

The Impact of an Interactive Virtual Museum on Students' Attitudes Toward Cultural Heritage Education in the Region of Al Hassa, Saudi Arabia

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Abstract—The goal of this study was to investigate students' views of the interactive Virtual Museum of Al Hassa Cultural Heritage. In this context, a study was carried out during the second semester of the 2014–2015 school year among sixth-grade elementary school students in Al Hassa, Saudi Arabia. After participating in an interactive virtual museum, 118 students answered a questionnaire after the teaching intervention. SPSS v.21 was used to analyze the data. The results indicated that students had a positive attitude toward the use of an interactive virtual museum in cultural heritage education. The results support the inclusion of cultural heritage in the social studies curricula in K–12 education in Saudi Arabia in order to raise awareness and knowledge of national heritage. The results also confirmed the views of experts regarding the importance and the value of virtual museums as a method for effective learning about cultural heritage.

Index Terms—Cultural heritage education, Virtual museums, Students' attitudes

I. INTRODUCTION

The significance of cultural heritage education refers to an individual's awareness and recognition of the past. This is an essential component of an individual's identity, reality, and future. A number of studies have claimed that museums support and enhance cultural heritage education [1-4]. Reference [5] claimed that museums hold a special place in the culture of a society: "They operate as educational institutions-archiving, displaying, explaining and sometimes teaching visitors the facts and histories surrounding certain artifacts and concepts."

In this regard, educational institutions (schools and universities) have realized the significant role of museums in the development of active educational experiences for learners. Advances in information and communication technologies (ICT) and their integration in traditional practices in the classroom have reinforced students' learning. Thus, educational institutions are creating virtual museums (VMs) in their own network for educational use in classrooms. This is a new strategy implemented by educational institutions, which benefit from modern technologies such as digital and multimedia design and the Internet [6]. The use of VMs has increased the significance of assessing the impact on students' attitudes to-

ward cultural heritage and their awareness of the importance of their national cultural heritage.

A. Cultural Heritage Education

In the field of cultural heritage, knowledge sharing is an essential aspect of communication that preserves and maintains cultural collections [2]. Cultural heritage is a key area in today's knowledge society, where the "key factors are knowledge and creativity" and where the most "valuable asset is investment in intangible human and social capital" [3]. Therefore, cultural heritage education is very relevant in contemporary education.

The importance of cultural heritage education has been emphasized in the literature. Reference [3] stated, "Educational activities in the heritage field are an ideal way of giving meaning to the future by providing a better understanding of the past" (p. 131). The leadership of Saudi Arabia, similar to that of other countries, has taken a special interest in cultural heritage. Many significant resolutions involving cultural heritage have recently been adopted. Among them is King Abdullah's national project for the care of Cultural Heritage of Saudi Arabia, which was issued under Royal Decree No. 28863 dated May 20, 2014. This project has been implemented by the Saudi Commission for Tourism and Antiquities (SCTA) that aims to preserve national heritage and to raise awareness of the rehabilitation and development of national cultural heritage components. The goal is to make cultural heritage part of people's daily life as well as a source of honor and national identity [7].

The project includes 10 paths. One involves raising awareness and knowledge of national heritage directed at academic institutions such as highlighting the culture dimension in public education curricula and the museum education project. This study aimed to highlight the impact of interactive virtual museums on students' attitudes and perspectives toward their national cultural heritage. Therefore, examining the potential of VMs as effective educational tools that raise awareness and knowledge of Saudi national heritage. That is considered one of the strategies supporting museums' education project initiatives.

