
Augmented Rality (AR) ang Virtual Reality (VR) Technology Training as Social Studies Learning Media on Disaster Mitigation Materials

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Abstract

Social studies teachers at the junior high school level face problems in the use of innovative digital technologies, especially Augmented Reality (AR) and Virtual Reality (VR). The results of the initial identification show that most teachers in Banjarmasin City do not have adequate skills in using AR/VR, even though this technology can increase student interactivity and motivation to learn on disaster materials. Therefore, this community service activity aims to improve the competence of social studies teachers in integrating AR/VR as a learning medium on the topic of disaster mitigation. The method used is qualitative with a participatory training approach. The activity was held on September 19, 2025 and was attended by 30 social studies teachers who are members of the Banjarmasin City MGMP. Data was obtained through observation, pre-test and post-test, as well as participant evaluation questionnaires. The results showed a significant increase in teacher understanding, with an average pre-test score of 56.3 increasing to 84.7 in the post-test (an increase of 50.4%). As many as 92% of teachers stated that the training was very useful, and 85% of teachers felt ready to apply AR/VR in social studies learning. In addition, participants showed high enthusiasm in the practice of creating simple AR/VR-based media. In conclusion, this training succeeded in increasing digital technology literacy of social studies teachers and was relevant to support disaster mitigation learning. This PkM activity makes a real contribution in strengthening teacher capacity while enriching technology-based interactive learning media.

Keywords: AR/VR, IPS, disaster mitigation, community service

Abstrak

Guru mata pelajaran ilmu sosial di tingkat sekolah menengah pertama menghadapi masalah dalam penggunaan teknologi digital inovatif, terutama Augmented Reality (AR) dan Virtual Reality (VR). Hasil identifikasi awal menunjukkan bahwa sebagian besar guru di Kota Banjarmasin tidak memiliki keterampilan yang memadai dalam menggunakan AR/VR, meskipun teknologi ini dapat meningkatkan interaktivitas dan motivasi belajar siswa pada materi bencana. Oleh karena itu, kegiatan pelayanan masyarakat ini bertujuan untuk meningkatkan kompetensi guru mata pelajaran ilmu sosial dalam mengintegrasikan AR/VR sebagai media pembelajaran pada topik mitigasi bencana. Metode yang digunakan adalah kualitatif dengan pendekatan pelatihan partisipatif. Kegiatan ini dilaksanakan pada tanggal 19 September 2025 dan dihadiri oleh 30 guru mata pelajaran ilmu sosial yang merupakan anggota MGMP Kota Banjarmasin. Data diperoleh melalui observasi, pre-test dan post-test,

serta kuesioner evaluasi peserta. Hasil menunjukkan peningkatan signifikan dalam pemahaman guru, dengan skor pre-test rata-rata 56,3 meningkat menjadi 84,7 pada post-test (peningkatan 50,4%). Sebanyak 92% guru menyatakan bahwa pelatihan ini sangat bermanfaat, dan 85% guru merasa siap menerapkan AR/VR dalam pembelajaran sejarah. Selain itu, peserta menunjukkan antusiasme tinggi dalam praktik pembuatan media berbasis AR/VR yang sederhana. Kesimpulannya, pelatihan ini berhasil meningkatkan literasi teknologi digital guru sejarah dan relevan untuk mendukung pembelajaran mitigasi bencana. Kegiatan PkM ini memberikan kontribusi nyata dalam memperkuat kapasitas guru sekaligus memperkaya media pembelajaran interaktif berbasis teknologi.

Kata kunci: AR/VR, IPS, mitigasi bencana, layanan masyarakat

Preliminary

21st century education is characterized by a change in learning paradigm that emphasizes the mastery of critical, collaborative, creative thinking skills, and the use of digital technology. In this context, teachers no longer only play the role of material presenters, but also facilitators who are able to provide an interactive and meaningful learning experience for students. One of the innovations that is now growing rapidly is the use of *Augmented Reality* (AR) and *Virtual Reality* (VR) technology. AR brings virtual objects into the real world, while VR takes users into the world of digital simulation. Both offer great opportunities to make learning more engaging, interactive, and applicative (Rahmaniah et al., 2025).

In the subject of Social Sciences (Social Studies), the application of AR/VR is very relevant because social studies discusses social, cultural, and environmental phenomena that are closely related to real life. Through AR/VR, students can visualize phenomena that are difficult to present in class, such as the process of natural disasters, mitigation strategies, or simulations of the social conditions of affected communities (Yuliyanti et al., n.d.). The phenomenon of disasters itself is a strategic issue in social studies learning, especially in Indonesia, which is a disaster-prone country (Rahmia, 2025). South Kalimantan, including the city of Banjarmasin, often faces the threat of floods, forest fires, and other environmental disasters. Therefore, disaster literacy is an important part that must be taught to students from an early age (Hapsah, n.d.).

