



Research Article

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A Study on the Development of Application for Diversification of Democratic Citizenship

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Abstract

Technological advances have led to diversifying educational methods. This is because educational methods are being developed in a form that allows more immersive participation based on digital technology that relies on text and simple visual materials. This paper explains the process of developing AR(Augmented Reality)-based programs to educate the 'May 18 Democratization Movement'. This AR program captured four representative scenes during the protest and developed a scenario. The app targeted the occurrence and development of the May 18 event, community activities, the situation after the May 18 event, and an element that allows diverse learners to participate directly in each scene. Considering that there are currently a small number of realistic media-based programs developed for democratic citizenship education in Korea and that adoption and use in the field have problems with the curriculum and time, the value of this AR-based application has the potential to expand for diversification of democratic citizenship diverse learners.

Keywords: Democratic Citizenship Education, Augmented Reality (AR), Digital Education, Educational Applications, May 18 Democratization Movement

1. Introduction

The information revolution, which took place at the end of the 21st century, created a new communication structure in the form of immediate and mutual information exchange between information senders and recipients based on the Internet and digital devices. In virtual space, humans have greatly changed and expanded the area of thinking and perception, and the amount of information has overwhelmed the public. In light of a series of trends, future changes following the Fourth Industrial Revolution also mean changes in the form of communication (Eisenstein, 2005). Above all, new types of media based on digital technology will gradually occupy a major position, which will be carried out to break down the wall between reality and virtual (Schmitt, 2019).

In particular, Augmented Reality (AR) technology, which has recently been used to produce digital textbooks and various contents, is a remarkable method. AR is spreading and being applied in

various ways due to the increasing penetration of digital devices such as mobile phones and tablets, the development of technology, and the establishment of a fast wireless network environment.

The Ministry of Education in Korea has distributed digital textbooks according to the revised curriculum 2015 and provides realistic content combining technologies such as augmented and virtual reality. In general, educational activities based on AR are evaluated to affect the educational field positively. AR technology increases participants' activity, promotes learning commitment, and increases learning motivation and interest (Nam & Lee, 2020). In alignment with this policy, this paper explores the possibility and direction of the diversification of educational methods of the May 18th Democratic Movement and the combination of AR technology. The results of this paper lead future researchers and developers to guide learners to educate AR-based history education effectively.

2. Literature Review

2.1 *The May 18th Democratization Movement in South Korea*

The May 18th Democratization Movement was an incident that took place in South Korea in May 1980 and was an incident in which urban residents formed a community against the dictatorship. The dictatorship concealed the incident after the outbreak but was formalized in 1993 and officially re-evaluated in 1997 with the punishment of those involved. Since then, various educational activities related to the democratization movement have been carried out in the form of democratic citizenship education, which is currently in progress.

When looking at history education and educational activities related to the May 18th Democratic Movement, the first focus was informing facts in the informal domain from the 1980s to the mid-1990s. The military dictatorship was still in power during this period, so mentioning the pro-democracy movement was premised on personal threats. From the mid-1990s to the 2000s, it shows the expansion of formalization and public domain. Various facts about the democratization movement were known, and official educational and memorial activities related to May 18 could be carried out in schools, various educational institutions, and public areas. From the late 2000s to the present, May's education has been used as a political tool, showing a regressive appearance and paying attention to facts (Kim, 2016). Meanwhile, the history education and educational activities of the May 18th Democratization Movement have been carried out in various ways in the form of exhibition materials, activity sites, information materials, textbooks, dioceses, video materials, and books. In particular, the May 18th Library VR Content, recorded as a virtual experience developed by the May 18th Memorial Foundation in 2019, shows an approach based on digital technology in developing educational materials.

Recently, democratic citizenship education in Korea has shown a strong demand for diversifying educational methodologies using digital technology (Oh & Kang, 2020). This educational background reflects the concerns of the times. At the same time, the issue of drawing consensus is important in a situation where generations who have directly experienced historical events are gradually disappearing. A similar example is organizing educational programs in a form that can elicit consensus from the next generation in a situation where the generation who experienced the Holocaust is disappearing in Holocaust-related research (Meyers, 2010). In the end, the expansion of democratic citizenship education using digital technology can be said to be an effort to elicit 'universal memory' and 'expansion of empathy' for the May 18th democratization movement (Kim & Kim, 2020).

Democratic citizenship education using digital technology has mainly focused on archiving work until the 2010s. In the modern history of Korea, efforts to record and remember major historical events and protests against dictatorship are being digitized and shared with the public. However, developing this as an educational application has been mainly conducted throughout the late 2010s and the pandemic season. For example, in the case of unification education, a major field of democratic citizenship education in Korea, it was only required to diversify educational

methodologies using digital technology in 2020 (Oh & Kang, 2020), and only the following year, the AR app '*Unification Spring with Teachers*' was launched at the Unification Education Center.