B. Virtual Museum

The idea of a VM was first introduced by Andre Malraux in 1947. He suggested the concept of an imaginary

museum [8], a museum without walls, locations, or spatial boundaries, with many objects surrounded by their content and information to be made accessible around the globe. Reference [9] defined VMs as *digital creation organized on a permanent or temporal basis in the service of society and its development, open to the public, which acquires, conserves, researchers, communicates and exhibits, in a digital way, the tangible and intangible heritage of humanity and its environment. It uses various forms of interactivity and immersion, for the purpose of education, research, enjoyment and enhancement of visitor experience.*

From a technical perspective, the term VM refers to various types of digital creations (visual representations), ranging from repositories of multimedia content to virtual reality and three-dimensional (3D) reconstructions that are accessible via either a physical space inside a traditional museum (or visitor center) or cyberspace (the Internet, content distributed on DVDs, etc.) [10].

VMs are digital artifacts that exploit ICT potential to address social and cultural skills by sustaining awareness and increasing knowledge in heritage, arts, and history [1]. In addition to addressing cultural heritage education, VMs often contribute to enhancing core 21st-century skills, such as communication, collaboration, digital literacy, and creativity [1, 11, 12]. Museums are interested in digitizing their collections not only to preserve the cultural heritage but to also make the information content accessible to the wider public in a manner that is attractive [8].

Similar to physical museums, VMs enjoy the same functions of acquisition, storage, documentation, research, exhibition, and communication. A virtual museum website can provide worldwide publicity. Research has revealed that 70% of people who visit a museum website would be more likely to then go and visit the physical museum [13]. Independent of technical implementation, VMs are applications oriented toward increasing knowledge and learning [1]. Giving students the ability to act on issues based on their experiences, needs, and interests not only provides knowledge that is essential but also reinforces learning availability [14].

C. VM-Based Innovative Learning Approaches

In a literature review of why people visit museums, [15] asserted that the main reason people gave for visiting museums was to learn. However, what does learning look like in the online sphere? The emergence of Web 2.0 now means that individuals have more control of what, how, where, and when they learn and consult a wide range of information sources in their own time and space [16]. The Internet and more specifically Web 2.0 have opened up a whole new approach to engaging audiences, specifically educational audiences, who are taking up these tools in droves. Reference [17] stated that "the use of Internet will inevitably change museums... the change when it comes, will not be merely technological but at its core philosophical."

Because of the power and influence of virtual museums on the learning process, they have been adopted by many educational institutions in many countries all over the world as an educational method that enriches and strengthens learning and makes it more refined. Thus, it was necessary for educators and those interested in the educational process to seize the opportunity to expand the learning experience of VMs and enhance their role in the

educational process with the effective use of modern networking technology capable of creating interactions and learning experiences with additional value that are not possible at the level of traditional educational environments.

Educational institutions consider that the use and exploration of ICT provides a cross-curricular approach combined with a holistic way of learning. Teachers must use appropriate tools to provide useful information in an attractive environment [14]. VMs are an ICT application that should be deployed in the teaching and learning process as an innovative learning approach.

Fig. 1 places VMs among several learning approaches. The constructivist learning approach, for example, focuses on learners and the meanings they make based on their prior experience, knowledge, and interests [15, 18]. The VM learning experiences provided under a constructivist framework would encourage learners to use their hands and their minds to experiment with the world and reach their own conclusions, through choosing what they want to attend to [19].

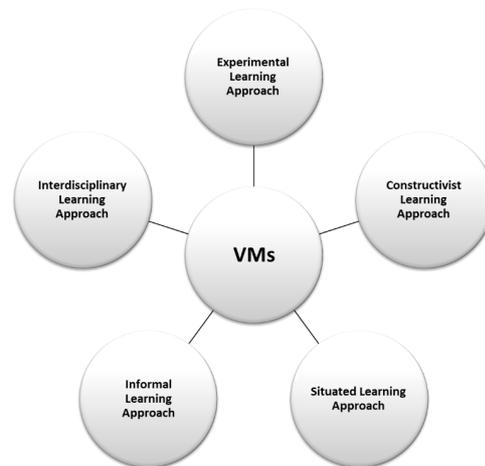


Figure 1. Positioning VMs among innovative learning approaches

ICT may guarantee access to a huge amount of information, which (by its own nature) lays itself open to be "discovered" instead of "taught." This goes in the direction of supporting an active experiential learning approach, a new method of acquiring knowledge. It offers students an active role, based on educational interaction, initiative, and creativity [14]. VMs are a new model of communication that create a personalized, immersive, and interactive learning environment that fosters students' ability to retrieve information and build up their own knowledge and therefore their approaches to learning [4, 9].

