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Enhancing Art Education Through Virtual Reality: The Impact of Virtual Art Museums on Junior High School Students

Siqi Wang[1]

[1] University of Nottingham, UK

Correspondence: Siqi Wang, University of Nottingham, UK.

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Abstract

Art museums have an important responsibility in education to improve the aesthetic skills and cultural heritage and innovation of junior high school students. Virtual Reality (VR) technology enables the development of Virtual Art Museums (VAMs), offering a novel and accessible educational platform, particularly beneficial for students in small and medium-sized cities by overcoming time and space limitations. This paper designs a VR-based educational activity tailored for virtual art museum education and examines how VR can address challenges inherent in traditional art education. The results demonstrate that VAMs significantly enhance students' engagement and understanding of art, providing an innovative solution to the limitations of conventional art education methods.

Keywords: virtual reality, museum education, virtual museums, experiential learning, educational technology

1. Introduction

Museum education plays a central role in the exposure of the general public to culture (Carrozzino & Bergamasco, 2010). Roberts and Lyons (2017) suggest that museum, as a type of informal learning environment, allows students to engage in inquiry-based learning in a social setting. Müller (2010) says that "museums are the most trusted institution." Art museums, as a type of museum, are institutions dedicated to the collection, conservation, exhibition and study of artworks and have a similar impact on art education. COVID-19 has forced the closure of offline museums and virtual galleries have attracted public attention. Some galleries or art institutions have begun to experiment with digital galleries. Art museums at all levels across China have also launched unique digital art museums, such as online virtual exhibitions.

The concept of virtual museums was introduced in the early 20th century (Kim, 2020). According to Biedermann (2017), virtual museums can be used as stand-alone educational tools. Fowler (2015) found that experiential, interactive, situated and collaborative learning in virtual worlds can translate into learning gains and enhance the process of knowledge input. Students can explore museum learning with a purpose and potentially develop new learning objectives (Roberts & Lyons, 2017). Shaik and Yoo (2018) state that, through virtual museums, students can not only learn about and internalise the artwork, but also have a more personal experience. Shehade and Stylianou-Lambert (2020) claim that virtual museums can shape learners' experiences and perceptions of cultural heritage. Prominent museums, such as the Louvre in France, the Tate in London, and MoMA in New York, utilize web-based 3D digital technology to create immersive, panoramic spaces. These virtual environments provide vivid, intuitive experiences that foster a deeper understanding of art. In addition, virtual museums address practical challenges faced by traditional museums, such as space limitations (Zidianakis et al., 2021). Students can access vast amounts of information tailored to their needs through virtual platforms, mitigating issues like land shortages (Biedermann, 2017).

In China, art education is a compulsory subject for junior high school students, underscoring its growing

importance in the curriculum. Students develop their thinking skills and creativity while learning the basics of art and basic skills and techniques (Zhang, 2001). However, art museums are often concentrated in large cities and economically developed areas, and students in small and medium-sized cities have little access to them. Virtual Art Museums (VAMs) break through the reality of time and space and change the educational target from a niche audience to a mass audience. In this lesson plan, students are able to experience the VAM without the constraints of time and space, primarily through the use of Virtual Reality (VR) glasses. In this open, interactive context, students can enjoy learning more easily and freely, without the pressure of traditional schooling, so that they can more effectively enhance students' visual literacy, communicate with experts or peers online, heritage and innovation. At the same time, VAM education breaks away from the traditional lecture and examination mode of education and the monotonous environment of the classroom.

2. Context

Students at junior high schools are perceptive, have a certain aesthetic foundation and are good thinkers able to investigate and solve problems. Integrating VR technology into middle school art appreciation classes can modernize teaching methods and enhance student engagement. Traditional art education often relies on abstract concepts and a teacher-centered approach, which can make lessons feel dull and disengaging. However, VR technology offers a more immersive and interactive learning experience. For instance, by using VR to view Van Gogh's "Starry Night," students can virtually enter the world Van Gogh envisioned, experiencing the environment and emotions that influenced his work. This immersive approach not only enhances visual appreciation but also deepens students' understanding of artistic techniques and cultural context, making art learning more engaging.