In addition, programs using realistic media technology began to appear in the way of conducting democratic citizenship education through historical events around this time. For example, the National Museum of Korean History launched programs such as '*When May Day Comes*' and '*With Rusty Steel Net*' in 2020 to experience the May 18 Democratization Movement and the Korean War using VR. It was produced in time for 40 and 70 years, when historical events took place and focuses on the elements of democracy and peace, respectively. In addition, Jeju Special Self-Governing Province created the Smart Jeju 4.3 Peace Memorial in 2023. The space provides a foundation for democratic citizenship education based on digital technology by establishing 3D exhibitions, virtual reality (VR) exhibition halls, and online memorial halls.

In history education and educational activities related to the May 18 Democratization Movement, the May 18 Library VR Content in 1980, recorded as a virtual experience developed by the May 18 Memorial Foundation in 2019, shows an approach based on digital technology in developing educational materials. This app aims to use HMD to experience participants in the space of the time. In 2022, Gwangju Metropolitan City in South Korea established the '*Street Museum of the May 18 Democratization Movement*' underground of the May 18 Democratization Movement Archives. This app provides an experience that allows you to indirectly experience the space where the incident occurred based on AR and VR content. This app shows that the technical efforts of the existing May 18 Democratic Movement are mainly focused on informing the facts.

2.2 Empirical research on AR for history education

Three research studies have examined augmented reality (AR) technology in tourism and historical education. The first study by Lee et al. (2018) involved developing the Chungmuro AR mobile application, which allows users to visit historical sites lost in the development era virtually. The app is named after the Chungmuro area, famous for movie-making for over 30 years until the '90s. The app lets users walk along a historic trail and photograph virtual historic spots. The study found that AR-based tourism for history education benefits Korean learners.

The second study by Kang (2016) analyzed the use of mobile AR technology at a tourist spot and its positive recall of historical cultural sites. The study found that mobile AR technology positively influences experiential value and positive recall. Experiential value also positively influences positive recall and mediates the relationship between mobile AR technology and positive recall. The study suggests that the tourism industry should examine the presence of mobile AR technology in the tourism experience.

The third study by Jung and Lee (2022) developed an AR online archives exhibition platform using the Unity Engine. The platform was based on functional requirements derived from related literature analysis. The platform's usability was evaluated through a platform demonstration for 35 users. The study found that the platform has potential as an exhibition service and can be useful during the coronavirus pandemic. Some advanced technology supplementation is required to enhance the platform's usability.

3. Procedures of AR-Based Application Development

Augmented reality can increase learners' interest by augmenting 3D and three-dimensional learning materials into reality. In addition, 3D learning materials can enhance the understanding of learning content because they increase the sense of reality of learning content. In addition, augmented reality-based learning materials are attracting attention as realistic learning materials with high practicality because they operate on daily devices such as mobile phones and tablets.

The May 18th Democratization Movement application was developed for youth education materials, and it is expected that students and teenagers will increase educational effectiveness in

education for the May 18th Democratization Movement. The 'Time-Time of May 18' application can be installed wherever the May 18th Memorial Foundation logo is located, increasing accessibility. Learners can install and use the application on a portable or tablet PC. The development procedure of this application was carried out over four stages, including scenario development, application design, application development, and feedback and modification.

3.1 Scenarios Development for Applications

Interaction between users and AR apps in AR learning materials is a way to increase learners' interest and maximize learning effects. Active interaction between learning materials and learners is important to increase learners' interest and participation. To this end, the user must be able to manipulate the learning material, and the learning material must be accompanied by a response accordingly. In other words, when developing AR-based learning materials, it is important to select learning materials to be provided to learners and to construct interactions that learners will experience.

First, the main learning content in the theme of 'Democratic Protection Citizen Rally' is that ordinary citizens resisted dictatorship in one mind. Giving learners an experience that has entered the situation at the time is important for an immersive experience. To this end, it was intended to provide an experience for learners to become ordinary citizens gathered in front of the fountain at the time and to participate in the speeches of young college people holding Korean flags and speaking on the fountain. To implement this, when the learner presses the 'join' button, voices such as 'protecting democracy' will be heard. The chants were recorded with five types and different voices to increase diversity. To summarize the main activities in this topic, 1) listen to the speech and 2) press the join button and join the speech. Learners can interact with learning materials through the 'press button' operation.