Current educational trends advocate the association between school knowledge and children's experiences with the situations, conditions, and circumstances of everyday life [14]. Situated learning approaches stress the importance of the cultural and social context where learning takes place. Since this context is strictly tied to the knowledge development process [20], school can no longer be the only place for education. Educational experiences, particularly those concerning cultural heritage, should occur in different places, so that students may directly discover the artifacts and/or environment to be studied. Therefore, students may experience their heritage in its context [4].

The informal learning approach refers to unstructured learning processes that occur spontaneously outside a formal educational setting, such as a neighborhood, workplace, marketplace, library, and museums [21]. However, today, informal learning is no longer defined only in terms of the place where learning occurs but also by the type of activities carried out and the process activated during the learning experience [4]. Students today, who are considered "digital natives" [22], are increasingly engaged in digital technology-based activities and therefore immersed deeper in self-regulated learning [23]. Thus, VM as an interactive ICT application has broadened the number of possibilities and the kind of occasions of informal learning mainly in cultural heritage.

ICT offers cultural heritage education a new, interdisciplinary dimension, by providing the possibility of looking at each artifact not only as an isolated object but also as a product within a broader intertwined network of historical, cultural, socioeconomic, and geographic links, which foster a better understanding and interpretation of the artifact itself. ICT, particularly VMs are considered "multidisciplinary educational centers" [24] that involve a number of subjects, to provide a broad perspective on the artwork [4].

D. The Potential of VMs in Cultural Heritage Education

Museums have always been perceived as having an educational role [15, 25-27]. The earliest museums were founded on the premise of "education for the uneducated masses" [28]. In the past 20 years, there has been a conceptual change from thinking about museums as places for education to places for learning, responding to the needs and interests of visitors [15]. To preserve and maintain the integrity of cultural goods, knowledge sharing generally uses substitutes to avoid the direct exposure of the real artifacts to the potential risk of deterioration. Multimedia technologies such as VMs are increasingly prevalent in cultural heritage [2].

Although [3] and [9] asserted a lack of references has been directly made as far as the use of ICT such as VMs for supporting and enhancing cultural heritage education, the opportunity to exploit the potential of ICT emerged. Today, ICT is recognized as a suitable tool for renewing and enhancing education, even in the complex sector of cultural heritage. VMs are increasingly employed for producing large archives of materials and for fostering the preservation of cultural heritage artifacts.

VMs strengthen the elements that characterize and define the collective memory of society through digitizing items and exhibiting them in cyberspace. VMs also promote social, educational, cultural, and economic objectives. Virtual museums' educational role and social contribution are achieved by increasing their communication with each social group and their extroversion cultural roles. VMs can also offer experience exchanges that encourage students' attendance [14].

The educational potential of virtual museums is widely acknowledged, although their actual use for educational purposes is still very limited, at least in a formal educational context, as [1] contended. Reference [29] asserted that the number of visits to virtual museums is equivalent to the actual visits to physical museum sites. This was confirmed by a study conducted by [24] that assessed the educational values of museum websites, pointed out that 57% of the visitors to physical museum sites visit these

museums virtually on the network before and after they visit the museum.

E. VMs and Students' Attitudes

Many studies that have evaluated the use of VMs in schools have confirmed the importance and role of virtual museums in the learning process as well as students' positive motivation and attitudes toward learning through VMs.

Reference [1] conducted a project that aimed to estimate the current level of knowledge and awareness of Italian teachers and students about VMs, as well as their perceptions and actual use. A questionnaire was distributed to 372 students and 29 teachers at upper secondary schools. The study revealed that the use of VMs in Italian schools was still low, although students and teachers think VMs are (potentially) powerful tools.

