Research Article

The Examining of 360° Media That Support Learning in Field of Education

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Abstract.
Currently, 360° product media is becoming very popular, especially through an immersive approach as a learning media and is not yet known in depth about how 360^0 product media are used in the education sector. This research aims to analyze the use of 360° media supporting learning media in education and to explore future research opportunities. The method used is a systematic mapping study of primary literature that used only scientific papers that have been published and Scopus indexed. The number of scientific papers analyzed were 100 out of 179, and only 20 scientific papers were truly suitable. The results analysis shows that the use of 360° media can be in the form of video formats, 3D models, and applications. With its utilization mostly used in interdisciplinary fields, and the results of the parameter analysis of media utilization 360° show that this media is very useful and recommended for use in education.

Keywords: 360° media, immersive, learning media, review paper, systematic mapping

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1. Introduction

The development world of photography is increasingly varied along with advances in camera technology. Camera is a recording tool that can capture an event or atmosphere. Advances in camera technology have made this tool capable of recording events in various circumstances. Currently there are types of cameras that are capable of capturing and recording the atmosphere of circular and rotating objects. This type of camera is known as a 360^0 degree camera. The ability of this camera provides a breakthrough to be applied in several fields that require 360^0 panoramic photos. Learning is a continuous process of transferring knowledge so that it can be useful and utilized in life's problems.

The use 360^0 camera is one of the technical things that makes it easier for someone to see a complete 360^0 visual scene in a virtual space. This immersive method allows users to see more broadly and thoroughly by rotating up and down. This panoramic image gives the user an experience to feel as if they are in that space. The use of camera 360^0 as a supporting tool in learning has been carried out in several studies, and can increase the level of understanding experience in learning. Currently quite widely used, especially in teaching, because 360^0 video media can increase motivation and experience in learning [1]. Providing experiences in multiple perspectives arouses curiosity and strives to explore every side to find or feel immersive experiences. Online learning has led to the emergence of various learning innovations with digital platforms, both VR and AR technology, this has fostered motivation for both students and teachers [2]. Various fields have utilized the 360^0 media, whether in video format, 3D modeling, or applications, including in the fields of medicine, sports, manufacturing tutorials, forestry, environmental engineering, and other [3];[4];[5];[6].

Learning through digital media used camera images or 360^0 videos can be an innovation in the delivery of learning media. This research is to see the role that has been carried out in these tools in developing learning methodologies. Systematic review literature is used as a reference to find out the benefits generated by the use of camera 360^0 in the world of learning.

2. Research methods

The method used is a systematic mapping study of primary literature, using only published scientific research papers and Scopus indexed journals, proceedings, and books. Screening was carried out based on titles and abstracts, the number of scientific papers that were successfully collected was 179, but only 100 scientific papers were initially screened, and 28 scientific papers were obtained that were truly in accordance with the research topic raised. The primary literature search stage is carried out through Scopus tools with keywords: 360 + learning + media, by limiting journals published in the last five years (2019-2023).

Systematic mapping study purpose to obtain a comprehensive and systematic description of a research topic, and analyze the appropriate literature, then analyze research gaps to take ideas as initial ideas in further research [7]. While primary literature is the result of scientific writing from research activities and then published. through

the results of interviews, theses, dissertations, journals, research reports, and so on [8]. In this study, we adopted the process flow used by Petersen et al [9], refer Figure 1.

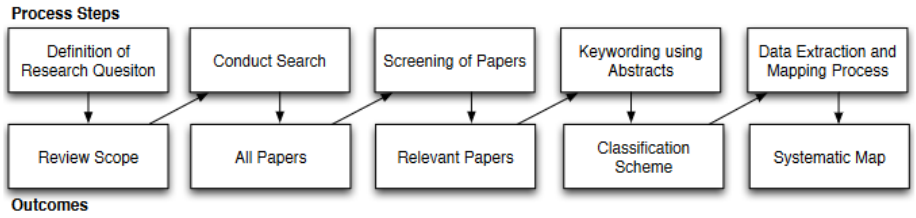

Figure 1: The Systematic Mapping Process (Petersen et al, 2008) [9].