The participants in this activity were a teacher and a class of 30 students from a Chinese junior high school. The teacher and each student were provided with a pair of VR glasses. In the classroom, the teacher and the students entered the VAM through the VR glasses to learn and explore together. The virtual art classroom provides students with a more experiential and immersive experience, enabling them to touch, zoom in, rotate and even take apart and change artworks in virtual space. Using VR glasses to access the VAM not only allows students not only to appreciate the artwork from a different perspective but also gives teachers a broader space to teach.

3. Virtual Art Museum

The VAM uses VR and Visualization technology to bring the physical museum to life in a three-dimensional way on the Web. The VAM not only fulfils all the functions of a traditional museum, but also allows the public to use VR glasses to visit the museum anytime, anywhere and achieve effective use of information about the collection.

In the VAM, the visitor has full control over his/her navigation through the museum, as well as the freedom to explore, walk around, manipulate exhibits and create his/her own virtual experience in an interactive and flexible way. The virtual gallery is able to give an object's background information and history at the time the visitor is looking at it, together with the context and reasons for their creation as well as personal information about the artists, and if there are stored videos in the cloud, historical videos. Virtual visitors can also select exhibits with a cursor to enhance their appreciation. Importantly, visitors can create, save and share their own personal collection of 3D digital exhibits, even from different museums, according to their own interests and preferences, as well as creating their own art gallery. In My Art Gallery, users can independently curate and add their own unique interpretations to their works and share them with others. This amounts to a truly holistic and lifelong art education art education. In addition, in the VAM, the visitor is not just an observer but can interact with the exhibits and enrich his/her knowledge by collaborating with experts to create interactive and unique virtual exhibitions. The visitor's understanding is enhanced by the entire process and navigation of the virtual museum, which also stimulates and maintains interest through a rich aesthetic sensation. What's more, collectors or experts can upload private collections and artefacts that may disappear as a result of being beyond repair, natural or man-made disasters, and other factors via the cloud.

4. Virtual Reality

VR is a computer simulation system that allows the creation and experience of virtual worlds. It uses computers to generate a simulated environment in which the user is immersed. Users can interact directly with things in the virtual environment through visual, auditory and tactile sensations (Roldan et al., 2019). VR technology has three main characteristics: immersion, interactivity and perception. Immersion means that the user is inside a virtual scene generated by a computer and obtains an immersive feeling in the virtual scene by the use of VR. The viewer can take on the role of a virtual character or can role play and is able to travel through the interior of the work (sculptures etc.) for an all-encompassing experience. Interactivity supports the interaction and communication of characters in the virtual world. Imagination means that the user is immersed in multiple information spaces and is able to acquire knowledge in a holistic way, relying on their own perception and cognitive abilities. It enables a comprehensive evolution from the idea of the work to the whole structure of the

exhibition, expanding the space and field of artistic production in the most productive way.

The use of VR in museums plays an important role in the conservation of artefacts, the restoration of history and the better execution of educational and social functions. VR can be used as a technological tool to restore damaged artworks or historical environments (Carrozzino & Bergamasco, 2010). Through VR museums, these historical records can then be permanently preserved to make history and culture more accessible to a wider audience. Pavelka and Raeva (2019) suggest that real objects can be perfectly replicated through VR technology. Digital virtual artefacts can reproduce not only the shape but also the colour of the artefacts, which can give a more stunning experience of visiting. Zidianakis et al. (2021) suggest that VR produces an immersive display providing a solution for museums through a 360-degree rotating view of the exhibits. Putting on the VR glasses allows not only visits to any corner of the museum, but also observation and close study of objects without fear of damaging them. Furthermore, in a study on whether VR affects users' social experience, Parker and Saker (2020) found that spatial and social autonomy enhanced the immersive experience of users. Although this experience is fleeting, it can create a very deep impression and feeling for visitors. For example, the "Flower Dance Forest" art exhibition in Beijing in 2017 used full VR technology, where the entire exhibition was virtual and there were no real exhibits, creating an illusory world, but visitors were fascinated by this amazing technology and immersed in the exhibition.

