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A Training on Designing 3D-Based on Instructional Media to Enhance Elementary Student Motivation

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Abstract

Elementary school teachers often struggle with integrating 3D-based instructional media due to limited digital skills, hindering efforts to enhance student motivation through innovative learning tools. While 3D media like Assemblr EDU enhances student engagement, prior research has largely ignored the need for teacher training in utilizing such media effectively. This study evaluated the impact of a structured training program on teachers' competencies in developing 3D instructional media, with the ASSURE model serving as a guide for teachers to select and create appropriate media during the training. Employing a qualitative descriptive approach, data from 40 elementary teachers were gathered through observations, interviews, and feedback forms. Findings showed significant improvements in digital skills, with 75% completing 3D media projects and over 50% ready to implement them in classrooms. This training effectively bridged digital gaps and fostered pedagogical innovation, underscoring the importance of structured professional development for transforming learning practices and motivating students. Advanced training and continuous support are recommended for sustained technology integration.

Keywords: *Assemblr EDU, 3D-Based Learning Media, ASSURE Model, Teacher Training, Integrated Project-Based Learning.*

INTRODUCTION

Technology integration into education has become an urgent necessity in the digital era, particularly in creating engaging and interactive learning experiences for elementary school students. While 3D-based instructional media offers significant potential to enhance student motivation, many educators face challenges due to limited digital competencies. According to UNESCO & SEAMEO (2023), although Southeast Asia has experienced rapid growth in digital technology adoption across various sectors, including education, it is still too early to claim that technology has fully transformed education, as challenges related to teacher readiness and equitable access remain prevalent. Nearly one-third of primary school teachers in the region reported feeling ‘not very’ or ‘not at all’ confident in using information and communication technology (ICT) in the classroom, highlighting the need for targeted training and support (UNESCO & SEAMEO, 2023). Furthermore, this Global Education Monitoring Report noted that 34% of primary school teachers in Southeast Asia had not received any ICT training, with considerable variations across countries, underscoring the need for comprehensive training programs. Gottschalk (2022) emphasized that ensuring teachers are capable and willing to integrate digital tools into their learning practices is essential for providing engaging learning experiences for students. However, Mezza (2022) also highlighted that many teachers, particularly older ones, face barriers to effectively utilizing digital tools, demonstrating a pressing need for continuous training and support as digital technologies evolve.

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3D media, particularly augmented reality platforms such as Assemblr EDU, has been proven to significantly enhance student motivation and learning outcomes (Bhagat et al., 2021; Rizqiyah et al., 2024). However, most studies have focused primarily on the direct impact of media on students, while teacher training in 3D media design remains underexplored (Marrahí-Gómez & Belda-Medina, 2022). Teacher digital competency plays a critical role in the successful integration of technology into education, which heavily depends on teachers' self-efficacy and their perceived utility of educational technologies (Backfisch et al., 2021).

Training in technology use, including augmented reality media, not only enhances instructional quality but also boosts student motivation and broadens their skill sets (Akram et al., 2022). Assemblr EDU, as a modern platform, enables the design of creative and innovative learning experiences through dynamic 3D formats and audiovisual elements (Anjali et al., 2024), which has been shown to improve students' scientific literacy and foster 21st-century skills (Febriyani et al., 2024). Previous research highlights the need to optimize technology adoption in teacher training through more targeted strategies, such as online-based training and innovative digital learning aids (Asfahani et al., 2024).

Developing digital competencies is essential for fostering innovative learning practices (Teo et al., 2021). Countries that successfully leverage technology in teacher education enhance teachers' digital skills and the relevance of learning, offering valuable insights for other educational systems (Asfahani et al., 2024). Therefore, this study addresses the gap by focusing on intensive teacher training in 3D media design using Assemblr EDU, employing blended learning and project-based learning approaches to empower teachers and support a more inclusive and technology-driven educational transformation.

The 3D-based instructional media design training supports previous research by emphasizing the importance of enhancing teachers' competencies in educational technology, addressing the challenge of limited digital skills among elementary school teachers through a strategic approach to integrating 3D media into learning practices. In this training, the ASSURE model, developed by Heinich, Molenda, and Russel (1982), was utilized by participating teachers specifically to select and develop appropriate 3D instructional media rather than for designing or evaluating the training itself. This model ensures the effective use of instructional media through six systematic steps: analyzing learner characteristics, stating learning objectives, selecting or designing materials, utilizing materials, engaging students actively, and conducting summative evaluation (Mansur & Utama, 2021). Teachers were guided to develop 3D-based instructional media tailored to students' needs, boosting their confidence in using technology and integrating 3D media effectively into the learning process.