3. Result and discussion

Definition of research question, and Review scope, the first step taken is to make a research question, this stage is carried out to express explicitly what you want to know from this research, so that you can determine the research objectives and appropriate research methods. The research question is "How the use of 360^0 media in supporting learning media in education?". Thus the purpose of this research is to find out what the 360^0 media has been used for in supporting learning in education. In order for this research to remain focused on the initial objectives, a review scope was also determined, this step was to make the boundaries of the object to be studied. Therefore, we limit the problem only to the use and results of using 360^0 media in learning in the world of education.

Conduct search, and all papers, then start doing a literature search in the form of papers (books, journals, proceedings), using the Scopus website tools (www.scopus.com), for keywords search is "360+ learning AND media", that published in the last five years, that is between 2019 and 2023, from all subject areas, and all document types, so that 179 papers were found. Screening of papers, and relevant papers, from the total papers found (N=179), then screening is carried out again by only taking papers that are truly relevant to the purpose and scope of the research by analyzing the titles of these papers, so that 28 papers are obtained. whose title really fits. Keywords using abstract, classification schema, paper filtering is carried out again in more depth than the 28 papers selected based on the title, by reading the abstract, so that in the end there are only 20 papers that are truly appropriate to the research topic.

Screening of papers, and relevant papers, from the total papers found (N=179), then screening is carried out again by only taking papers that are truly relevant to the purpose

and scope of the research by analyzing the titles of these papers, so that 28 papers are obtained. Whose title is very suitable and relevant for this research.

Keywords using abstract, classification schema, paper filtering is carried out again in more depth than the 28 papers selected based on the title, by reading the abstract, so that in the end there are only 20 papers that are truly appropriate to the research topic. As shown in the classification scheme table 1 below.

Table 1: Classification scheme of review paper results.

360^0 media /author	**Field Utilization of media**	**Results**
3D models / Tak et al, 2023 [23]	Periodontal instrument surgery learning media (dentistry)	Highly recommended for used
Video / Rosendahl and Wagner, 2023	Interdisciplinary teaching and learning process	Able to increase motivation and interest in learning
Video / Rosendahl et al, 2022	Reflective and observational training in taekwondo martial arts	Very suitable for use because the user can imitate the movement
Video / Kong et al, 2022	VR tutorial on using 3D printers (Additive Manufacturing) for students	Improve students' ability in operating 3D printers
Applikasi Desktop virtual reality (DVR) / Albus and Seufert, 2022 [10]	Measuring the effect of the signal in the 360˚ desktop virtual reality (DVR) learning method on learning outcomes and cognitive load.	Students who receive a signal in the 360˚ DVR achieve significantly higher memory and comprehension scores than students who do not receive a signal
Applikasi / Lee, 2022 [11]	Assess the learning needs of mobile journalists and students' experiences with developing their digital skills with smartphones.	Journalists desperately need 360 media to write better news and stories for mobile audiences.
Model 3D / Daling et al, 2022[12]	Measures the degree to which mixed reality technology integration is suitable for remote teaching	Further enhance students' understanding of the theory presented compared to traditional teaching methods
Applikasi / Putra et al, 2022[13]	M-VFTs application based on 360^0 autostereoscopic and geospatial technology for Geography learning	Able to help students learn actively, independently and meaningfully through observation and exploration activities
Video / Tsai et al, 2021[15]	Use of VR and Visual intelligence for an action-aware offensive decision-making training system in basketball	Able to influence training in terms of decision-making time in basketball
Model 3D / Foehrder et al, 2021[5]	Make recommendations to propose a conceptual framework in the production of a 360˚ Virtual Forest Tour (VFT) to be used to complement a forest management field course	Proving that VFT 360^0 has quite a lot of advantages when used for forestry education in an academic context
Video / Khodaei et al, 2021[14]	Introducing design specifications, and technical tutorials (concept, design, and building tool development) to support teachers in preparing for virtual visits based on 360^0 video images	Highly recommended for used in the future
Model 3D / Wolf et al, 2021[6]	Exploratory study of the 360^0 model and tutorial of an innovative wastewater treatment system named P-Bank, for further development and research	Contribute to building effective learning tools in environmental engineering education

TABLE 1: Continued.

