Validation

Assessment Aspects	Total Score	Max Score	%	Category
Scientific Truth	20	20	100%	*very feasible*
Completeness of Content	19	20	95%	*very feasible*
Ease of Understanding	18	20	90%	*very feasible*
Social and Cultural Relevance	9	10	90%	*very feasible*
Innovation and Effectiveness	18	20	90%	
Total	**84**	**90**	**93.33%**	***very feasible***

The average score of 93.33% shows that the media has high quality and is suitable for preparedness education in Islamic boarding schools.

B. Media Member Eligibility Results

Media validators, assessing aspects of display, audio-visual, content, ease of access, and effectiveness.

Table 1. Media Expert Validation Results

Assessment Aspects	Total Score	Max Score	%	Category
Display	18	20	90%	*very feasible*
Audio and Visuals	19	20	95%	*very feasible*
Content and Delivery	19	20	95%	*very feasible*
Ease of Access	8	10	80%	*very feasible*
Media Effectiveness	15	15	100%	
Total	**79**	**85**	**92.94%**	***very feasible***

The 3D hologram media was declared to be very feasible, meeting the substance and technical standards for the learning process.

DISCUSSION

The results of the study show that the three-dimensional (3D) hologram-based learning media developed has been considered very feasible both in terms of material and media aspects. The assessment of material experts obtained an average score of 93.33%, while media experts reached 92.94%. This high feasibility confirms that the media produced has met the standards of substance, content accuracy, and an attractive and easy-to-use visual appearance. This shows that the integration of holographic technology in emergency preparedness learning has great potential to be applied in the pesantren environment.

In terms of substance, the material contained in this media is considered accurate, relevant, and easy to understand. These results are in line with the findings of Putri (17), which explains that the use of 3D hologram-based learning videos can clarify students' understanding of practical materials because they display objects and procedures in a more concrete and interactive way. Thus, the 3D hologram media in this study serves as a tool that makes it easier for students to understand the steps of preparedness and first aid through visual simulations that resemble real situations. From the design and appearance aspects, the validation of media experts shows excellent results. The graphic display, arrangement of visual elements, and audio integration are considered effective and communicative. These results support the research of Qazi et al. (9) which states that 3D hologram technology is able to increase motivation and concentration in learning because it presents an immersive and realistic learning experience. A similar opinion was put forward by Rakha (18) which confirms that the application of 3D holograms in learning activities can strengthen visual skills, especially in practice-based learning. With the support of a three-dimensional display, learners can observe

sequences of actions and procedures more clearly Pedagogically, 3D hologram media also plays a role in reducing the cognitive burden of students. Suzanna (19) Explains that hologram-based learning experiences can stimulate various senses at the same time, so that the process of understanding takes place more deeply and is not monotonous. This principle is relevant to the results of the research, where experts consider the developed media to be easy to use and do not cause difficulties in understanding for users. In the context of emergency preparedness, this study reinforces the view of Alshowair (2) that digital simulation-based learning such as virtual reality and holograms can increase participants' readiness to face emergencies because it provides exercises that resemble real conditions. Through a similar approach, the 3D hologram media in this study allows students to learn first aid measures in a more applicable way without real risks. In addition to being relevant to the field of nursing and health education, these results are also consistent with the report *The Practicality of 3D Hologram Media in Geometry Learning* (20) which states that 3D hologram media is relatively practical because it can be operated with a simple device and still attracts students' interest in learning. This condition is very supportive of its application in Islamic boarding schools that have limited technological facilities. With a simple but effective design, this media is an alternative means that is adaptive to the learning needs in the environment. However, this research is still limited to the stage of expert development and validation, so it has not measured the impact of media on improving students' knowledge and skills. The next stage needs to be directed to field implementation to assess the effectiveness of media in real learning. This is in line with Guo's recommendation (21) which emphasizes the importance of the sustainable integration of technological innovation in preparedness education to strengthen community resilience to disasters

Thus, the results of this research make a real contribution to the development of technology-based learning media in Islamic boarding schools. The novelty of the research lies in the application of 3D hologram media that has been validated by experts in the context of religious education, a field that is still rarely studied empirically. This media is not only feasible to use, but also has the potential to increase the effectiveness of emergency preparedness learning in a more engaging, participatory, and contextual way.

CONCLUSION

This study developed a three-dimensional (3D) hologram-based learning media focused on school safety zones and first aid. Expert validation indicated that the media was *very feasible*, with average scores of 93.33% from material experts and 92.94% from media experts. The developed media fulfills both the substantive and technical criteria required for emergency preparedness and first-aid learning. This research also provides an academic foundation for integrating interactive technology into nursing education curricula, particularly within Islamic-based learning institutions. Although this study was limited to the *Develop* stage of the 4D model, subsequent research is encouraged to advance to the *Disseminate* phase to examine its real-world application in pesantren settings. Field testing is essential to ensure that the 3D hologram media is not only technically feasible but also effective in enhancing students' knowledge and self-efficacy in dealing with emergency situations.