Findings indicate that teachers felt the training significantly improved their digital skills and provided concrete strategies for integrating technology, particularly 3D media, which enhanced student motivation. As highlighted by Santos & Castro (2021), possessing technological knowledge alone is insufficient; structured training programs that emphasize pedagogical integration of technology are essential for effective instruction. Bereczki & Kárpáti (2021) noted that training programs are most effective when systematically designed to target specific cognitive skills, foster creative attitudes, involve realistic tasks, and promote peer collaboration. Expert teachers in this study valued six key technology-enhanced strategies for enhancing creativity across curricula, including idea development, digital product creation, and the facilitation of creative student outcomes.

Timotheou et al. (2023) stressed that teachers' readiness to adopt technological tools depends not only on training but also on their willingness and self-efficacy. Supporting informal learning, encouraging teacher collaboration, and facilitating participation in digital professional networks are critical to strengthening skills and sharing best practices. Additionally, Alqudah et al. (2023) emphasized that the ASSURE model focuses on analyzing learners' educational needs to develop instructional methods, with six essential

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steps for designing effective instructional media. In this study, the ASSURE model was used by teachers as a framework to select and develop 3D instructional media, ensuring that the chosen media met students' needs and enhanced their learning experience. Mansur & Utama (2021) further affirmed that appropriate instructional media, selected and planned using the ASSURE model, enhances the effectiveness, efficiency, and meaningfulness of the learning process.

The urgency of this research arises from the growing demand for innovative teaching methods that align with 21st-century skills. A preliminary needs analysis conducted at SDN Lidah Kulon 1 and SDN Lakarsantri 3 revealed that while teachers demonstrated high intrinsic motivation to learn and develop new skills, they lacked experience and knowledge in 3D design applications such as Assemblr EDU. Furthermore, most teachers were unfamiliar with the software and hardware required to support this technology. Therefore, this training was designed to bridge that gap by providing structured learning and hands-on practice, equipping teachers with essential digital skills to enhance the quality of student learning through 3D technology.

This article supports the stance that effective teacher training in 3D media design is crucial for enhancing student motivation. It contributes to existing literature by highlighting the significance of professional development in educational technology and offers practical insights for future training programs. The objective of this article is to present the impact of the training program on teacher competency and elementary student motivation, showcasing the potential of 3D-based instructional media in modern education.

METHOD

This study employed a qualitative descriptive approach using a needs analysis method to identify teachers' needs for 3D-based instructional media design training and to analyze the outcomes based on observational data and participant feedback. The subjects were teachers from SDN Lidah Kulon 1 and SDN Lakarsantri 3, selected through purposive sampling due to their high motivation to learn technology despite having limited experience and skills in using 3D media.

Data collection involved semi-structured interviews to explore teachers' motivations, challenges, and expectations, direct observation during the training to document processes, participation, and technical difficulties encountered by participants, as well as questionnaires and feedback forms completed by participants post-training. Research instruments included interview guides, observation sheets, and needs analysis and evaluation questionnaires.

Data analysis followed the Miles and Huberman model, which involved data reduction by selecting and summarizing information from interviews, observations, and feedback; data display in a narrative description; and conclusion drawing to provide insights into teachers' needs, the effectiveness of the training, and recommendations for enhancing digital skills in elementary education settings. This study provided a comprehensive overview of teachers' needs for 3D media training, training effectiveness in improving teachers' digital competencies, and their readiness to implement 3D media in classroom instruction.

RESULTS AND DISCUSSION

This 3D-based instructional media design training was attended by 40 teachers from SDN Lidah Kulon 1 and SDN Lakarsantri 3, consisting of classroom teachers and subject teachers, including those teaching Science, Physical Education, Religion, and English. These schools were selected due to their ongoing development of interactive instructional media programs aimed at enhancing thematic learning effectiveness. Out of the 40 registered participants, 37 teachers attended the training, while 3 were absent. Each participant possessed basic digital skills and was equipped with laptops and Android devices with version 8.1 or higher.

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Pre-Questionnaire Results

The pre-questionnaire results revealed that most participants had no prior experience in developing 3D-based instructional media. Although some teachers had previously created dioramas, and models, or used concrete objects in their teaching, the majority admitted to having no experience with 3D media development. Only a few had prior exposure, such as creating short instructional videos or attending brief training sessions on augmented reality tools like Zappar.

