Journal for the Education of Gifted Young Scientists, 13(3), 131-146, Sept 2025
e-ISSN: 2149- 360X
jegys.org dergipark.org.tr/jegys

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Research Article

An investigation into the social validity of differentiated instruction for gifted students supported by augmented reality on the topic of historical places

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Article Info

Received: 29 March 2025
Accepted: 4 June 2025
Online: 30 Sept 2025

Keywords
Augmented reality
Differentiated instruction
Gifted students
Social validity
Teaching historical places

Abstract

In the rapidly changing world of the 21st century, technology-focused skills are reflected in educational environments in order to help individuals achieve success. Augmented reality applications are among the most important applications used in education. The aim of this research is to examine the social validity by determining the opinions of gifted students on augmented reality–supported differentiated instruction about historical places. In this research, a case study design, one of the qualitative research methods, was used. The hypothesis of the research is expressed as "the opinions of gifted students regarding augmented reality-supported teaching of historical places are positive." The participants of the research consist of 12 gifted primary school 3rd grade students studying in a science and art center located in the Eastern Mediterranean Region of Türkiye in the 2024-2025 academic year. The activity self-assessment form was used as the data collection tool. Descriptive analysis was used in the analysis of the data. The data obtained from the self-assessment form was transferred to writing without changing the student opinions. It was determined that the students had positive opinions regarding the teaching of historical places supported by augmented reality. It was determined that it provided permanent, fun and concrete learning for the students. Having different options while downloading the augmented reality application was seen as a difficulty. Activities can be designed for different lessons, topics and contents related to augmented reality, especially in teaching abstract concepts.

To cite this article:

Sönmez, D. (2025). An investigation into the social validity of differentiated instruction for gifted students supported by augmented reality on the topic of historical places. *Journal for the Education of Gifted Young Scientists*, *13*(3), 131-146. DOI: http://dx.doi.org/10.17478/jegys.1668145

Introduction

Today, the development levels of societies progress in direct proportion to the science and technology they create (Karasar, 2004). Therefore, educational environments cannot be considered independently of science and technology. Developments in technology are reflected in educational environments. As stated in the Ministry of National Education Life Science Curriculum, the rapid change in science and technology, the changing needs of the individual and society, innovations and developments in learning and teaching theories and approaches directly affect the roles expected from individuals. This change defines an individual who produces knowledge, can use it functionally in life, can solve problems, thinks critically, is enterprising, determined, has communication skills, can empathize, contributes to society and culture, etc. In order for all these processes to take place, technological developments must be reflected in educational environments (Özden Çınar, 2022).

Digital competence is one of the eight key competencies in the Turkish Qualifications Framework (TYÇ) (Demirbaş and Demir, 2018). Since Turkish education system aims to raise individuals with knowledge, skills and behaviors

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integrated with competencies, the use of augmented reality technology in the education process is important in developing digital competence skills.

Augmented reality (AR) is a technology that combines the real world with digital information. AR applications that offer real-time interactive environments allow users to see objects in three dimensions by combining real and virtual features (Daniela and Lytras, 2019; Özeren and Top, 2023; Turan and Atila, 2021). Three common features of augmented reality are as follows; Integration of virtual and real objects in the real world, their real-time interaction with each other, and the appropriate blending of real and virtual objects in interaction (Azuma et al. 2001).

AR applications are used in education and training processes to develop cognitive and affective skills (Jamali et al., 2014; Yılmaz and Batdı, 2016). Using augmented reality technology in the classroom environment increases the rate of participation in the lesson and supports group work, makes learning fun, increases motivation and provides effective and permanent learning (Önal, 2017). It can be used to concretize abstract concepts; It enables the subjects to be enriched with 2D models, 3D models, animations and videos. Apart from these, there are also dimensions that will save time, space and money, such as going to places that cannot be visited and seeing things that cannot be seen. For this reason, augmented reality-supported teaching of historical places can be transformed into a different, memorable and interesting activity by integrating the real world and the virtual. Considering the reflection of all these on the education process, the use of augmented reality technology in education has become increasingly widespread both in the world (Aslan, 2021).

