

Sharing Space Experiences through Augmented Reality as An Alternative Educational Game to Introduce Historic Buildings in Semarang Old Town

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ABSTRACT

Augmented Reality, became one of the breakthroughs to introduce the heritage value of Semarang Old Town to the younger generation. Heritage value consisting of non-material value, namely the history of struggle and development of Semarang Old Town, and material value consisting of colonial-era historical buildings in Semarang Old Town. This study aims to analyze Augmented Reality technology as part of gamification in educational games used to introduce the heritage value of Semarang Old Town. Augmented Reality offers an immersive experience in the learning process of Semarang Old Town. Augmented Reality characters are interactive, real-time with interesting games, and contain elements of challenges are expected to increase the interest of the younger generation to get to know Semarang old town. Being one of the cultural heritage with colonial-era buildings that are hundreds of years old, Semarang Old Town is witnessing the history of Semarang city's glory. Semarang Old Town is a living heritage that bequeaths an important and unique historical value for the formation and development of Semarang City. Unfortunately, efforts to introduce the historical value of Semarang Old Town have not been optimal. The problem is historical learning tends to be undesirable, complicated, and memorized a lot. And also about how to create an introductory media that is able to attract the attention of the younger generation to know the historical value of Semarang Old Town. This study uses qualitative analysis. Conducted through literature studies, field surveys, and interviews related to Semarang Old Town to obtain primary data. Primary data will be analyzed to identify the right gamification to introduce the heritage value of Semarang Old Town through educational games. This research resulted in a gamification analysis in an augmented reality-based educational game that contains knowledge about the heritage value of Semarang Old Town.

Keywords: *Educational Games, Augmented Reality, Gamification, Immersive, Heritage Value, Semarang Old Town*

1. INTRODUCTION

Semarang was born as one of the cities with a long history. one of the largest cities in Central Java is not only growing as an industrial and commercial city, but also growing as one of the tourist destinations, both local and foreign tourists. One of the popular tourist destinations is Semarang Old Town. Semarang Old Town is one of the areas rich in history and cultural heritage. Witnessing the history of Semarang city's glory, Semarang Old Town area has hundreds of colonial era buildings that are more than 200 years old.

Historically, Semarang Old Town is very close to the facilities and infrastructure of inter-island trade networks in the archipelago or internationally. In colonial times, Semarang city was seen as an important industrial center, for that since the 16th century Semarang Old Town has grown as a cosmopolitan area. Then under the control of the VOC and colonial government developed into one of the most important trading and industrial cities in the Dutch East Indies. The establishment of Semarang Old Town area cannot be separated from several supporting factors, namely the geographical environment, demographics, and also infrastructure [1]. In terms of the geographical environment, before being visited by Europeans, especially the Dutch, Semarang has become a settlement for citizens from other ethnic groups, such as immigrants from China, Arabia, Koja, as well as a number of ethnicities in Asia. They live in groups around Semarang River. The next support factor is the demographic factor. Semarang city has good geographical and economic potential, this condition attracts migrants to enter Semarang city. Before the arrival of Europeans, Semarang was controlled by the majority of ethnic Javanese.

After the Europeans came, especially the Dutch, Semarang quickly turned into a European city that is now better known as Semarang Old Town. In terms of infrastructure facilities, the establishment of the Old City area of Semarang cannot be separated from the existence of complete facilities and infrastructure. Starting from roads, ports, transportation, markets, and banks. The success of Semarang city in the past is still well recorded. Can be seen from various magnificent buildings in the Semarang Old Town. The iconic buildings of the colonial era bear witness and proof of the success of Semarang City. As a living heritage, the historical value found in the Semarang Old Town certainly needs to be introduced to the younger generation. There are two historical values, consist of non-material historical values and material historical values.