Second, the main learning content of the 'Daedong World' theme is to inform that Gwangju citizens in South Korea cheered in support of the citizen army that resisted dictatorship and that the families of Gwangju citizens were all citizen soldiers. The topic included stories of a lady handing out rice balls around Chungjang-ro Street searching for a child who does not return, a young woman waiting for her husband who does not return overnight, and a nurse and hospital managing citizens who donate blood for injured citizens.

The learner clicks on the avatar standing in front of the old Jeollanam-do Provincial Government Office to listen to the citizens' stories and acquire relief items given by the citizens. Relief items acquired include rice balls, blood donation packs, cider and bread, and energy drinks, all shared by actual citizens based on actual stories. When the learner clicks on the avatar, the learner interacts with the learning materials through reactions such as receiving voice and relief supplies. Learners can experience talking to citizens at the time through the voice actor's acting voice that realizes the actual story. In addition, the learner can have a vivid experience by receiving relief items distributed at the time.

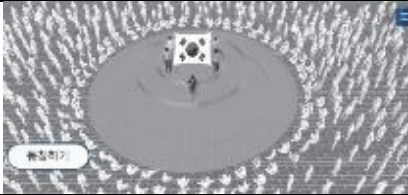



Third, in the subject of 'Senator,' the learning content was used as a space for the commerce officer to lay the bodies of many victims, and the victims included innocent citizens, including young students passing by and pregnant women. The learner can read the contents of the pop-up and press the 'OK button' to see the reaction of the being laid on the coffin. The victims were organized so innocent people, such as civic groups, young students, and pregnant women, were mixed evenly. When learners click on the coffin, they are given images such as photos of the victim's face and stories. They can indirectly experience the experience of finally laying flowers on the victim's coffin.

Finally, the main learning content in the theme of 'The Last Fireworks' is to understand the determination of young people and citizens who remained in the former Jeollanam-do Provincial Government Office on the night of May 26 and protested democracy and military dictatorship politics to the end despite being aware of the attack by martial law forces. To this end, young people and citizens who remained in the former Jeollanam-do Provincial Government were selected, and

photos and stories of each victim were included.

In addition, the speech of a female college student who gave the last speech at the time was organized to come out. When the learner clicked on the shadow-model photo on the window of the former Jeollanam-do Provincial Government Office, the victim's face and story appeared in a pop-up. When the learner reads the content in the pop-up and presses the OK button, the shadow picture in the window can see the reaction converted into the actual victim picture. The learner can indirectly experience the memorial experience of the victims who endured death at the time and kept the will to protect democracy until the end. <Table 1> summarizes the scenario's explanation of the learner-augmented reality learning material interaction.

Table 1. The learner-augmented reality learning material interaction in scenarios

| No. | Scenarios | Learner-VR Learning Material Interaction |
|-----|---------------------------------------|---|
| 1 | 'Democratic Protection Citizen Rally' | <p>The virtual avatar clicks the "join" button while delivering a speech for the protection of democracy. The learner can hear the sound of applause and the voice of support, allowing learners to indirectly experience the actual participation in the rally. The accompaniment sound of "March for My Beloved" is provided as background music, raising the atmosphere of the time.</p>  |
| 2 | 'Daedong World' | <p>The learner clicks on the citizen to hear the story and receives the citizen's support and relief goods. With the voice actors' vivid acting voices, the learner can sympathize with the stories of the citizens at the time, and you can see that the citizens are cheering.</p>  |
| 3 | Sangmu Hall | <p>The learner can check the victim's face and story through a pop-up as above by clicking without the Korean flag. When the confirmation button is pressed, the coffin is laid as a chrysanthemum, and indirectly, the learner can experience memorializing the victim.</p>  |
| 4 | 'The Last Fireworks' | <p>The learner clicks on the photos of the last people waiting for the Airborne Brigade at the window of the building in the old provincial office in Jeollanam-do province. In that case, the story of the victim expressed in black shadows appears and changes to the actual photo of the victim. Learners can commemorate the victims who remained in the old provincial government building in Jeollanam-do to kneel and protect their will at the time.</p>  |

3.2 Application development

The process of developing this AR application is as follows. First, a background 3D building was developed. For example, the old provincial government buildings, fountains, and commercial buildings are in Jeollanam-do Province, South Korea. In particular, the old provincial government building was carried out after consulting experts because the appearance of the incident and the current one was very different, and the fountain and the commercial building used the remaining data as photos and records. All of them were developed using sketch-ups modeled after the appearance of a real building.

