Enhancing Teachers' Proficiency in Implementing Augmented Reality Technology as Interactive Learning Media

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Abstrak

Kreativitas merupakan elemen kunci dalam dunia pendidikan, terutama bagi guru dalam menciptakan media pembelajaran yang menarik dan memikat minat siswa untuk memahami materi. Setiap siswa memiliki minat dan antusiasme yang berbeda terhadap media pembelajaran, dan hal ini menjadi kesempatan bagi guru untuk berinovasi dalam menciptakan media pembelajaran yang menarik. Salah satu media pembelajaran yang menawarkan pengalaman unik adalah media berbasis augmented reality (AR), yang memberikan interaksi dan pengalaman audio-visual secara individual. Dalam penelitian ini, kami memanfaatkan platform Assemblr Edu, sebuah media pembelajaran berbasis AR dan VR, dalam workshop pengabdian kepada masyarakat di SMPN 3 Batusangkar, melibatkan partisipasi guru dari MGMP Ilmu Pengetahuan Alam Kabupaten Tanah Datar. Tujuan penelitian ini adalah untuk meningkatkan kreativitas para guru dalam menciptakan media pembelajaran dengan memanfaatkan teknologi augmented reality Assemblr Edu. Melalui metode kuantitatif, kami mengukur tingkat keberhasilan guru dalam menciptakan media pembelajaran interaktif menggunakan platform Assemblr Edu dengan hasil berupa media pembelajaran augmented reality yang dapat diakses melalui smartphone Android. Hasil penelitian menunjukkan bahwa Assemblr Edu dengan teknologi augmented reality terbukti sangat efektif dalam merangsang minat siswa, meningkatkan motivasi belajar, serta membantu siswa dalam memahami materi pelajaran dan mengatasi tugas-tugas dengan lebih efisien.

Keywords: Kreativitas, Educator, Media Pembelajaran, Augmented reality, Interactive learning

Abstract
Creativity is critical in education, especially for teachers in crafting instructional media that captivates and engages students' interest in comprehending the subject matter. Each student possesses distinct interests and enthusiasms towards the instructional press, allowing educators to innovate in devising captivating learning resources. One form of instructional media that offers a unique experience is augmented reality (AR) based media, which delivers individualized audio-visual interactions and experiences. In this research, we harness the Assemblr Edu platform, an AR and VR-based instructional media tool, within a community engagement workshop held at SMPN 3 Batusangkar, involving participation from educators of the Natural Sciences Teachers' Subject Study Group (MGMP IPA) in Tanah Datar Regency. The research aims to enhance the creative aptitude of educators in designing instructional media using the augmented reality technology of Assemblr Edu. Employing a quantitative approach, we gauge the extent of success among educators in crafting interactive instructional media using the Assemblr Edu platform, yielding augmented reality instructional media accessible through Android smartphones. The research findings underscore that Assemblr Edu, integrated with augmented reality technology, remarkably stimulates students' interest, amplifies their learning motivation, and assists them in comprehending subject matter while efficiently tackling assignments.

Keywords: Creativity, Educator, Instructional Media, Augmented Reality, Interactive Learning

1. Introduction

Interactive learning media has become one of the significant innovations in the field of education [1]. Through modern technology, interactive learning media presents educational material engagingly and interactively, inviting active participation from students [2][3]. With the help of animations, videos, images, and other interactive elements, students can engage in the learning process more enjoyably and profoundly. [4]. Interactive learning media can also enhance understanding of concepts, facilitate exploration, and provide instant feedback [5], Enabling students to understand and overcome learning difficulties more effectively [6].

With the sophistication of technology, interactive learning media can be accessed from various devices, enabling more flexible and accessible learning anywhere and anytime [7]. Although interactive learning media offers many benefits, several issues must be addressed. One of the challenges is technology accessibility [8]. Some schools may not have adequate infrastructure to support interactive learning media, making it difficult for students from low-income backgrounds or remote areas to access this learning material [9].