1.1 Efforts to Preserve the Heritage Values of Semarang Old Town

Heritage value should be introduced as an effort to cultivate character to the younger generation. Character which is then interpreted as a way of thinking and behaving, working together in the sphere of family, society, nation, and country [2]. The heritage value contained from the history of Semarang Old Town becomes a wealth of heritage that can contribute indirectly to the mental formation of the nation's generation. There are various moral messages of struggle of the Indonesian nation in the heritage values of Semarang Old Town, such as the history of trade economic development in the Old City of Semarang, the history of cultural acculturation that developed in the Old City of Semarang, to the struggle of the Indonesian nation in the Dutch colonial period.

1.2 Preserving Semarang's Old Town Heritage through Education

The heritage value of Semarang Old Town must be introduced to the younger generation through education. Education can be done including knowledge related to the historical value contained in the Old City of Semarang, such as the history of buildings that still stand majestically and bear witness to the formation of Semarang city, to the history of struggle and development of Semarang Old Town. Hopefully, education to the community, especially the younger generation, can encourage the formation of pride of young people in the Semarang City.

History becomes a subject matter that tends to be considered too broad, complicated, and memorized a lot [3]. Today, the interest of the younger generation towards history is quite low. Often history is considered boring and unattractive. Even in a survey conducted by Zenius.net of 1340 students in Indonesia, history lessons became one of the lessons hated by students [4]. This is the subject, so far history is still studied by conventional learning. Of course, this affects the interest of the younger generation to get to know more deeply the historical value of the Old City of Semarang. Then, how can educational games be a medium to introduce the value of history?

1.3 Educational games with Augmented Reality to introduce the Semarang Old Town

Educational games offer a game that contains learning materials so that it can give rise to an experience in the learning process. Educational

games can be a solution to introduce the Old City of Semarang to the younger generation. Meanwhile, introducing a historical value as part of learning can use a gamification approach. Gamification can be supported with various latest technologies, one of which is with Augmented Reality technology. Augmented Reality in educational games is able to present an immersive experience that can bring the younger generation to feel more real an experience, exploring and getting to know the Old City of Semarang. Providing information about how the space experience is presented through Augmented Reality, that's the goal of this study.

2. METHODOLOGY

This study uses qualitative analysis. Conducted through literature studies, field surveys and interviews with the Badan Pengelola Kawasan Kota Lama Semarang, BPK2L, to obtain primary data.

The purpose of using descriptive qualitative studies is to reveal or obtain information from research data thoroughly, extensively, and in-depth [5]. The primary data obtained will then be analyzed to identify the gamification used in educational games that will be used as a medium of recognition of the heritage value of Semarang Old Town.

3. RESULT AND DISCUSSION

Semarang Old Town is a living heritage that bequeaths important and unique historical value for the formation and development of Semarang City [1]. Until now, there are still many buildings and spaces that are still well utilized. Buildings in the Old City Area of Semarang are still used for various activities, ranging from office activities, art galleries, public spaces, community spaces, cafes, and also restaurants, for which Semarang Old Town is referred to as living heritage.

Nicknamed Little Netherland, or Miniature Netherlands in Semarang, Kota Lama became a Cultural Heritage area with important values, ranging from history to the development of civilization, even the Old Town area of Semarang is also on the tentative list as the World Heritage nominee selected by UNESCO [6].

The historical values in Semarang Old Town consist of non-material historical values and material historical values. Non-material historical value is the historical value of the past relics that are intangible but can be seen and can be felt its existence. Semarang Old Town has an interesting historical story in the colonial era that became part of the history of the struggle and the formation of Semarang city today. The value of non-material

history among them is the Old City of Semarang has a function as the center of political activity. There is a traditional Javanese system of government located on the southwest side of Semarang Old Town. The colonial system of government is located on the main road, namely at *westerwalstraat* (Mpu Tantular Street) for the government office of North-East Coast Province of Java, as well as *Oude Staduisstrat* (Branjangan Street) and *Standhuisplein* (Srigunting Park) for the City government office. Semarang Old Town is also a center of economic activity, where there are many offices and trade firms that manage trade traffic in Semarang City. In addition to being the center of economic activity, the historical value of Semarang Old Town is also illustrated from its function as a cultural center, a center of social management activities, and also the center of consulate offices from various countries.