Second, 3D avatars were developed. It was developed using DAZ and iClone 7 to implement a college student avatar holding the Korean national flag. The images of the surrounding citizen avatars were purchased without individual development and randomly put in the developed avatars, especially in this process, in an uncolored form to prevent overload due to the increase in capacity. Avatar speeches and explanations of stories were written by recruiting experts from the May 18 Memorial Foundation and writing remaining historical records at the time. Voice actors were recruited to record them to bring life to life. In addition, the intro of the "Arbitrary March," the most important song related to the May 18 Democratic Movement, was added as background music to raise the atmosphere. The development team recruited five in-service teachers to request usability evaluation and received feedback. The main feedback was that first, the reaction of the Join button of the 'Democratic Protection Pan-Citizens' Rally' was monotonous. Since the monotonous reaction could reduce the students' immersion, a response was necessary, and to improve this, support messages were diversified, and male and female voice actors were recruited and additionally recorded in various ways. Eight combinations of reactions were configured to be randomly output, thereby increasing the diversity of reactions.

Second, in the early version of 'Daedong World,' buildings such as hospitals, schools, shops, and whole-day buildings, which are scenes representing the story, were put in. Still, feedback was received that it was difficult to find avatars because the building was too complicated. To improve this, the place was changed to a square in front of the old provincial government building in Jeollanam-do province and rearranged so that four avatars could be easily found. Third, there was an opinion that it was impractical to deploy only six coffins in 'Chief,' considering there were so many victims' coffins at the time. In reflection of this, several coffins were placed, but the national flag was placed to distinguish them from the six coffins with victim pop-ups. The learner changed it so that if he chose a dark-colored wooden coffin without a Korean flag, he could offer flowers with chrysanthemum flowers.

Lastly, "The Last Flame" shows the victim's face and story when a black person's shadow is selected on the window. When the confirmation button is pressed, the window is changed to a flame, expressing the victim's death, but it is considered less meaningful in memorializing the victim. To solve this problem, after the pop-up information about the victim appeared in honor of the victim, it was changed to an actual picture of the victim to cultivate the meaning of remembering the victim.

4. Conclusion

In the May 18th Democratic Movement, it has often become an important goal to inform others of the exact 'facts' immediately after the incident. Therefore, much effort has been made to develop various educational materials to convey facts through educational activities, comparisons, and activities. In particular, AR technology has gained more potential as a medium based on the increased penetration of smartphones, the development of virtual reality-related technologies, and improved device utilization capabilities. In particular, participants' high interest and immersion are the biggest advantages of technology and have remarkable potential in delivering information. In addition, considering the rapidly changing pattern of media use, the importance of education methods

combined with technological changes for future generations is a notable factor.

The 'Time of May 18' is an application developed under these circumstances to convey the important moment of the Democratic Movement by applying augmented reality technology. This application was produced for teenagers familiar with augmented reality technology, and four major moments of the Democratization Movement were selected and used as materials in consideration of the capacity and driving environment of the application. In addition, efforts were made to contain objective elements by targeting major materials and concepts announced by the May 18 Memorial Foundation and related books. The change in the medium is not only a change in how the message is delivered but, ultimately, in the message. Various approaches are also needed to consider various methodologies for educational activities related to the May 18 Democratic Movement, as media based on print culture are gradually losing their initiative.

5. Pedagogical Suggestions

South Korea experienced economic growth and complex political fluctuations shortly after the Korean War. A series of social backgrounds also provided very rapid volatility in education. In particular, in the state-centered education system, democratic citizenship education has undergone various subject changes from the presence or absence of existence. In addition, the rapid change in the educational environment and the introduction of various media according to economic growth raised the task of 'adaptation' for teachers and students. Attempts at democratic citizenship education activities based on AR apps can be a tool to continuously maintain and expand interest in democratic citizenship education in a social environment where digital technology is introduced and rapid changes occur. In addition, democratic citizenship education is only one of various optional topics in the current curriculum in Korea. This is not subject education, and it can be conducted in the form of many different sessions, depending on the choice of teachers. In this situation, it is very important to increase students' immersion and create applications so students can learn voluntarily and discuss memories based on this. The legitimacy of democracy rather weakens the educational efforts of democracy or democratic citizens.

6. Limitations

This research has several limitations. First, the developed app's actual use and educational effectiveness should be evaluated later. The 'Time of May 18' was created as an educational app for teenagers, which means that it will aim to achieve educational effects. Therefore, checking the app's actual use and educational effects is essential. Second, there is a need for technological expansion of apps. The main body of the May 18 Democratic Movement was the public, and even today, the public's voluntary participation and sense of community are discussed as the most important factors. However, the app represents the public as an anonymous pile for smooth operation. This must be displayed in a form that highlights public values through future technical updates.

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