Acknowledgement
The authors would like to express their sincere gratitude to the Nursing Study Program, Faculty of Medicine and Health Sciences, Universitas Jambi, for the support and guidance provided throughout the research process and the preparation of this manuscript.

Funding Source
This study did not receive any specific funding from public, commercial, or non-profit funding agencies.

Author Contributions
Study conception and design: Tiara Kamila Dyanti
Data collection: Tiara Kamila Dyanti
Data analysis and interpretation: Tiara Kamila Dyanti
Drafting of the manuscript: Tiara Kamila Dyanti
Critical revision of the manuscript: Andi Subandi, Rts Netisa Martawinarti, Yosi Oktarina, and Andika Sulistiawan.

Conflict of Interest
The author states that there are no financial, personal, or professional conflicts of interest that can affect the results of this research.

REFERENCES

1. Huang AYQ, Lu OHT, Yang SJH. Effects of

artificial Intelligence–Enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. Comput Educ. 2023;194:104684.
2. Alshowair A, Bail J, AlSuwailem F, Mostafa A, Abdel-Azeem A. Use of virtual reality exercises in disaster preparedness training: A scoping review. SAGE Open Med. 2024;12.
3. Mahbubi M, Shahidi N, Gunawan R. Implementation of the Amtsilati Method in Improving the Ability to Read the Yellow Book in Islamic Schools. Electron J Educ Soc Econ Technol. 2024;5(2):2002–11.
4. Alsswey A, Malak MZ. The effect of using 3D hologram technology as a learning method on university students' self-efficacy, curiosity, and emotional intelligence. Interact Learn Environ. :1–13.
5. Qing Y, B ML, Q YW. The effectiveness of 3D holographic technology on students' learning performance: A meta-analysis. 2022;
6. Kaggwa MM, Chaimowitz GA, Agboinghale P, Marginean D, Olagunju AT. Virtual reality training programs in disaster preparedness: a systematic review. Discov Educ. 2025;4(1).
7. Nurul Hidayah, Pepin Nahariani, Anja Hesnia Kholis, Syahdatul Nabila Indana Zulfa, Abdul Azis. WEB-SAINSTREN (Science and Digital Disaster Literacy Website) to improving Knowledge and Disaster Preparedness of Islamic Boarding School Students. Prof Heal J. 2024;6(2):662–8.
8. Chen X. A Comparative Study on the Effectiveness of Traditional and Modern Teaching Methods. Lect Notes Educ Psychol Public Media. 2025;85(1):13–8.
9. Qazi A, Ghulamani S, Thartori V, Abdallah SS, Shah A, Khowaja K. 3D Hologram in Education to Enhance the Learning Power of Students. Int Conf Eng Technol Appl Sci Shap Futur Technol through Smart Comput Eng ICETAS 2023. 2023;(December).
10. Kaur DP, Mantri A, Horan B. Enhancing Student Motivation with use of Augmented Reality for Interactive Learning in Engineering Education. Procedia Comput Sci. 2020;172:881–5.
11. Maryani I, Karimi A, Fathi K. Virtual Reality in Elementary Education: A Scientometric Review. J Learn Dev. 2024;11(3):430–46.
12. Radianti J, Majchrzak TA, Fromm J, Wohlgenannt I. A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. Comput Educ. 2020;147(December 2019):103778.
13. Kortemeyer G, Dittmann-Domenichini N, Schlienger C, Spilling E, Yaroshchuk A, Dissertori G. Attending lectures in person, hybrid or online—how do students choose, and what about the outcome? Int J Educ Technol High Educ. 2023;20(1).
14. Ridwan. Skala Pengukuran Variabel-Variabel Penelitian. Alfabeta; 2013.
15. Akbar S. Instrumen Perangkat Pembelajaran. PT Remaja Rosdakarya; 2013.
16. Imran A, Yantahin M, Mustamin M, Iswanto MRI. Pengembangan Media Pembelajaran Berbasis Video Hologram 3D. Remik. 2022;6(4):965–75.
17. Wahyuni ED, Irfan M. Perancangan Prototype Interface Sistem Informasi Keberadaan Dosen. J Tekno Kompak. 2020;14(1):11.
18. Zamsiswaya, Sawaluddin, Sihombing B. Model Pengembangan 4D dalam Pembelajaran Pendidikan Islam. J Islam Educ El Madani. 2024;4(1):11–9.
19. Putri A, Raina I. Educational Video Using the 3D Hologram Technique in Kindergarten Learning Methods. J Multimed Trend Technol. 2023;2(1):19–27.
20. Rakha AH. Application of 3D hologram technology combined with reciprocal style to learn some fundamental boxing skills. PLoS One. 2023;18(5 May):1–25.
21. Suzanna S. Application of Holographic Technology in Education. PIKSEL Penelit Ilmu Komput Sist Embed Log. 2023;11(2):253–66.