Participants expressed high expectations from this training, with most hoping to gain new knowledge and skills in developing 3D instructional media. Teachers anticipated that the training would enhance their creativity, enrich their teaching experience, and enable them to implement 3D media effectively in their classrooms. Some participants also hoped to use 3D media to make lessons more engaging, increase student interest, and improve comprehension, particularly in Physical Education and English.

The pre-questionnaire results highlighted the urgent need for this training, not only to improve teachers' technical skills but also to equip them with pedagogical strategies for integrating 3D technology into their teaching practices. The participants' enthusiasm and high expectations serve as key indicators that this training is expected to significantly contribute to enhancing teacher competencies and the quality of elementary education.

Training Implementation

The Creative Strategies: Designing 3D-Based Instructional Media to Enhance Elementary Student Motivation training was conducted according to the pre-established plan, utilizing the Project-Based Learning (PjBL) model with a Blended Learning approach. The independent learning phase began three days prior to the face-to-face session, where participants received pre-training modules via a WhatsApp group. These modules provided step-by-step instructions for installing and exploring basic features of Assemblr EDU, including creating new projects, adding 3D objects, and using templates. While most participants completed this phase independently, some faced technical difficulties that were resolved during the face-to-face session.

The face-to-face session was held at SDN Lidah Kulon 1 Surabaya. It commenced with an inspirational video on 3D media-based learning, followed by small group discussions on how 3D media can enhance student motivation and the challenges of its implementation in classrooms. The theoretical content covered included an introduction to digital 3D media, types of 3D media, implementation in teaching, media selection procedures using the ASSURE model, and meaningful learning strategies. Participants then developed 3D media project plans based on their teaching materials, guided by instructors through provided templates.

The process of creating 3D media using Assemblr EDU was closely monitored, and participants received feedback on their initial projects based on creativity, relevance, and technical quality. All participants successfully completed 3D media projects relevant to their instructional materials, though some expressed the need for additional time and proposed advanced follow-up training. Challenges encountered during the training, such as technical difficulties in operating the application and temporary internet instability, were addressed through additional demonstrations by instructors and guidance for working offline.

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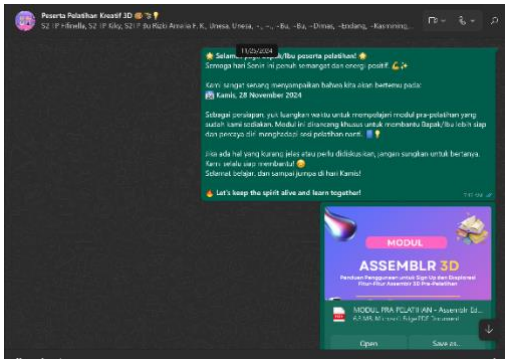

Figure 1. Asynchronous Discussion via WhatsApp, Participants Study Pre-Training Modules

Figure 2. Implementation of Face to Face Training Sessions

Figure 3. Participant's 3D Media Work for the "Penyerbukan Tanaman" Material

Post-Questionnaire Results

The evaluation of training indicated positive responses from participants across various aspects of the program. According to the post-training questionnaire, 75% of participants successfully completed their 3D media projects, while 25% were still in the process of completion, with no participants failing to initiate their projects. Participant satisfaction was notably high, with 77.4% expressing that they were very satisfied and 22.6% indicating they were satisfied with the training.

The training materials were considered highly relevant by 75% of participants, while 25% found them relevant to their needs as educators. In terms of duration, 56.3% of participants felt that the training duration was adequate, although 12.5% believed it was insufficient, highlighting an area for improvement in future programs. The clarity of the instructor's delivery was well received, with 75% rating it as very clear and 25% as clear.

The training significantly enhanced participants' understanding of Assemblr EDU, with 81.3% stating that it greatly helped them comprehend the application, and 18.8% noting it was helpful. Confidence levels in creating 3D media improved, with 50% feeling very confident, 43.8% confident, and 6.3% moderately confident. Participants' readiness to implement 3D media in their classrooms was also promising, with 53.1% expressing readiness to try 3D designs soon and 46.9% indicating they needed further practice, while none felt unprepared or found 3D media irrelevant.

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Table 1. Post-Questionnaire Results

Aspects	Scales			
	1 (Less)	2 (Enough)	3 (Good)	4 (Very Good)
Completion			25%	75%
Satisfaction			22.6%	77.4%
Materials			25%	75%
Duration	12.5%	31.3%	56.3%	
Instructors			25%	75%
Comprehension			18,8%	81,3%
Confidence to implement		6,3%	43,8%	50%
Readiness to implement		46,9%	53,1%	

Participants highlighted that the most engaging aspects of the training were gaining new knowledge on 3D instructional technology, experiencing their first attempt at developing digital 3D media, and working with materials highly relevant to modern educational needs. The instructor's patience and the innovative content were also praised. Many participants felt inspired to explore educational technology further and hoped to apply their newly acquired skills in their teaching practices to enhance student learning experiences.