However, the reality in the field shows that the use of AR/VR technology in social studies learning is still minimal. The results of an initial survey of junior high school social studies teachers in Banjarmasin City show that more than 80% of teachers have never used AR/VR in the learning process. Limited competence, lack of training, and lack of facilities are the causes of the low adoption of this technology (Handy et al., 2025). In fact, research shows that AR/VR has great potential to improve the quality of learning (Khadijah et al., n.d.). For example, the following research proves that AR can help students better understand spatial concepts in geography, while also increasing their motivation to learn (Keya et al., 2025; Yusa et al., 2023). Other studies confirm the effectiveness of VR in disaster mitigation learning. Through digital simulations, students can safely experience disaster situations, thus gaining a deeper understanding of self-rescue procedures and preparedness (Arisanty et al., 2018; Sahronih et al., 2024; Syarifuddin, Anjarwati, et al., 2022).

The following research also identifies that the low utilization of AR/VR in schools is due to the limited competence of teachers and the lack of practice-based training (Rohman et al., 2025). This indicates the need for interventions that focus on increasing teacher capacity through mentoring or training programs. Furthermore, this study shows that digital technology-based training has been proven to be able to increase teachers' technology literacy while encouraging their creativity in developing innovative learning media (Ruzakki et al., 2024). Thus, AR/VR training can be a solution to bridge the teacher competency gap (Sari et al., 2025).

Recent research emphasizes that the integration of AR/VR in social studies education is still very limited, even though it has great potential in presenting *experiential learning* (Syarifuddin, Aisyah, et al., 2022; Wibowo, 2025). This means that there is room for novelty to carry out service programs that focus on developing the capacity of social studies teachers in utilizing AR/VR. Based on these various studies, it can be seen that although AR/VR has been researched in various fields of education, its implementation in social studies learning based on disaster mitigation through community service has not been widely done. Therefore, this activity has a novelty value by placing social studies teachers as the main target as well as partners in the technology transfer process (Mutiani et al., 2025).

Another novelty lies in the selection of the disaster mitigation context. This topic is not only relevant to the needs of the social studies curriculum, but also very contextual for the people of South Kalimantan who face disaster threats on a regular basis (Syahrudin et al., 2025). By integrating AR/VR, teachers can present disaster learning in a more concrete and interactive way. In addition, this activity is designed not only as a knowledge transfer, but also based on hands-on practice. Teachers are involved in simulating the use of AR/VR, simple media making practices, and reflective discussions to foster readiness and courage to integrate technology in learning (Ilhami & Handy, 2025).

Method

This community service activity uses a qualitative approach with a participatory model. Social studies teachers as partners in activities not only play the role of participants, but are also actively involved in direct practice and reflection. The activity was held on September 19, 2025 at the Computer Laboratory of Lambung Mangkurat University, involving 30 social studies teachers who are members of MGMP Banjarmasin City. The stages of the activity consist of several main steps. First, the needs of partners were identified through an initial survey to map the level of teachers' understanding of the use of AR/VR in social studies learning. Second, the identification results were used as the basis for the preparation of training materials, which focused on the integration of AR/VR on disaster mitigation topics. Third, participatory training was carried out which included introductory sessions, demonstrations of the use of AR/VR, direct practice of making simple media, and reflective discussions. Fourth, evaluation and feedback are carried out to assess the effectiveness of activities and formulate a follow-up plan.

Ensuring the success of activities can be measured, several evaluation instruments are used. The instruments include pre-tests and post-tests to determine the improvement of teachers' knowledge, observation sheets to assess participants' participation and involvement, evaluation questionnaires to measure teachers' satisfaction and readiness to integrate AR/VR in learning, and short interviews to obtain qualitative data related to participants' perceptions and experiences. The level of achievement of the success of the activity was assessed through several indicators, namely changes in attitude aspects (teachers' motivation and openness to new technologies), socio-cultural aspects (there is an understanding within the MGMP environment regarding the use of AR/VR as an innovative learning medium), and educational aspects (teachers' readiness to develop AR/VR-based media in social studies learning). With a combination of these indicators, the success of the program can be assessed measurably both from a quantitative and qualitative perspective.

Results and Discussion

1. Improving Teacher Knowledge through Pre-Test and Post-Test

Measuring the increase in teachers' understanding of the use of AR/VR technology in social studies learning, the implementation team conducted a pre-test before the activity and a post-test after the training.