Furthermore, according to Hürst, de Coninck, and Tan (2016), visual processing technology confirms the potential of VR museums. Visualisation technologies are computer-generated interactive simulation environments (Pavelka & Paeva, 2019). Visualisation uses computer graphics and image processing techniques to present data in charts, maps, tag clouds, animations or any graphical way that makes the content easier to understand, improving the accessibility of content expressed through the data. The display exhibition, as a visual presentation, has been an important vehicle for museums to disseminate knowledge and realise social value, but such visualisation is only a physical or pictorial presentation. True data visualisation emerges gradually with the digitisation of museums. Virtual museums establish a clearer, more complete and extensive connection between data, images and the world on a visual level, perform knowledge production and shape perceptions. In addition, the visualisation of museum collections with data makes the collections more manageable. Data visualisation helps visitors solve the problem of how to spend time most effectively in museum exhibitions and enables the development of learning interests and visual literacy in a freely chosen learning environment (Ma, Ma & Frazier, 2019).

5. Activities

Art museum education uniquely revolves around the collections and exhibitions, making it highly student-centered. In VAM classes, the teacher takes on a supervisory role, guiding students through their explorations. Initially, the teacher introduces the functions of the VAM and instructs students on how to use VR glasses to navigate the museum. Students learn how to collect objects of interest and add their own commentary to the exhibits. After establishing the lesson topic, students engage in inquiry-based learning within the VAM, taking their questions with them as they explore. When using the VAM, students have the opportunity to create personalized VAMs by adding artworks that capture their interest (Shaik & Yoo, 2018), enhancing both their understanding and the interactive nature of the museum experience. For example, VR technology allows students to compare and analyze different artworks, including identifying fake pieces, by using web-based resources for real-time comparisons. They can access detailed information about each exhibit through audio or text and search for related works by the same artist, deepening their understanding of the artist's techniques and creative process.

The VAM also offers hands-on experiences, such as creating sculptures and repairing artifacts using VR technology. This immersive interaction greatly enriches the students' experience. At the conclusion of their exploration, students share their findings with peers and teachers, showcasing their custom VAMs and receiving feedback. Take the example of exposing students to the traditional Chinese art of shadow puppets. Shadow puppets are a traditional Chinese folk art. Before visiting the virtual museum, students are asked to work in groups to find information about shadow puppets in the VAM, collaborate and share and create their own shadow artwork to be displayed in the VAM. Through VR technology, students worked in teams to create their own shadow works as they gained an insight into the folk art of shadow, giving them the opportunity to experiment with their artistic creations. During the activity, the students' interest in the shadow works after viewing the exhibition was used to introduce knowledge about traditional Chinese folk art and to teach students about the characteristics of different ethnic folk arts. Peer-to-peer collaboration allowed for new forms of artistic expression to be shared and explored.

Hein (1995) defines museum education through the lens of constructivism, emphasizing that "learners construct knowledge as they learn; they don't simply add new facts to what is known, but constantly reorganize and create both understanding and the ability to learn as they interact with the world." In line with this constructivist approach, students build their own knowledge by engaging with exhibits based on their individual needs and

expectations (Gil-Fuentetaja & Economou, 2019). For students in small and medium-sized cities, VAMs offer a significant opportunity to access and learn about art, especially in areas where physical art galleries are scarce or nonexistent. Traditionally, these students' understanding of art is limited to what they can glean from books or teachers, making it challenging for them to develop a personal connection with the subject. VAMs overcome the constraints of time and geography, allowing students to explore art galleries in other cities or countries, thereby contributing significantly to the dissemination of art education.