The historical value of the material, seen from the typical urban layout, such as the worship room that is the church located in the city center. The government center is close to the worship hall, public space, entertainment room to business activity room. The buildings in Semarang Old Town are evidence of the rapid development of Semarang City. There are many heritage buildings and sites that can be proven authentic. Cultural acculturation of various ethnicities living around Semarang River also brings influence to cultural values that grow as diversity and harmony. There is a physical blend of buildings with the cultural value of civilized people living in the historical building environment of Semarang Old Town such as Kauman village, Malay Village, Chinatown, and Pekojan.

3.1 Introducing Historical Value through Experience

Historical value can be introduced to the younger generation through active and fun learning by using experiential learning models. Experiential Learning is one of the models of cooperative learning, wherein practice students will be more active to seek information obtained directly through experience. Experiential Learning takes advantage of new experiences and learning reactions to their experiences. This is useful for building understanding and transfer of knowledge, new skills, or even new ways of solving various problems [7].

This learning model focuses on the experiences students will feel and learn. By being directly involved in the learning process, students can construct their own experiences so that they become knowledge.



Figure 1. David Kolb's Experiential Learning Model

The process of experiential learning relates to the process of making meaning from the individual's direct experience. This process can take place without a teacher, but nevertheless, the learning process still requires several aspects of ability. Knowledge is gained through both personal and environmental experiences. To gain experience, students must have four abilities [8]. Individuals must be willing to be actively involved in the experience.

- Individuals should be able to reflect on the experience.
- Individuals must have and use analytical skills to conceptualise experience.
- Individuals must have the skills to make decisions and solve problems for new ideas that arise from experience.

3.2 Gamification Brings Experience

Learning that offers experience can be delivered through gamification. Gamification is based on human intuition in exploring solutions. In the game, there are abstract elements, challenges, judgments, awards, and emotional engagement [9]. Intrinsic motives in gamification are divided into two, the first related to internal motivations such as challenges, adventures, and also fantasy. The second is interpersonal motivation, namely cooperation, competition, and recognition.

It can be concluded that in gamification the elements in the game are inserted in the activities that the user does to create more interesting and fun learning. Gamification in learning has the concept of minimizing conventional learning activities with lectures. Gamification brings out games that involve physicality, cognition, and feeling, creating a fun and engaging learning process.

Gamification in learning media builds a learning environment with immersion elements in it. Immersive technology is presented in the form of digital games. The immersion process is required in learning through games. There is direct and thorough involvement of learners in interacting with the systems contained in the design of games [10].

Table 1. Comparison table of traditional training, hands-on training and gamification technique

	Traditional Training	Hands-On Training	Gamification - Technique
Cost-Effective	X		X
Low Physical risk/liability	X		X
User actively engaged		X	X
High engagement		X	X
Standardized assessments allow users comparison	X		X
User can easily transfer learning to real world environment		X	X
Immediate feedback in response to student mistakes		X	X
Learning pace accommodate to individuals		X	X

There are three ways of looking at games in the learning aspect [10]. The first is games as intervention. Gaming is seen as a delivery mechanism as an intervention to change the player's learning process. Changes occur as a result of experience gained directly in the game. The results of interventions can be positive, such as improving motivation, spatial viability, and the development of complex motor skills. Changes can also be negative, such as aggression and addiction. Second, games as an interactive medium. Games serve as simulations and models that deliver meaningful experiences, allowing players to achieve a task. In this case, the game has a role as a companion of the cognitive process that produces changes in the player. Third, games as an environment that can create a variety of useful and meaningful activities from the learning aspect. In this point of view, learning is interpreted as an activity that occurs in a system.

3.3 Augmented Reality Creates a Space Experience.

The digital age brings significant development to a wide variety of learning media. In gamification, Augmented Reality is one of the technology options that can create different virtual space experiences. The presence of Augmented Reality has blurred the boundaries that exist on the computer layer with the real world. Augmented Reality technology is used as a medium for virtual information delivery so that the way space is transformed.