Augmented reality technology offers opportunities in the education of all students as well as in the education of gifted students and helps them to realize their potential. The education of gifted individuals, who constitute approximately 2% of societies; raising them as individuals who produce and think about social benefit is important in terms of determining the welfare of society, its future and its position against world countries (Ünal and Er, 2015). Therefore, it should be considered important to raise gifted students who are technologically equipped. In this context, the inclusion of augmented reality in the education process and the presentation of content with materials developed with this technology will be intriguing for these students and will enable permanent learning, as well as increase awareness of augmented reality technologies.

Teaching about historical places allows students to act like historians and develop historical empathy skills. It also develops students' skills, analysis and evaluation abilities. In addition, teaching about historical places helps students become aware of national cultural values (Yesilbursa, 2008). In this respect, integrating historical place teaching with technology and using augmented reality application will also facilitate the achievement of the goals of The Century of Türkiye Education Mode. Bringing historical places that are too far to go to the classroom environment using augmented reality application is an indicator of the usefulness of technology in educational environments. Teaching about historical places with augmented reality supported by special talented primary school students will also enable these students to develop national consciousness by knowing their own history and culture, and the ability to evaluate historical changes by using technology effectively.

The basic approach of the curriculum in the The Century of Türkiye Education Mode, which aims to reach the peak of national and spiritual values and material development, aims to develop students' information, culture, digital and citizenship literacy skills with the mission from roots to the future and to make them patriotic, competent and virtuous people. With social science field skills, students will be able to develop time perception and chronological thinking, historical empathy and spatial thinking skills (Ministry of National Education [MEB], 2024a). In this context, the relationship between The Century of Türkiye Education Mode and the augmented reality-supported teaching of historical places for the gifted students addressed in the project has been revealed. The Science and Art Center (BİLSEM) Support Education Framework Curriculum, prepared as a skill-based program within the scope of The Century of Türkiye Education Mode, aims to increase national awareness by knowing the history and culture of gifted students, to develop the ability to evaluate historical changes by using technology effectively, and to develop critical thinking and scientific research process skills (MEB, 2024b). In line with this purpose, the project is related to the BİLSEM Support

Education Framework Curriculum, as the augmented reality-supported teaching of historical places for gifted students is addressed.

Aim/problem of the Study

The aim of the research is to determine the opinions of gifted students regarding the teaching of historical places supported by augmented reality.

The research question of the study is " What is the social validity of augmented reality–supported differentiated instruction practices on the topic of historical places for gifted students?" The sub-research questions of the study are as follows;

- What did gifted students learn from teaching historical places with augmented reality support?
- What did gifted students enjoy most about teaching historical placess with augmented reality?
- What did gifted students find difficult in teaching historical places with augmented reality support?
- What is the gifted student's suggestion for teaching historical places with augmented reality support?

Method

Research Model

In this study, which determined the opinions of gifted students regarding the teaching of historical places supported by augmented reality, a case study design, one of the qualitative research methods, was used. A case study is a research method that is based on the questions of "how" and "why" and allows the researcher to examine in depth a phenomenon or event that he/she cannot control (Yıldırım and Şimşek, 2018; Creswell, 2017). A case study was selected as the research model because it was the most appropriate design for the structure of the research to examine the student opinions regarding the teaching of historical places supported by augmented reality in detail and in depth.

Participants

The Onikişubat Science and Art Center located in the Onikişubat district of Kahramanmaraş province, Turkey, in the 2024-2025 academic year. The participants were 6 girls and 6 boys, aged 8-9. They had no previous experience with augmented reality technologies. This study is a qualitative research and the easily accessible case sampling method was preferred among the purposeful sampling methods since it is easier to access the participants of the study (Yıldırım and Şimşek, 2018).

Augmented Reality Application Process

For the teaching of historical places supported by augmented reality, the augmented reality historical place cards in Appendix 1 were used. First, the PTT Augmented Reality (PTTAR) application was requested to be installed on the tablet or phone. The installed application was opened and the augmented reality historical place cards in Appendix 1 (2nd Term Grand National Assembly, Sultan Ahmet Mosque, Bursa Ulu Mosque, Galata Tower, Maiden's Tower, Hagia Sophia Mosque, Anıtkabir) were scanned by the camera (Appendix 1A/1B/1C/1D/1E/1F/1G). The three-dimensional visual and audio information of the relevant historical place was opened. The students were allowed to see and examine all the determined historical places. After the application, the students were asked to make a self-assessment in order to determine their opinions about the activity. Measures were taken to ensure that this study was carried out in accordance with ethical rules in all processes.