Traditional museums primarily serve to provide knowledge and enrichment to visitors. However, the passive nature of browsing in such settings often limits the efficiency and effectiveness of museum education. Das (2015) points out that museum exhibits can be powerful tools for experiential learning. By integrating museum exhibits with the curriculum, students can experience greater engagement, relevance, and proficiency, as their learning becomes tied to personal experiences. Similarly, Sabalis (2017) suggests that incorporating museum education into the classroom can help students build self-confidence. Jun and Bin (2011) highlight the potential of virtual museums to enhance awareness through interactive experiences, allowing learners to engage more deeply with traditional knowledge in a more vivid and memorable way. In junior high school art education, VAM empower students to take control of their learning journey. Through autonomous interaction in a virtual environment, students can acquire art appreciation knowledge and experiences that resonate with them. VAM facilitates independent inquiry-based learning, enriches the experience of art appreciation, expands the educational scope, and increases student motivation. Furthermore, VAM emphasizes the importance of active participation and self-reflection in the learning process, demonstrating how emotional engagement can significantly enhance educational outcomes.

In addition, virtual museums allow museum exhibits to be preserved digitally for a long time and enables visitors to view artworks that have been destroyed or otherwise no longer exist (Skamantzari & Georgopoulos, 2016). Not only does this effectively pass on art history and culture, it also increases student engagement with museum collections, creating fun interactions and memorable experiences that impact on engagement levels and learning. The Google Art Project, for example, works with museums around the world to capture historic paintings in their galleries in ultra-high resolution and uses Google Street View technology to capture actual museum interiors, making it possible to view famous paintings from around the world without leaving the classroom. The combination of highly effective digital media with the art form of the museum in the art curriculum and teaching process is an example of how to achieve an open, participatory, interactive and connected aesthetic education function for the museum.

6. Challenges and solutions

6.1 Breaking the Limitations of Traditional Classroom Teaching

In Chinese art education, there is a serious problem with the transmission of basic knowledge and skills, which students can only passively accept, memorise and repeat. In the art classroom, the teacher-led approach to teaching deprives students of their autonomy. In addition, students in the junior art classroom can only appreciate drawings and draw their own, but students can easily find drawing alone in art teaching boring and tedious. Traditional methods do not fully mobilise students' subjective initiative in learning and are not conducive to the cultivation of students' creative thinking. In addition, what teachers are actually teaching may not coincide with students' needs. For example, in a traditional classroom, it is difficult for students to grasp the true meaning of artworks simply by watching them on video, so they do not develop an interest in art.

Cognitive psychology believes that using VR technology to engage students' multiple senses can motivate students to view and appreciate artworks, achieve emotional and sensory resonance, and gain a deeper understanding of the images. VAM is not restricted to the classroom, but can be accessed by students at will, breaking the stereotypical school approach and broadening learning time outside of the classroom. VR makes teaching and learning digital, not only enhancing the effectiveness of the art appreciation classroom, but also improving learning efficiency and deepening internalisation of knowledge (Parker & Saker, 2020). VR has also changed the way traditional artworks are viewed. Through VR glasses, users can view works from collections around the world. For example, one Ismini craftswoman was able to interact with virtual exhibits and immerse herself in the culture of ceramic art by wearing an Oculus Quest VR Headset at home (Zidianakis et al., 2021). Real and virtual spaces allow students to develop their curiosity and maintain their attention. Therefore, some museums have developed a number of education-related mini-games with the help of digital technology that strongly engage the audience. This sort of educational mini-game can help develop students' artistic thinking (Bossavit et al., 2018). The Digital Gallery at the Metropolitan Museum of Art in New York, USA, has a 'Kids & Family' section with an interesting mini-game called 'Time Machine', which starts with a selection of "Time Periods", "Geography", "Big Ideas". The two-step process allows students to 'travel' through time and space to view the corresponding artwork.

6.2 Developing Students' Aesthetic Perception

Junior high school is an important time for students to develop their visual skills. However, many parents in China consider art to be a dispensable subject and therefore neglect the development of their children's aesthetic and cultural qualities, resulting in a low level of artistry in the art classroom. Chinese art museums have a variety of educational activities, but a single mode of teaching. Moreover, with the overload of schoolwork, students are less interested in learning about art.