Table 1. Pre-Test and Post-Test Results of Training Participants (n=31)

No	AR/VR Knowledge Indicators	Rata-rata Pre-Test	Post-Test Average	Increase (%)
1	Understanding of basic AR/VR concepts	57,5	86,5	50,4
2	Introduction to AR/VR applications	55,0	83,0	50,9
3	Integration in social studies learning	56,0	85,5	52,7
4	Application to disaster mitigation materials	57,0	84,0	47,4
Average		56,4	84,8	50,3

Source: Data processing, 2025

The results in Table 1 show an increase in the average score from 56.4 (pre-test) to 84.8 (post-test) in 31 teachers. This increase of 50.3% proves that the training has succeeded in significantly increasing teacher knowledge. Teachers who were previously unfamiliar with the concept of AR/VR now better understand its application in social studies learning, especially in disaster mitigation materials.

According to research (Sahronih et al., 2024), research (Yusa et al., 2023), and research (Keya et al., 2025), the development of AR learning media to increase student motivation and learning outcomes in science. In addition, research (Yusa et al., 2023) shows that the application of VR to prepare for fire preparedness increases participants' readiness and understanding of fire hazards.

2. Teacher Satisfaction Level with Training

In addition to the knowledge test, the team also distributed a satisfaction questionnaire to measure teachers' perceptions of the implementation of the training.

Figure 1. MGMP IPS Banjarmasin Teacher Training



Table 2. Teacher Satisfaction Level with Training (n=31)

Rating Categories	Very satisfied (%)	Puas (%)	Sufficient (%)	Less (%)
Relevance of the material	87	13	0	0
Clarity of delivery	84	16	0	0
Training facilities	81	17	2	0
Fit to needs	90	10	0	0
Average	85,5	14	0,5	0

Source: Data processing, 2025

Based on Table 2, more than 85% of teachers stated that they were very satisfied with the training. This shows that the material presented is relevant to needs, clear delivery, and adequate facilities provided. This finding also confirms that PkM activities have answered the real needs of partners, especially in improving teachers' competence in integrating AR/VR technology in social studies learning.

Training involving elementary school teachers in Lampung; participants showed positive responses and improved ICT literacy after the training (Rohman et al., 2025). In addition, research on Augmented Reality-Based Learning Media Training in Cirebon shows that teachers are very satisfied, mainly because the learning media has been updated. Even worldwide, research on the application of virtual reality for fire evacuation preparation in schools shows that participants are satisfied because VR is considered more interesting, realistic, and useful than conventional methods.

Thus, the level of teacher satisfaction with this training not only describes the success of the program, but also confirms the consistency of the results with previous studies. This strengthens the argument that AR/VR training for social studies teachers is a strategic and innovative step in improving the quality of learning and technology-based disaster preparedness.

3. Changes in Teachers' Attitudes and Motivation

Assessing changes in attitudes, observations and short interviews were conducted with participants.

Figure 2. Teacher simulates training materials

**Table 3.** Changes in Teachers' Attitudes and Motivation (n=31)

Observed Aspects	Before Training	After Training	Change
Motivation to try new technologies	Low (35%)	High (90%)	+55%
Readiness to integrate AR/VR	Low (29%)	High (86%)	+57%
Perception of the benefits of AR/VR in IPS	Medium (42%)	High (91%)	+49%
Understanding at MGMP regarding AR/VR	Low (33%)	High (88%)	+55%

Source: Data processing, 2025

The results in Table 3 show a positive change in the attitude and motivation of teachers. Before the training, only a small percentage of teachers showed readiness to try new

technologies. However, after the training, the majority of teachers stated that they were ready to use AR/VR in learning. This is in line with observations in the field, where teachers seem enthusiastic about trying AR/VR devices and actively discussing in practical sessions. This increase in motivation is an important indicator that training not only increases knowledge, but also shapes teachers' mental readiness and skills in integrating innovative technologies into social studies learning.

These results support research that found that AR-based training is able to foster teachers' confidence to adopt new technologies in learning (Idrus & Yudherta, 2016; Zulfahmi & Wibawa, 2020). In addition, the study also noted that teachers' motivation increased significantly after participating in a workshop on the use of smartphone-based AR media (Nugraha et al., 2014; Sugiono, 2021). Even in an international context, studies related to the use of VR for disaster preparedness in schools have found that immersive experiences encourage proactive attitudes of teachers and students in understanding disaster mitigation procedures (Wibowo, 2025).

Thus, the changes in teachers' attitudes and motivations shown in Table 3 confirm that AR/VR training does not only affect cognitive aspects, but also affective and psychomotor aspects. This shows the importance of the PkM program in encouraging the paradigm transformation of teachers from just passive technology users to learning innovators who are adaptive to digital developments.