Data Collection Tool

The activity self-evaluation form was used as a data collection tool (Appendix 2). The self-evaluation form was created by the researcher. Two experts were consulted for the questions in the self-evaluation form before the research. The self-evaluation form included 4 (four) open-ended questions.

In order to ensure the internal validity of the study, the opinions of two experts were sought for the self-assessment form created by the researcher for use in the study. Experts provided feedback on the form's clarity, content validity, and age-level suitability. In line with this, language simplification was made in 2 questions. Necessary arrangements and additions were made in line with the expert opinion. For the self-assessment form prepared, two teachers who did not participate in the study were asked to read the forms and evaluations were made in terms of readability and

understandability of the questions. The self-assessment form was reorganized in line with these evaluations. It took approximately fifteen minutes for the students to answer the questions in the self-assessment form.

Data Analysis

Descriptive analysis was used in the analysis of the data. Descriptive analysis is an analysis technique in which direct quotes are frequently used to reflect the views of the interviewees in a striking way and the results obtained are interpreted within the framework of cause-effect relationships (Yıldırım and Şimşek, 2018). In descriptive analysis, the data are transferred as unchanged quotes as obtained from the interviewees. The data obtained from the self-assessment form, the opinions of the students were transferred to the writing without changing them. The names of the students were transferred from S1 to S12. The obtained data were read, and preliminary coding was determined. Similar codes were grouped, and themes were created. In order for this research to be valid and reliable, the data analysis process was explained in detail and sample quotations belonging to the categories created were included. In addition, the analyses were conducted by two different experts. In the analyses, it was determined that there was 80% agreement between the researchers. The reliability formula suggested by Miles and Huberman (1994) was used to determine this agreement percentage. Reliability = (consensus) / (consensus) + disagreement × 100. In the concepts that could not be agreed upon, both researchers reached a common decision by discussing.

Findings

This section includes findings in line with the questions regarding the sub-objectives of the research. 4 themes, 7 categories and 16 codes were created in the research. These themes are education, teaching and learning, technological benefits and innovation, difficulties encountered, and suggestions.

Findings Regarding the First Sub-Problem and the Theme of Education, Teaching and Learning

The first sub-problem question is "What did I learn from teaching historical places supported by augmented reality?" In response to this question, students stated that they learned that they could see different historical places in the classroom using augmented reality technology (f:5), that the augmented reality application made learning easier (f:4), and that the Turkish and English voice-overs about historical places in the application provided information in different languages (f:3). In line with the data obtained from the first sub-problem, the theme of "Education, teaching and learning" was created. Table 1 includes the categories and codes related to the theme of education, teaching and learning.

Table 1. Category and code table for the theme of education, teaching and learning

Theme	Category	Code	Explanation
Education, training and learning	3D date to places oriented opinions	Accessibility	Reaching difficult the one which... date places class to the environment Moving
		Facilitation	Date places with information to learn facilitation, visual to learn to provide
		A lot Multilingualism	Different language Options with date places with relating to information of acquisition Providing
	Learning to the process oriented opinions	Concretization	History with relating to abstract concepts by concretizing learning process facilitation
		Virtual transport	Class to the environment virtual transport with date places Moving

In Table 1, in the category of views on 3D historical places in the theme of education, teaching and learning, the codes of accessibility, facilitation and multilingualism are included; in the category of views on the learning process, the codes of concretization and virtual transportation are included.

S2: "It allowed us to see historical places that we would not have been able to visit in the classroom."
S3: "The augmented reality application made our learning easier."
S9: "The fact that there are Turkish and English information voice-overs about historical places in the application was useful for us to gain information."

Findings Regarding the Second Sub-Problem and the Theme of Technological Benefits and Innovation

The second sub-problem question is "What did I enjoy most about teaching historical places supported by augmented reality?" In response to this question, students stated that seeing different historical places with augmented reality was interesting (f:4), enjoyable (f:4), and fun (f:4). In line with the data obtained from the second sub-problem, the theme of "Technological benefits and innovation" was created. Table 2 includes the categories and codes related to the theme of technological benefits and innovation.