Suggestions for improving the training included requests for advanced-level training, extending the duration, and organizing continuous training programs. Some participants proposed starting sessions earlier to allow more time for hands-on exploration, while others expressed their desire for Universitas Negeri Surabaya to host more similar activities in the future.

The evaluation results demonstrated that the training successfully enhanced teachers' skills in utilizing Assemblr EDU to design 3D instructional media. The positive responses and enthusiasm from participants reflect the relevance and effectiveness of the training, underscoring the need for continuous support in teachers' professional development, particularly in integrating technology into classroom practices.

Skills Gap Before and After Training

Before participating in the training, most teachers involved had little to no experience in developing 3D-based instructional media. Some teachers were only familiar with using simple media such as dioramas and models, while their skills were still limited to conventional instructional media. Only a few participants had attempted to use augmented reality applications, but these efforts were not sustained due to technical challenges and costs. After completing the training, there was a significant improvement in teachers' skills, particularly in operating Assemblr EDU to produce 3D media relevant to their instructional materials. A total of 75% of participants successfully completed their 3D media projects during the training, and more than 50% expressed readiness to implement them in classroom teaching in the near future. This improvement reflects a clear transformation from basic skills to proficiency in 3D application, both in technical and pedagogical aspects.

This improvement is supported by previous studies indicating that in-service teacher training is designed to enhance teachers' knowledge, skills, and professional approaches comprehensively (Ahmed et al., 2021). Such training has been shown to have a positive impact on teachers' attitudes, performance, and motivation, despite the challenges they face in implementing new skills in the classroom (Nawab, 2017, as cited in Ahmed et al., 2021). Systematic and continuous in-service training is recognized as an effective method for

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improving teachers' competence and delivering quality education to students (Jahangir et al., 2012, as cited in Ahmed et al., 2021).

Continuous professional development plays a critical role in fostering innovation skills among teachers, enhancing their confidence, and motivating them to teach more effectively using technology in their classrooms (Saleem et al., 2021). A well-planned and sustained professional development process not only strengthens teachers' competencies but also ensures that the training provided aligns with their needs, thereby improving the effectiveness of technology integration in teaching. Training through instructional technology further supports teachers in their professional growth and enhances their motivation to adopt new teaching strategies (Bhutto, 2018, as cited in Ahmed et al., 2021).

The improvement in teachers' skills from this training aligns with findings that highlight how training programs, supported by adequate resources, help teachers transform their lesson preparation and delivery methods. Teachers reported becoming more flexible, creative, and capable of using multiple approaches to present content to students, thereby creating more engaging and effective learning experiences (Boice et al., 2021). Thus, this training successfully addressed the digital skills gap among teachers and contributed to the ongoing transformation of technology-based education.

The Effectiveness of Blended Project-Based Learning in Training

The training utilized a Project-Based Learning (PjBL) model integrated with Blended Learning, combining asynchronous self-directed learning through pre-training modules and face-to-face sessions for hands-on practice. Although active participation was not observed during the asynchronous sessions, participants exhibited notable enthusiasm during face-to-face meetings. This approach allowed participants to explore 3D media technology in depth, produce relevant instructional media, and enhance their technical skills and understanding (Hujjatusnaini et al., 2022). The training evaluation indicated increased confidence and motivation among participants in implementing 3D media, affirming the effectiveness of this project-based and blended learning approach (Kamaraj et al., 2021).

The participants' engagement during face-to-face sessions highlighted the model's capability to provide meaningful learning experiences despite limited interaction in asynchronous settings. Blended learning effectively addressed time and resource limitations by enabling participants to access materials independently and discuss them during in-person sessions, ultimately boosting their confidence and motivation to apply newly acquired skills (Sumarni et al., 2021).

Research highlights that BPBL improves participation, fosters a positive learning attitude, and enhances instructional material quality (Arianto et al., 2021). Additionally, integrating e-learning within blended learning provides direct feedback, boosting engagement and learner independence.

Compared to conventional strategies, BPBL yields better learning outcomes by allowing students to reflect on their learning process and present final projects (Mursid et al., 2022). The combination of PjBL with blended learning enhances student engagement and participation through a structured, student-centered approach (Li & Zhu, 2023).