Museums can connect visitors and users (Biedermann, 2017). In the process of exploring VAMs, students identify artworks, gain their own unique experiences and form their own aesthetic feelings and judgments. The gradual accumulation of aesthetic experiences in art exploration activities can enhance their own artistic expression and creative thinking skills. Shehade and Stylianou-Lambert (2020) interviewed 16 museum professionals about their views on VR and found that VR can facilitate immersive museum experiences and education. There is a realistic experience in the virtual scene, and it is the immersive, authentic stimulation that deepens perception of things and promotes the construction of relevant knowledge. Csikszentmihalyi and Csikszentmihalyi (1992) suggest that immersive experiences bring intrinsic satisfaction as people are engaged in tasks with full interest, forgetting fatigue, and keep exploring and reaching new goals. For example, the 'Battle of the Egadi' project uses VR technology to bring the viewer into the experience, with colour and audio effects enhancing the immersive experience (Pantile et al., 2016). This experience removes the influence of material life on students' aesthetics, allowing them to focus on elements of artwork such as shape, colour and texture, thereby providing an independent perception of artwork and improving aesthetic judgement. In addition, VR digitally extracts two-dimensional flat delicate images and transforms them into a three-dimensional dynamic real space, allowing the user to enter the painting and feel the real scene made by the words, helping the user to better understand the painter's creative concept. The immersive learning created through VR technology visualises and makes abstract knowledge concrete, reducing the learning difficulty for students to a certain extent, helping them to strengthen their cognitive abilities and develop logical thinking skills.

6.3 Cultural Heritage and Innovation

With the development and progress of society, more and more people are focusing on cultural heritage. Despite the high level of attention given to historical and cultural artefacts and ancient works of art, students rarely have the time and opportunity to go into museums, galleries, or even older buildings to experience the progress of human civilisation and learn about the history and culture of the past. This can lead to a lack of creative awareness among students. Moreover, many historical artefacts and artworks are disappearing. However, with increasing maturity, VR technology has been used to build and recreate the world's cultural heritage, enabling ancient cultures and artefacts to be better preserved and perpetuated. Through digital technology, museums can not only meet the needs of their users but also pass on the historical and cultural value of their exhibits (Bolognesi & Aiello, 2020). It has also been claimed that digital technology brings museums closer to their users. For example, Digital Dunhuang, which uses digital technology to scan and image Dunhuang's caves and murals, allows the public to experience Dunhuang's splendour from the comfort of their own homes. The artist Manolis produced a large number of paintings and sculptures during the COVID-19 pandemic and created a virtual exhibition of artworks, where visitors were able to appreciate all the artworks and gain valuable understanding through virtual reality technology (Zidianakis et al., 2021). Traditional conservation and restoration of historical and cultural artefacts requires a great deal of time, effort and money on the part of professionals, and the extent of restoration and presentation does not perfectly reflect the original appearance of historical artefacts. However, the use of VR to recreate historical artefacts can be achieved without damaging the artefacts themselves. Virtual museums are not limited by traditional museum architecture, and they not only have a variety of storage options but can also bring participants physically closer to the artefacts (Kim, 2020). This goes some way to avoid the possibility of secondary damage during the restoration of artefacts. For example, the National Museum of Brazil had about 20 million pieces of its collection destroyed in a fire but, through VR, AR technology on the Google Arts & Culture platform has brought back into public view a small portion of the historical artefacts that were lost. In addition, VAMs are not limited by time and space, allowing students to have a new experience while learning. VR can enhance the experience of museums and cultural heritage and can provide a reflective learning experience (Lee et al., 2020).