Table 2. Category and code table for the theme of technological benefits and innovation

Theme	Category	Code	Explanation
Technological benefits and innovation	Insights into the application	Motivation	Making teaching about historical places enjoyable
		Attracting Attention	3D visuals and audio information of historical places provided attraction.
		Learning process	Facilitating the process of teaching historical places and providing visual learning
	Multilingualism	Intelligibility	Ensuring clarity with language options

In Table 2, in the category of views on application in the theme of technological benefits and innovation, the codes motivation, attention-grabbing, and learning process are included; in the category of multilingualism, the code of comprehensibility is included.

S1: *"Seeing historical places in 3D was interesting and fun."*
S4: *"Learning about historical places in a classroom environment with augmented reality created interesting, fun and permanent learning."*
S5: *"This activity was very understandable and nice. I did not encounter any difficulties."*
S7: *"It was great to see historical places and get information. I wish we could go inside the historical places."*
S11: *"The augmented reality cards and application were remarkable. It provided visual learning."*

Findings Regarding the Third Sub-Problem and Challenges Theme

The third sub-problem question is "What did I have difficulty with in teaching historical places supported by augmented reality?" In response to this question, students stated that having different options while downloading the augmented reality application made it difficult to download the application (f: 2) and some students stated that they did not have any difficulty (f: 10). The theme "Difficulties Encountered" was created in line with the data obtained from the third sub-problem. Table 3 includes the categories and codes related to the theme of difficulties encountered.

Table 3. Category and code table for the theme of challenges encountered

Theme	Category	Code	Explanation
Challenges encountered	Application installation issues	Having difficulty	The application has different download options
		No difficulties	No difficulties were encountered.

In Table 3, in the theme of difficulties encountered, the codes for experiencing difficulties and not experiencing difficulties in the application installation problems category are included.

S6: *"We gained a different learning experience with this activity. There may be confusion in choosing when downloading the augmented reality application due to the different options."*

Findings Regarding the Fourth Sub-Problem and Suggestion Theme

The fourth sub-problem question is "What is my suggestion for teaching historical places supported by augmented reality?". In response to this question, students suggested that the augmented reality application should include historical places in their own provinces (f.3), learning about augmented reality technologies (f:3), entering the historical

places in the application (f:3), some historical places could be more beautiful in the application (f:1), and the Çanakkale Martyrs' Monument should be among the augmented reality historical places cards (f:1). 2 students did not make any suggestions (f:2). The theme "Suggestion" was created in line with the data obtained from the fourth sub-problem. Table 4 includes the categories and codes related to the suggestion theme.

Table 4. Category and code table for the suggestion theme

Theme	Category	Code	Explanation
Suggestion	Proposal for the process	Getting information	Recommendations for learning more about AR
	Recommendation for implementation	Virtual Tour	Virtual tour feature by entering historical places
		Design	The visuals of some historical places could have been better
		National historical awareness	Proposal to give place to the Çanakkale Martyrs' Memorial
		The proximity principle	Suggestion that historical places in the city they live in should also have AR cards

In Table 4, in the suggestion theme, the process-oriented suggestion category included the information acquisition code; in the application-oriented suggestion category, the codes virtual tour, design, national history awareness, and proximity principle were included.

S7: "It was great to see historical places and get information. I wish we could go inside the historical places."
S8: "The implementations of some historical places could have been better."
S9: "I would suggest including the Çanakkale Martyrs' Monument among the augmented reality historical places cards."
S10: "We would also like to see augmented reality applications in the historical sites in our own province."
S12: "I want to learn about augmented reality technologies."

Conclusion and Discussion

In this section, the results obtained as a consequence of the research are discussed in line with the research questions. Based on what is learned in the augmented reality-supported teaching of historical places expressed in the first sub-problem of the research, it was concluded that gifted students learned visualization, applied learning, learning with fun, collaborative learning, concretizing abstract concepts and integrating technology-supported education methods into lessons in augmented reality-supported education. This result is similar to the studies conducted by Akın and Kızılaslan Tuncer (2024), Aktaş (2023), Akyol and Anıl (2024), Önal and Önal (2021) in the literature.

Based on what is enjoyed the most in the teaching of historical places supported by augmented reality, which is expressed in the second sub-problem of the research, it was concluded that gifted students enjoy learning by having fun and visual learning. This result is similar to the studies conducted by Aktaş (2023) and Uysal and Özdemir (2024) in the literature.