360^0 media /author	Field Utilization of media	Results
Video / Speidel et al, 2021 [2]	Conduct tests to measure how important individual digital teaching elements will be in the future	Video-based teaching elements are considered more important for future teaching. When compared to VR, AR, and 360˚ video
Video / Alamaki et al, 2021[16]	Testing students' affective responses to two-dimensional (2D) and 360˚ videos experienced with or without inexpensive virtual reality (VR) headsets	Using a low-cost VR headset detracts from a positive user experience, but it is better than 2D video
Model 3D / Bak et al, 2021[17]	Developed educational VR content for students with disabilities so they can communicate using their eyes	VR content that is designed with an eye blink system to select navigation buttons is suitable for application to students with severe disabilities
Video / Hebbel Seeger et al, 2021[18]	Comparing students' learning ability, between immersive technology (360 degree video on Head Mounted Display/VR headset) with classic LectureCast technology (16:9 video via Desktop)	The immersive media format alone does not increase students' attention to learning, therefore it needs further modification
Video / Figueiredo et al, 2021[19]	Analyzing VR applications and their relationship with education to propose the adoption of this technology in the classroom as a social innovation experiment with teachers	Recommendations for educators and schools to adopt a VR approach to be used as an educational media
Video / Arrasyid et al, 2020[20]	Conduct analysis, design, and implementation of the development of tourism education learning media applications	Based on the results of usability testing, the application is considered user friendly and ready to be implemented
Model 3D / Harrington, 2020 [21]	Analyzing immersive augmented reality (AR) and virtual reality (VR) for informal learning research	Both of these media can use accurate content and attractive designs, to convey past, present and future information
Video / Hallberg et al, 2020 [22]	Quantitative study of a quasi-experimental design to compare the learning outcomes of 360˚ VLE and the traditional (face to face) group	There is no difference in learning outcomes between traditional and 360˚ methods, VR helps to focus more on delivering demonstrations, but face-to-face has more interaction

Data extraction and mapping process, and systematic map, the 360^0 media used was made in the following formats: Video: 11, 3D model: 6, Application/DVR: 3. Utilization of learning media in the fields of: Medicine: 1, interdisciplinary: 9, sports: 2 , forestry:1, tourism: 1, geography: 1, tutorials: 3, persons with disabilities:1. And journalists:1. Result: Recommended for use because it has positive analytical results: 16, and not recommended for use, because of negative analysis results: 4

4. CONCLUSION

Results analysis of the literature review, it shows that the use of media can be in the form of video, 3D models, and applications. The most widely used in education is 360o media with video formats (N=11/20x100=55%), then 3D models (N= 6/20x100=30%), and application (N=3/20x100=15%). For utilization is most widely used in interdisciplinary fields (N=9/20x100=45%), followed by tutorials (N=3/20x100=15%), sports (N=2/20x100=10%), and with the number of uses the same amount in medicine (N=1/20x100=5%), forestry (N=1/20x100=5%), tourism (N=1/20x100=5%), geography (N=1/20x100=5 %), persons with disabilities (N=1/20x100=5%), and journalists (N=1/20x100=5%). Parameter results of media utilization 360^0 show that most of research results stated 360^0 media is very useful and recommended for use in the education field (N = 16/20 x 100 = 80%), while only a small number stated that this media was not better than face-to-face learning (N=4/20 x 100 = 20%). Therefore it can be concluded that systematically mapping from literary sources shows that the use of 360^0 media (video, 3D modeling, and applications) provides benefits to the learning experience for students in learning something, student understanding and encouragement to learn more will be very effective.

References

[1] Rosendahl PW. 360° videos in education – A systematic literature review on application areas and future potentials. Educ Inf Technol. 2023.

[2] Speidel R, Angermaier S, Junger K, Gill-Khan C, Wößner Ö. Did video kill the XR star? Digital trends in medical education before and after the COVID-19 outbreak from the perspective of students and lecturers from the faculty of medicine at the University of Ulm. GMS J Med Educ. 2021.