Augmented Reality (AR) technology has revolutionized the world of education [10]. By combining the physical and virtual worlds, AR creates a unique and engaging learning experience for students [11]. With the use of AR, students can experience immersive learning, where they can interact with objects and learning content in a realistic three-dimensional visual format. [12]. For example, in science, students can view three-dimensional models of body organs or planets in the solar system, enabling them to understand better their structure and characteristics [13]. AR technology also allows teachers to provide more precise and captivating explanations, sparking students' interest in learning [14]. In this way, AR brings a new dimension to the learning experience and helps enhance students' absorption of the subject matter [15]. The use of Augmented Reality technology in education also presents challenges that need to be addressed, and one of them is the issue of cost [16]. Implementing AR technology may require specialized devices, such as AR devices, which can be expensive and not affordable for all schools (Perifanou et al., 2023). Creating high-quality AR content relevant to the curriculum also demands adequate resources and expertise [17].

The learning experiences of students and teachers' teaching experiences are closely intertwined in the education process [18]. In the context of interactive learning media and AR technology, students' learning experiences become more vivid and memorable [19]. By actively involving students through interactive media and AR technology, teachers can help create an inspiring learning environment and provide exciting student challenges [20]. Furthermore, teachers' teaching experience is also enhanced with the presence of this modern technology. Teachers can utilize interactive media and AR technology to present educational material more innovatively and effectively [21], Enhancing communication with students and offering more focused feedback. This enables teachers to attain a higher level of efficient and effective teaching, while students directly benefit from a more captivating and in-depth learning experience [22].

When dealing with interactive learning media and AR technology, challenges related to both students' learning experiences and teachers' teaching experiences may arise [23]. Sometimes, an excessive focus on technology can obscure the core learning objectives, and students may become overly captivated by interactive features, making it challenging to grasp the essential content. On the teacher's side, some may encounter difficulties adapting to new technology or lack sufficient training to integrate interactive media and AR technology into their teaching effectively. Overcoming these challenges necessitates a balanced approach that utilizes technology to enhance students' learning experiences while providing teachers with the necessary training and support [24].

The latest trend in global education is prioritizing experiences in the teaching and learning process [25]. The experiential education approach originated from the ideas of John Dewey, who believed that students' experiences should be the primary focus of all teaching and learning activities [26]. This experiential learning method relies on the power of teaching through direct experience and enhances learning by processing subjective experiences. [27] Mihály Csíkszentmihályi refers to it as the 'flow' experience, where we become so immersed in an activity that everything around us becomes less significant; the experience itself becomes delightful, and we want to continue the training for the pleasure it brings. Challenges in completing tasks can also serve as a source of inspiration, and completing these tasks provides students with joy and pride, turning learning into an enjoyable adventure.

Some key points regarding interactive learning using Augmented Reality technology can be drawn to address current issues: 1) Technology Accessibility in Interactive Learning, not all schools have adequate infrastructure; 2) Challenges of Augmented Reality Technology Implementation, cost issues pose a barrier to AR implementation, 3) Balancing Technology and Learning Objectives, in creating a learning media, validation by experts is necessary to ensure that the designed media doesn't deviate from the learning objectives, 4) Teacher Skill Development in Using Technology, human resources are crucial when initiating the use of Augmented Reality technology, with many teachers still in the process of learning to use this technology.