7. Limitations

Although VR technology has some advantages in art teaching, it also raises practical problems and difficulties in teaching. The notion that "traditional museums are better" than online museums is deeply rooted in the minds of the public. The virtual museum approach is opposed by the general public due to the fear of diminishing the value of the original exhibits (Biedermann, 2017). This is because what attracts visitors to a physical museum is a strong artistic atmosphere, which is the most essential thing missing from an online museum. The most fundamental issue is the smoothness of access to the website. Due to the speed of the network or the volume of data on the site, pages often do not load completely, which greatly reduces the experience of visiting an online

gallery. Secondly, in the case of visual websites, where viewers demand high quality images, most online galleries focus on innovative information technology and neglect to present original works in high definition. While this may attract some viewers, it does not retain them. Third, the use of VR in education also requires consideration of two important factors: the space of the gallery and social norms (Certeau, 1988). VR provides a wealth of resources and an open virtual space for teaching and learning, but it also makes it more difficult for the teacher to control the classroom. Therefore, learning in VAMs requires a high level of self-motivation. Emotional concerns (quality of mind, psychological qualities, etc.) of junior high school students may not be as important in VAMs as in traditional art education. Communication and emotion between teachers and students are weakened. Then, the rapid pace of development of VR technology may or may not lead to some teachers not being able to master and use it proficiently enough to be overwhelmed when conducting a new educational model. Finally, according to Daniela (2020), VR with immersive experiences is not only costly, but immersion can only be experienced with students' participation.

8. Conclusion

VAMs not only impact on traditional art spaces, but also provide a 'dynamic narrative' for contemporary art as a synthesis of the frontiers of modern technology, while creating the future of art museums. The museum is a place where visitors are able to engage their curiosity and attention to stimulate a desire for knowledge and continuous reflection. Web-based animations and interactive design add interest to online exhibitions and can stimulate students' interest. Applying VR technology to the VAM not only allows students to enter the world created by the painting and artist, but also engages their interest and enhances art appreciation (Shehade & Stylianou-Lambert, 2020). Virtual museums convey information through an emotional and cognitive approach (Park et al., 2019). The use of VR technology in junior high school art teaching not only improves students' visual literacy, but also develops their ability to pass on and innovate. VAMs have greatly improved the accuracy of information dissemination, but there are still some problems like website construction, public perception, student experience, etc. Future research should focus on improving students' access and addressing their emotional needs. Although VAMs are still evolving, their potential is undeniable. They bring artworks from the virtual realm into everyday life, providing students with authentic experiences of history, culture, art, and science. VAMs, with their unique cultural resources and dissemination capabilities, are poised to preserve and witness the ongoing development of history and culture.

References

Biedermann, B., (2017). 'Virtual museums' as digital collection complexes. A museological perspective using the example of Hans-Gross-Kriminalmuseum. *Museum Management and Curatorship*, *32*(3), pp. 281-297.

Bolognesi, C. and Aiello, D., (2020). Learning Through Serious Games: A Digital Design Museum for Education. *ISPRS-International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *43*, pp. 83-90.

Bossavit, B., Pina, A., Sanchez-Gil, I. and Urtasun, A., (2018). Educational games to enhance museum visits for schools. *Journal of Educational Technology & Society*, *21*(4), pp. 171-186.

Carrozzino, M. and Bergamasco, M., (2010). Beyond virtual museums: Experiencing immersive virtual reality in real museums. *Journal of Cultural Heritage*, *11*(4), pp. 452-458.

Certeau, M.J.E., (1988). The practice of everyday life.

Csikszentmihalyi, M. and Csikszentmihalyi, I.S. eds., (1992). *Optimal experience: Psychological studies of flow in consciousness*. Cambridge university press.

Daniela, L., (2020). Virtual Museums as Learning Agents. *Sustainability*, *12*(7), p. 2698.

Das, S., (2015). Using Museum Exhibits: An innovation in experiential learning. *College Teaching*, *63*(2), pp. 72-82.

Fowler, C., (2015). Virtual reality and learning: Where is the pedagogy? *British journal of educational technology*, *46*(2), pp. 412-422.

Gil-Fuentetaja, I. and Economou, M., (2019). Communicating museum collections information online: Analysis of the philosophy of communication extending the constructivist approach. *Journal on Computing and Cultural Heritage (JOCCH)*, *12*(1), pp. 1-16.

Hein, G.E., (1995). The constructivist museum. *Journal of education in Museums*, *16*(1), pp. 21-23.

Hürst, W., de Coninck, F. and Tan, X.J., (2016, November). Complementing Artworks to Create Immersive VR Museum Experiences. In *Proceedings of the 13th International Conference on Advances in Computer Entertainment Technology* (pp. 1-6).