Augmented Reality adds human sensing to space [11]. With Augmented Reality, the space experienced becomes transformed even if not physically, the user will be brought in to understand and experience space. Augmented reality is interactive, immersion, real-time, and virtual objects are usually 3-dimensional [12]

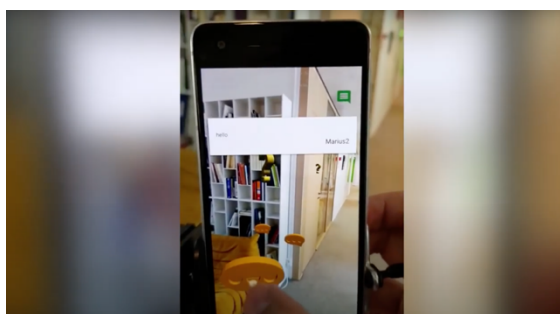


Figure 2. Interaction Patterns in Augmented Reality.

Source:

<https://www.youtube.com/watch?v=OMyI7zYSZuM>

Augmented Reality interaction patterns can be performed directly between virtual objects and the physical world or their users. The development of Augmented Reality technology also allows virtual

information to respond when touched by users. In this case Augmented Reality is simulated in contact with the object so that the user gets an existing virtual space experience [13].



Figure 3. Augmented Reality on Sony PS Vita Games.

Source: <https://www.youtube.com/watch?v=-mFBraJzbZU>

Human vision becomes a sense of being able to sense space [14]. In figure 3, users are seen using Augmented Reality technology. The physical object in the picture above is a carpet with a card as a marker that will be read by Augmented Reality. While what is seen on the user's device screen is a virtual object that is a football field and its players. In this working concept, augmented reality has changed the physical space functionality of its users. There are additions and changes in physical space that the user has previously known.

3.4 Augmented Reality as an Educational Medium

In its development, Augmented Reality is widely used as an educational medium. AR is used as a learning medium to increase interest in learning. Augmented Reality technology has an entertainment aspect and can project it in real-time and involve the interaction of all five senses of the user. This technology can help clarify the delivery of information to users and can provide motivational stimuli and interest in learning.

In Indonesia, the development of learning media using Augmented Reality technology is still limited. At the Multimedia Development Center for Education and Culture, BPMPK, Kemendikbudristek, learning media with Augmented Reality has only been developed since 2019. BPMPK produces 10 Augmented Reality annually. Meanwhile, for educational games, production begins in 2021. While educational games that use Augmented Reality amount to 4 applications.

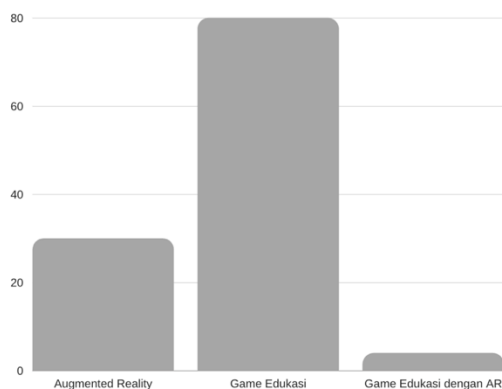


Figure 4. Number of learning media in 2019 - 2021

Augmented reality leads to a real environment that makes augmented reality objects have a direct relationship with the real world. Augmented Reality becomes a more effective learning medium compared to other media, such as books, videos, and computer use [15].

Augmented Reality can provide a fun gaming experience while learning for teens. Teenagers get the experience of playing in search of virtual objects that seem to blend in with their real world. There is a challenge to find more in-depth information related to the cultural heritage of Semarang Old Town.

3.5 Augmented Reality to Introduce Semarang Old Town

Augmented Reality technology has been used in several travel support applications in Semarang City. Some tourism development support applications used in Semarang city have used augmented reality technology support. These are Wis Semar and Lunpia apps. Both applications use augmented reality technology support to create an experience to explore Semarang City.