2. Method

In our community service program, we used a quantitative approach to evaluate its effectiveness. Before this, we provided training on enhancing interactive learning media skills with Augmented Reality technology using Assemblr Edu. The community service program lasted for three days, starting from 8 AM until 4 PM local time. The program consisted of three stages. The first stage involved theory delivery on Android-based interactive media, where we provided examples of creating Augmented Reality learning media to understand the structure of the human heart. The second stage included learning about asset management in Assemblr Edu, including transforming media into Augmented Reality applications accessible through Android smartphones. The third stage engaged teachers in practical tasks, where they were asked to create learning media based on their respective subject areas. During this stage, they were guided by the community service team from Padang State University. To assess the training outcomes, we distributed questionnaires to participating teachers. Here is a brief overview of the community service program.
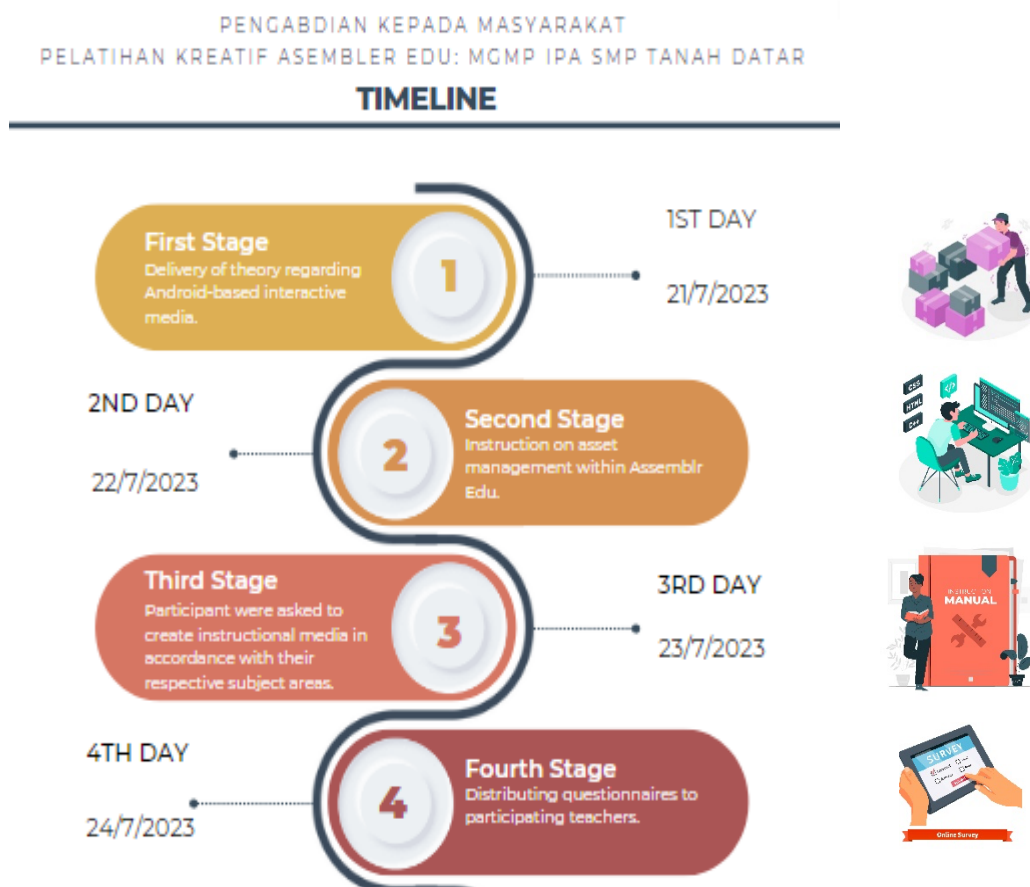

Figure 1. The stages of implementing the community service program
with the Assemblr Edu training MGMP Tanah Datar

The total number of participants in this training is 15 teachers from the Tanah Datar Science Teachers' Working Group (MGMP IPA). The participants are active teachers selected as representatives from 50 teachers in the MGMP IPA. The participants have an age range of 25-50 years. It's worth noting that many senior teachers eagerly volunteered to participate in this community service program.

3. Results And Discussion

This partnership program represents one of the responsibilities of university faculty under the tridharma doctrine, where they share their expertise with the community. We conducted prior observation and data collection of potential partners before the training. Ultimately, we decided to collaborate with the Tanah Datar District's Natural Science Teachers' Working Group (MGMP Ilmu Pengetahuan Alam), which consists of approximately 50 active teachers. Due to limited capacity, the community selected 15 participants for the workshop on interactive smartphone-based learning media utilizing the Assemblr Edu application.

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Figure 2. The Opening Of The Assembly Edu Interactive Learning Media Workshop

On the first day, there was a theoretical introduction to interactive learning media specifically designed for smartphones, particularly Android platforms. During this session, an example of media created using the Assemblr Edu application was presented, focusing on the circulatory system in the human heart. Using 3D objects representing the right and left ventricles and the right and left atria, interactive explanations were provided using a 3D pointer. The heart object also featured animations illustrating heart movements, allowing students to gain a better visual understanding of the circulatory system in the heart.

Figure 3. Assemblr Edu's Workshop

The next step involved evaluating the participants to measure the extent to which the teachers' expectations were met, such as gaining new insights, smoothly following the speakers' instructions, and quickly adapting to using Assemblr Edu media. At the end of the meeting, a final evaluation was conducted to assess how well these expectations were fulfilled. It was observed that the teachers could create engaging AR learning media and had an enjoyable experience of learning through play using Assemblr Edu.