Based on the difficulties experienced in the teaching of historical places supported by augmented reality, which is expressed in the third sub-problem of the research, it was concluded that having different options while downloading the augmented reality application was seen as a difficulty for specially gifted students. This result is reported in the literature. It is similar to the studies conducted by Basumatary and Maity (2023), Özbey and Arıcı (2024).

Based on the suggestions regarding the augmented reality supported teaching of historical places expressed in the fourth sub-problem of the research, it was concluded that the gifted students wanted to see the historical places in their own provinces in practice in the augmented reality supported teaching of historical places, that they wanted the Çanakkale Martyrs' Monument to have an augmented reality application and that they wanted to receive information about augmented reality technologies.

It was concluded that the interest of gifted students in historical places increased after the augmented reality-supported teaching of historical places. In the studies conducted by Aktaş (2023) and Önal and Önal (2021), it was determined that the interest of gifted middle school students in astronomy increased as a result of the augmented reality-supported astronomy education, and in the study conducted by Yıldırım and Arıcıoğulları (2024), it was determined that the interest of middle school students in science class increased with the augmented reality applications.

As a result, it was determined that students had positive thoughts about the teaching of historical places supported by augmented reality. It was predicted that the enriched activities regarding the teaching of historical places supported by augmented reality would have positive effects on the learning process and development of specially gifted students.

Recommendations

In line with the results of the research, the following suggestions can be made; Augmented reality-supported activities can be designed for different lessons, subjects and contents, especially in teaching abstract concepts. Augmented reality technology production workshops can be created for gifted students.

Limitations of Study

This research, Limited to the 2024-2025 academic year. It is limited to 3rd grade primary school students studying at the Onikişubat Science and Art Center in the Onikişubat district of Kahramanmaraş province. Limited to the questions included in the "self-assessment form".

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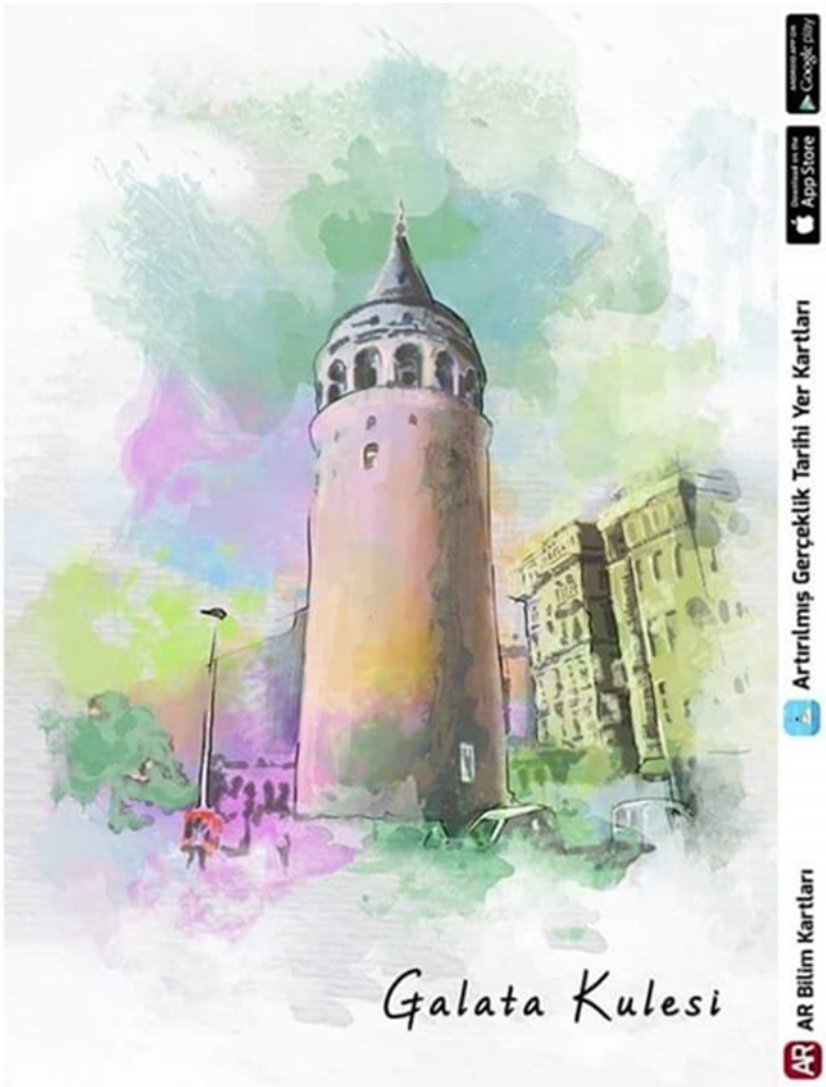
Appendix 1. PTTAR Historical Places Cards