In Wis Semar application, AR feature is used to make it easier for users to find the destination they want. The location point of the tourist destination is determined by the distance from the user and is directed interactively based on the direction of the desired wind. If the user points to the east side, the ar feature of the camera will provide the location of the detected tourist destination on the east side by providing a description of the distance from the user's location. Meanwhile, the Lunpia app, Augmented Reality guide in real-time provides morning instructions for users who have difficulty finding their intended location or destination. The user will be directed to open the camera access on his smartphone. Next will appear directions and directions of the desired tourist destination.

Looking at the review of the use of Augmented Reality in two applications in the Semarang City, the use

of Augmented Reality technology can certainly be maximized again. Furthermore, Augmented Reality can be used as a medium of learning the historical value of Semarang Old Town. Where users not only rely on the receipt of information but also involved to think more deeply, more actively to search for information through games with Augmented Reality.

Users can play as well as learn about the colonial history that influenced the formation of Semarang Old Town as well as the historical buildings of the colonial era in the Semarang Old Town. Augmented Reality is used to bring 3D objects in the real world when the user is in the Semarang Old Town.

3.6 Augmented Reality in Educational Games Creates Immersive Experiences

The ability of an educational game in presenting an immersive experience is one of the keys to the success of the educational game itself. Augmented Reality enhances the experience offered to users of educational games. Different visual experiences in real environments become more valuable. The immersive experience is an experience where players feel integrated with the game.

The immersive experience is divided into three types, [16]. The first is sensory immersion, which is the kind of immersive experience associated with the five senses. Examples are visuals and sounds. Second, it is imaginative immersion related to imagination, such as the world that exists in games, characters, and stories. Third, it is a challenge-based immersion that deals with the challenges offered by the game. The combination of the three types of experience will result in an immersive game.

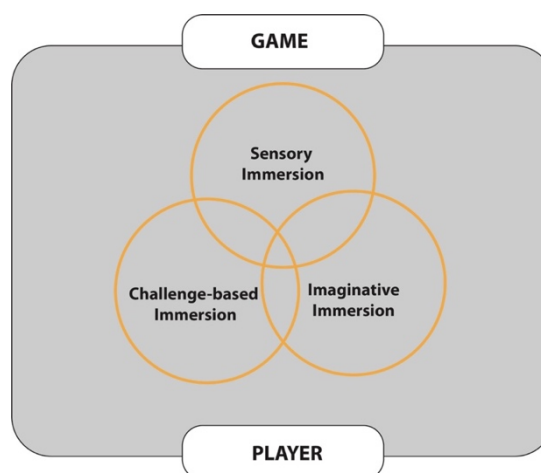


Figure 5. Immersive Model by Ermi and Mäyrä

The immersion process that exists in the use of Augmented Reality in the gamification of educational games introduction to Semarang Old Town creates direct

and thorough involvement from users that can be seen from various elements contained in the game such as:

- a. There is an element of challenge for the user.
- b. There is an individual or group purpose.
- c. There are relationships between individuals either competitive or non-competitive.
- d. There are exhilarating relationships.
- e. There is an exciting element for users to learn more deeply.
- f. There are mechanisms that are able to monitor the learning process and outcomes.
- g. There is feedback to spur higher learning achievements.
- h. There is stimulation to increase the sense of self-responsibility so that personal achievements are formed in the learning process.

4. CONCLUSIONS

Digital games technology has enabled a large immersion process. The use of Augmented Reality in educational games is able to create a space experience that can encourage the interest of the younger generation to learn more about the historical value of the Old City of Semarang.

Augmented Reality in educational games becomes a medium that has a novelty in the game-based learning process. Being one of the immersive technologies, Augmented Reality in gamification can also encourage the process of learning the history of Semarang Old City buildings to be more immersive and interactive. Elements in the game are inserted in the activities carried out by users to create more interesting and fun learning about the historical value of buildings in the Old City of Semarang. There is great potential in terms of the use of gamification in educational games to be used as a learning medium. The ability to create the immersion process becomes one of the assessments in the effectiveness of an educational game.

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