Table 1. Expectations and realization of Assemblr Edu training (on a 5-point scale, N=15)

expectations	Average	SD	Realization	Average	SD	Difference Between the Averages
This training has been beneficial for my classroom learning	3.69	0.48	This training has been beneficial for my classroom learning	3.79	0.41	0.1
I learned this media in a short amount of time	3.31	0.75	I learned this media in a short amount of time	3.10	0.92	-0.2
I gained a lot of new insights	3.62	0.51	I gained a lot of new insights	3.82	0.62	0.2
I will learn more about AR learning media	3.77	0.44	I will learn more about AR learning media	3.87	0.63	0.1
I will frequently use Assemblr Edu	3.23	0.44	I will frequently use Assemblr Edu	3.33	0.77	0.1
I can create engaging AR learning media	3.31	0.48	I can create engaging AR learning media	3.42	0.62	0.11
I listened carefully to the narration from the training speaker	3.69	0.48	I listened carefully to the narration from the training speaker	3.89	0.82	0.2
I could follow the material presented by the speaker	3.62	0.51	I could follow the material presented by the speaker	3.72	0.52	0.1
I played while learning with other fellow teachers	3.15	0.80	I played while learning with other fellow teachers	3.03	0.84	-0.12

The Gap difference can serve as a metric to assess how participants' training expectations align with their experiences. Positive values indicate that the realizations surpass the initial expectations, while negative values suggest that the realizations fall short of expectations. In this context, most statements exhibit positive Gap differences, indicating that training participants generally find the outcomes more satisfactory than anticipated. This observation applies to items in the first, fourth, and seventh rows highlighted in blue, except the second and ninth statements, which reveal negative Gap differences.

A questionnaire survey was conducted to assess this activity's effectiveness further. This survey aimed to explore the environmental factors influencing creativity. The questionnaire was adapted from the 'School Creative Climate Questionnaire' used in a study conducted by Peter Szarka (Kersánszki et al., 2023); this was done based on the similarity of the training characteristics being held.

Table. 2 Results of Teacher Training Effectiveness Questionnaire (7-point scale, N=15)

Questionnaire Items	Average	SD
This training fosters cohesion among teachers.	5.82	1.36
In this training, we had the opportunity to share our thoughts	6.41	0.98

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During the training, the instructors often laughed and enjoyed themselves	2.68	2.17
During the training, the instructors were motivated to learn more enthusiastically	6.67	0.84
I could only do what the instructors taught	6.14	1.14
Could interact as freely as desired	6.40	0.64
In the training, we were able to hone our critical thinking skills in solving each problem	6.28	1.12
The knowledge acquired during the training is not valuable for the real world	3.28	2.23
We always lagged in carrying out practical exercises, leading to rushed completion	6.45	2/57
The instructors continued to provide motivation even though we often made mistakes during the practical exercises	6.48	0.93
During the training, the instructors were always open to receiving ideas from the participants	6.40	0.85
Learning interactive media with Assemblr Edu is relevant to the current needs of students	6.73	0.46

Based on the data, several positive aspects can be identified, including the training's high ratings in facilitating idea sharing, motivation, and fostering critical thinking. However, there are also negative aspects, such as a perceived lack of real-world relevance and challenges with the practical implementation of exercises. It is important to note that the standard deviation (SD) plays a significant role. A high SD indicates substantial variation in participant responses to these statements, while a low SD suggests consistency in participant responses. A high SD may signify significant differences in participant opinions regarding these statements in certain instances.

4. CONCLUSION

Based on the preceding discussion, it becomes evident that teachers who actively created interactive smartphone-based learning materials using Assemblr Edu showed a strong inclination toward implementing these materials in their respective classrooms. In essence, this workshop exceeded the teachers' expectations in broadening their understanding of interactive learning materials. Instructors played a pivotal role in motivating teachers to foster innovation and creativity, aiming to make classroom content more captivating for students. The effectiveness questionnaire presented above portrays predominantly positive teacher responses, nearing a consensus. Several items in the questionnaire exhibited minimal standard deviations (SD), indicating a high degree of consensus among teachers in their responses and limited response variability. Nevertheless, it is imperative to acknowledge that every application has limitations, notably regarding available assets. The constraints associated with asset availability pose a creative challenge for teachers, compelling them to seek alternative investments beyond those offered by the Assembly Edu application. Additionally, the need for a stable internet connection and adequate laptop devices constitutes a considerable challenge for teachers.

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