Moreover, BPBL is linked to improved self-efficacy, perceived usefulness, and motivation (Alamri, 2021). By fostering knowledge sharing and collaboration, BPBL enhances academic achievement and prepares learners for real-world applications. These findings underscore its effectiveness in both education and professional training.

Application of ASSURE Model in 3D Media Design

The 3D instructional media development training adopted the ASSURE model as a structured guide for selecting and utilizing media effectively. Comprising six stages, they are analyzing learners, stating objectives, selecting methods and media, utilizing media, requiring learner participation, and evaluating outcomes. The ASSURE model was consistently applied throughout the design process using the Assemblr EDU platform.

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Presentation materials for face-to-face sessions also included theoretical insights on 3D media and the ASSURE model, enriching participants' understanding of these essential concepts.

(Waskito et al., 2024) highlighted how the ASSURE model supports the development of augmented reality-based instructional media, integrating e-modules, educational videos, 3D object animations, and interactive panels. This application parallels the design of 3D media in this training, offering a structured approach to visualizing abstract concepts through Assemblr EDU. Khasanah et al. (2024) demonstrated the effectiveness of the ASSURE model in developing video-based learning media for STEAM-based mathematics education. While their focus was video media, the principles of media selection and utilization inherent in the ASSURE model remain directly relevant to 3D media design.

Choi et al. (2022) described the ASSURE model as a comprehensive framework for educators, providing clear guidelines for developing digital technology-based lesson plans. Emphasizing the role of educational media, teaching aids, and instructional materials, their findings align with the use of Assemblr EDU for 3D instructional media development. Firman et al. (2023) the importance of the ASSURE model in integrating digital media into instructional design, including its adaptation within the ADDIE framework. This highlights the model's versatility in supporting various forms of technology-based instructional media, particularly 3D design.

Drawing from these studies, the ASSURE model's application in this training has proven instrumental in helping teachers design effective 3D instructional media that meet learners' needs and enhance the quality of teaching in the digital era.

Training Limitations

Several limitations were identified during the training program, which may influence its overall effectiveness and highlight areas for future improvement. One significant challenge was the digital competency gap among participants. Most teachers had limited or no prior experience with 3D design applications such as Assemblr EDU, necessitating additional time for basic technical training before progressing to more advanced tasks. Time constraints also posed a challenge, as the duration of the training was insufficient for participants to fully explore Assemblr EDU's features and complete their 3D media projects at an optimal level. This limitation impacted the depth of both theoretical understanding and practical application.

Participants encountered technical difficulties during the training, including navigating the Assemblr EDU interface, adding 3D objects, and managing software-related issues. Although these challenges were addressed through additional demonstrations, they occasionally disrupted the training flow. Lastly, there was a clear demand for advanced training sessions. Many participants expressed interest in more in-depth workshops to refine their skills and explore complex 3D media design applications, highlighting the need for ongoing professional development.

CONCLUSION

The training on designing 3D-based instructional media using Assemblr EDU has demonstrated significant improvements in teachers' digital competencies, particularly in integrating 3D media into elementary education. This program addressed the digital skills gap by providing structured learning experiences that enabled participants to explore, design, and implement 3D instructional media effectively. Enhanced teacher motivation and readiness to adopt 3D technology in classrooms were evident, indicating the training's success in fostering technical and pedagogical growth.

The use of the ASSURE model as a systematic instructional design framework played a crucial role in guiding teachers through the media selection, utilization, and evaluation processes. This approach ensured that 3D media developed during the training was pedagogically sound and aligned with students' learning needs. The integration of

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blended and project-based learning further enhanced participants' hands-on experience and collaborative skills, contributing to more engaging and innovative teaching practices.

This study highlights the importance of continuous professional development in educational technology, particularly for elementary school teachers who face challenges in adopting new digital tools. Future training programs should consider extending the training duration, providing ongoing technical support, and offering advanced-level workshops to build on the foundational skills developed in this program. The findings underscore the potential of 3D instructional media to enhance student motivation and learning outcomes, reinforcing the need for sustained investment in teacher training initiatives.

The results of this training contribute to the growing body of literature on technology integration in education, offering practical insights into effective training strategies and the application of 3D media in elementary classrooms. This study also provides practical implications for educational policymakers to design scalable teacher training programs that integrate 3D technology into curricula across various educational contexts. Furthermore, this study offers a novel approach to integrating 3D media in elementary education through structured teacher training, addressing digital competency gaps, and enhancing instructional innovation.

CONFLICT OF INTEREST

The authors affirm that this research was conducted and written with complete integrity, without any conflicts of interest with any individuals or organizations. The study was carried out solely for its intended objectives.

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