[3] Rosendahl PW, Kuhnt M, Wingert I. Immersive training for movement sequences: The use of 360° video technology to provide poomsae training in Taekwondo. J Phys Educ Sport. 2022;22(10):2318-2325.

[4] Kong X, Franklin A, Watson DB, Wang HG, Krizan K. Work-in-Progress: Developing an interactive, immersive, 360-degree virtual media for enhancing student learning in additive manufacturing. 2022 Aug 23.

[5] Foehrder T, Jäkel-Paetzold M, Scheuerlein P. Advantages of 360° virtual forest tours to supplement academic forestry education. GI_Forum. 2021.

[6] Wolf M, Schmid H, Faltin W, Scheuerlein S. Exploratory study of a 360-degree model in environmental engineering education. Proc Eur Conf e-Learn ECEL. 2021.

[7] Salama M, Becker R, Bobbert B. Managing trade-offs in self-adaptive software architectures: A systematic mapping study. In: Managing Trade-Offs in Adaptable Software Architectures.

[8] Mitra S, Wiegner E. Introducing undergraduates to primary research literature. J Chem Educ. 2021.

[9] Petersen K, Feldt R, Mujtaba S, Mattsson M. Systematic mapping studies in software engineering. Proc 12th Int Conf Eval Assess Softw Eng. 2008.

[10] Albus P, Schwind S. Signaling in 360° desktop virtual reality influences learning outcome and cognitive load. Front Educ. 2022.

[11] Lee YM. Digital skills of mobile journalists: Exploring learning needs and learner experiences of just-in-time learning with smartphones. Journalism Mass Commun Educ. 2022.

[12] Daling LM, Kohno S, Khadra D, et al. Evaluation of mixed reality technologies in remote teaching. Lect Notes Comput Sci (Incl Subser Lect Notes Artif Intell Lect Notes Bioinformatics). 2022.

[13] Putra AK, Putra IMN, Nugraha HW, Rahmadhani FM. Development of mobile virtual field trips in Ijen Crater geosites based on 360° autostereoscopic and geospatial technology as geography learning media. Geoj Tour Geosites. 2022:456-463.

[14] Khodaei S, Arjangi AA, Dini L, Ikpeazu II. A 360-VR authoring tool for engineering teachers preparing virtual excursions for mining engineering education courses. SEFI 49th Annu Conf Blend Learn Eng Educ Challenging Enlightening Lasting. 2021.

[15] Tsai WL, Lee SW, Kuo TY, Tseng TY, Huang MC. Feasibility study on using AI and VR for decision-making training of basketball players. IEEE Trans Learn Technol.

[16] Alamäki A, Dean A, Smith J, Corbett R. Students' experiences of 2D and 360° videos with or without a low-cost VR headset: An experimental study in higher education. J Inf Technol Educ. 2021.

[17] Bak S, Lee SA, Noh Y, Choi SW. Development and exploration of the applicability of virtual reality content for scientific experience activities using the eyes for students with severe disabilities. Korean J Phys Mult Health Disabil. 2021.

[18] Hebbel-Seeger BA, Pape R, Köhler A, Barthel M. Lecturecast as 360 degree video: What impact do immersion and presence experience have on learning performance? Athens J Educ. 2021.

[19] Figueiredo M, Ribeiro M, Kerren A. Virtual reality as an educational tool for elementary school. Smart Innov Syst Technol. 2021.

[20] Arrasyid R, Rosidi M, Umi CU, Hidayat DR. Design, development, and evaluation of a mobile learning application for tourism education. J Eng Sci Technol. 2020.

[21] Harrington M. Augmented and virtual reality application design for immersive learning research using virtual nature: Making knowledge beautiful and accessible with information fidelity. SIGGRAPH Spec Interest Group Comput Graph Interact Tech Conf Talks. 2020.

[22] Hallberg S, Lantz H. Experiences and outcomes of craft skill learning with a 360° virtual learning environment and a head-mounted display. Heliyon. 2020.

[23] Tak NY, Lee HJ, Lee DS, Huh YS, Jang IH. Effect of self-learning media based on 360° virtual reality for learning periodontal instrument skills. Eur J Dent Educ. 2023;27(1):1-8.