Appendix 1/A. 2nd Term Grand National Assembly

Appendix 1/B. Sultanahmet Mosque

Appendix 1/C. Bursa Grand Mosque

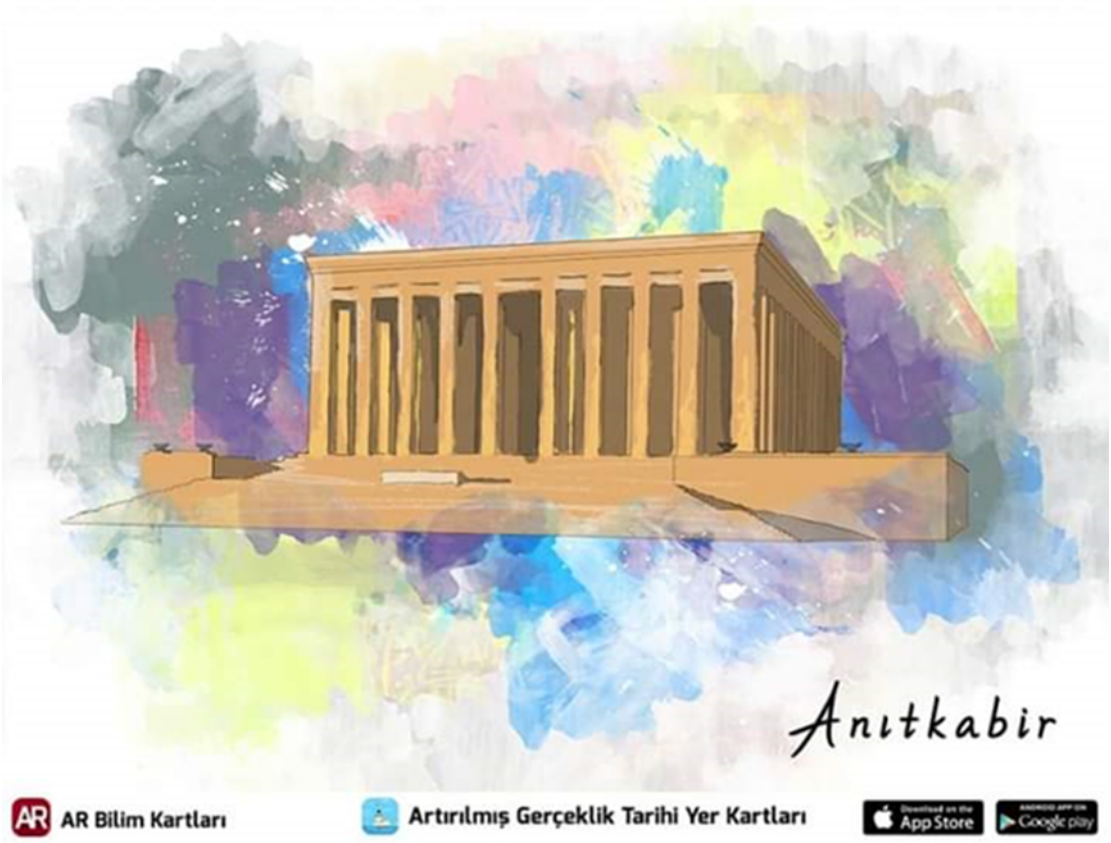
Appendix 1/D. Galata Tower



Appendix 1/E. Maiden's Tower

1/F. Hagia Sophia Mosque

Appendix 1/G. Anıtkabir



Appendix 2. Self-Assessment Form

Self-Assessment Form
Activity name: Opinions of Specially Gifted Students on Augmented Reality-Supported Historical Places Education
Explanation: Answer the following questions by taking your own opinions into account.
Q1. What did I learn in this activity?
Q2. What did I enjoy most in this activity?
Q3. What did I find most difficult in this activity?
Q4. What is my suggestion for this activity?

Thank you