Jun, J.Z. and Bin, W.Z., (2011, August). Ideas transforming in the public arts education of virtual museum. In

2011 6th International Conference on Computer Science & Education (ICCSE) (pp. 649-653). IEEE.

Kim, J., (2020). The archive with a virtual museum: The (im) possibility of the digital archive in Chris Marker's Ouvroir. *Memory Studies*, *13*(1), pp. 90-106.

Lee, H., Jung, T.H., tom Dieck, M.C. and Chung, N., (2020). Experiencing immersive virtual reality in museums. *Information & Management*, *57*(5), p. 103229.

Ma, J., Ma, K.L. and Frazier, J., (2019). Decoding a Complex Visualization in a Science Museum — An Empirical Study. *IEEE transactions on visualization and computer graphics*, *26*(1), pp. 472-481.

Müller, K., (2010). Museums in A Digital Age.

Pantile, D., Frasca, R., Mazzeo, A., Ventrella, M. and Verreschi, G., (2016, January). New technologies and tools for immersive and engaging visitor experiences in museums: The evolution of the visit-actor in next-generation storytelling, through augmented and virtual reality, and immersive 3d projections. In *2016 12th International Conference on Signal- Image Technology & Internet-Based Systems (SITIS)* (pp. 463-467).

Park, N., Hong, Y., Pak, H., Who Nam, J., Kim, K., Pyo, J., Gil, K. and Lee, K., (2019, November). Effects of Age and Motivation for Visiting on AR Museum Experiences. In *25th ACM Symposium on Virtual Reality Software and Technology* (pp. 1-2).

Parker, E. and Saker, M., (2020). Art museums and the incorporation of virtual reality: Examining the impact of VR on spatial and social norms. *Convergence*, *26*(5-6), pp. 1159-1173.

Pavelka Jr, K. and Raeva, P., (2019). Virtual museums — The future of historical monuments documentation and visualization. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci*, pp. 903-908.

Roberts, J. and Lyons, L., (2017). The value of learning talk: applying a novel dialogue scoring method to inform interaction design in an open-ended, embodied museum exhibit. *International Journal of Computer-Supported Collaborative Learning*, *12*(4), pp. 343-376.

Roldan, J., Lara-Osuna, R. and Gonzalez-Torre, A., (2019). The Project 'Art for Learning Art' in Contemporary Art Museums. *International Journal of Art & Design Education*, *38*(3), pp. 572-582.

Sabalis, S., (2017). Creating the Museum Experience: Using Museum Education to Teach Oral Presentation Skills in the Composition Classroom. *Pedagogy: Critical Approaches to Teaching Literature, Language, Composition, and Culture*, *17*(1), pp. 139-147.

Shaik, S.K. and Yoo, K., (2018, November). Interactive virtual exhibition: creating custom virtual art galleries using web technologies. In *Proceedings of the 24th ACM Symposium on Virtual Reality Software and Technology* (pp. 1-2).

Shehade, M. and Stylianou-Lambert, T., (2020). Virtual reality in museums: Exploring the experiences of museum professionals. *Applied Sciences*, *10*(11), p. 4031.

Skamantzari, M. and Georgopoulos, A., (2016). 3D Visualization for virtual museum development. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, *41*, p. 961.

Yun, S., (2018). Curiosity, Wonder and Museum Education. *Journal of Philosophy of Education*, *52*(3), pp. 465-482.

Zhang W. P., (2001). Rethinking art education in secondary schools. *Journal of Ningbo University: Education Science Edition* (In Chinese), *23*(4), pp. 123-124.

Zidianakis, E., Partarakis, N., Ntoa, S., Dimopoulos, A., Kopidaki, S., Ntagianta, A., Ntafotis, E., Xhako, A., Pervolarakis, Z., Kontaki, E. and Zidianaki, I., (2021). The Invisible Museum: A User-Centric Platform for Creating Virtual 3D Exhibitions with VR Support. *Electronics*, *10*(3), p. 363.