4. Obstacles and Challenges

Although the results of the training showed positive achievements, there were still some obstacles felt by teachers.

Table 4. Obstacles and Challenges Felt by Participants (n=31)

Types of Barriers	Number of Teachers (%)	Information
Device limitations in schools	65%	Not all schools have adequate VR headsets or devices
Limited time for exploration	45%	The administrative burden of teachers is quite high
Lack of previous experience	74%	Most teachers are new to AR/VR
Limitations of school support	40%	Need policy and facility support from schools

Source: Data processing, 2025

The data in Table 4 shows that device limitations are the main obstacle, experienced by 65% of teachers. In addition, lack of previous experience is also quite dominant (74%). Other obstacles that arise are limited time (42%) and limited school support (38%). However, these obstacles do not reduce the enthusiasm of teachers. In fact, many teachers are encouraged to look for creative solutions, for example by utilizing free applications that can be accessed through smartphones so that they can still integrate AR/VR into learning.

These findings are in line with research, which found that the main obstacle in new technology training is the limitations of digital infrastructure in schools (Usman et al., 2019). Other research also reported that even though teachers faced technical barriers, the level of enthusiasm remained high when training materials were considered relevant (Mustaqim, 2016). In fact, international studies emphasize that device limitations can be overcome with strategies for the use of *low-cost VR tools* and mobile-based applications, which have proven effective in the context of schools with limited resources (Sugiono, 2021).

Thus, although technical and infrastructural barriers are still challenges, these results show the potential for the sustainability of the program. The enthusiasm of teachers to adapt to

limitations emphasizes that PkM activities not only increase capacity, but also encourage the emergence of practical innovations in dealing with obstacles in the field. This strengthens the argument that the success of the PkM program is not only measured by the availability of facilities, but also by the adaptive attitude of teachers as agents of change in technology-based education.

The results of this training are consistent with previous research that emphasizes the importance of training to improve teachers' technological literacy. As mentioned in (Hidayat et al., 2025; Miller et al., 2020a), AR has been proven to be effective in increasing student motivation, and in this activity teachers are also motivated to use it. These findings also support the statement that VR can provide a simulative experience for students on disaster materials.

In addition, research showing the limitations of teacher competence is a major obstacle to the adoption of AR/VR, which was evident in the initial survey of this activity (Agustina et al., 2024; Hasanah et al., 2024; Miller et al., 2020b; Wijaya et al., 2024). But after being given practice-based training, these barriers can be minimized. Furthermore, it emphasized that digital training plays an important role in improving teacher literacy, which is in line with the findings in this activity (Abbas et al., 2024; Husna et al., 2023; Nurhidayat et al., 2022). Finally, he stated that AR/VR integration in social studies is still rare, so that this PkM program presents novelty in the local context of Banjarmasin (Aini et al., 2024; Cahyani et al., 2022; Dwiyo et al., 2024; Hayati et al., 2024; Lestari & Kurnia, 2023).

The training successfully improves three main aspects:

1. Teacher knowledge (demonstrated through an increase in post-test scores).
2. Attitude and motivation (as seen from observations and questionnaires).
3. MGMP's collective understanding to adopt AR/VR as an innovative medium.

Thus, this PkM activity has a strategic impact, not only for the participating teachers, but also for the world of education which is moving towards the integration of digital technology in learning.

Conclusion

The implementation of the PkM activity *"Augmented Reality (AR) and Virtual Reality (VR) Technology Training as Social Studies Learning Media on Disaster Mitigation Materials"* has succeeded in significantly increasing teachers' knowledge, skills, and motivation. The results of the pre-test and post-test showed an average score increase of 50.3%, which proves the effectiveness of the training in strengthening teachers' understanding of the concept, application, and integration of AR/VR in social studies learning. In addition to the cognitive aspect, this training also had a positive impact on teachers' attitudes and motivations, where the majority of participants showed high enthusiasm, readiness to try new technologies, and a commitment to integrate AR/VR into learning.

On the other hand, the teacher satisfaction rate of more than 85% shows that the training materials, methods, and facilities are in accordance with the real needs of the partners. The obstacles that arise, such as device and experience limitations, are not a barrier, but rather encourage teachers to find creative solutions by utilizing smartphone-based applications that are more accessible. Thus, this activity is not only relevant for increasing teacher capacity, but also makes a real contribution to the world of education in encouraging the use of innovative technology for disaster literacy. This PkM program can be a model for developing similar training in other areas to support the transformation of digital-based learning.

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