A study by [14] aimed to investigate students' views of the construction and use of virtual museums (Popular Cultural Museum) relating cultural heritage of art in the educational process. After participating in a school project concerning the construction of an educational virtual museum, 100 students participated in the study and answered a questionnaire before and after the teaching intervention. The results of the analysis showed that most students who participated in the school project had positive attitudes toward the use of these museums in education. The students justified such positive attitudes by expressing that virtual museums enable teachers to enrich the traditional method of learning with the use of information and communication technology. The students also changed their attitudes toward local art and were prompted to learn more about it, which helped them recognize the value of cultural heritage preservation. The authors asserted that after participating in this project, students were helped to increase the understanding of historical continuity in their region, to the extent that the majority believed that local art should be taught in secondary education.

Reference [30] conducted a study in Mexico with a group of undergraduate students. This study examined the effectiveness of an online 3D learning environment and its effects on visitors' discourse, attitudes, preferences, and knowledge acquisition during and after a visit to a physical museum. The results showed that the participants who used the virtual museum before the museum visit showed an increase in discourse, enjoyment, and knowledge acquisition.

Reference [31] investigated open education students' perspectives on using virtual museum applications in teaching history subjects in a Turkish learning environment. The researcher implemented a pilot study in a group of 20 students, and attitudes were measured before and after the use of the virtual museum in learning. The results showed that there was a significant difference in the students' views after they used virtual museums. The students held positive views regarding the application of the virtual museum in history lessons.

II. AIM OF THE STUDY

The present study was inspired by the King Abdullah Project for Cultural Heritage that targets the preservation of cultural heritage by raising the awareness and knowledge of Saudi citizens of their national heritage.

The present contribution aimed to explore and identify the influence of the use of an interactive virtual museum in the development of the attitudes of elementary school students toward their cultural heritage in Al Hassa. The results will help Saudi decision-makers in the educational process realize the importance of integrating and using virtual museums as an effective ICT tool in teaching cultural heritage education within social studies curricula.

A. Research Questions and Hypotheses

The current study focused on two research questions: How do virtual museums influence the development of elementary students' attitudes toward their cultural heritage in Al Hassa, Saudi Arabia? Are there any gender-based differences in using virtual museums to develop attitudes toward cultural heritage among the elementary students who participated in the study? To answer the second question, the following hypothesis was examined: There are no statistically significant gender-based differences at the 0.05 level between the means of female attitudes and male attitudes toward the use of the Virtual Museum of Al Hassa Cultural Heritage.

III. INTERVENTION: THE VIRTUAL MUSEUM OF AL HASSA CULTURAL HERITAGE

The Virtual Museum of Al Hassa Cultural Heritage was designed to create an interactive and immersive experience of historical sites, artifacts, folk games, and food. Virtual representations in this virtual museum allowed the participants to experience cultural objects within their historical context, thus enhancing awareness and understanding of their regional cultural heritage.

A. The Virtual Museum Design Stages

The interactive website of the Virtual Museum of Al Hassa Cultural Heritage was designed based on the five-stage analysis, design, development, implementation, and evaluation (ADDIE) model of educational design [32]. Fig. 2 represents the stages of the production of VM of Al Hassa Cultural Heritage: data collection, scenario, initial version, and final version.

The design of the VM of Al Hassa Cultural Heritage website was driven by one main objective: to explore the effect of VM on elementary students' attitudes toward the cultural heritage of Al Hassa.

Stage 1 was the starting point of the design and the development of the website. This stage included defining behavioral objectives of the topic that are reflected in the museum's contents. A list of these initial objectives was made, and then it was presented to a group of experts specialized in the field of curricula and teaching methods of instructions in order to get their opinion concerning how correct and accurately formulated the objectives were. The experts unanimously pronounced them as correct and recommended some modifications in the formulation. The modifications were implemented, and a final list of the museum's website objectives were made. Defining the learners' characteristics with regard to age, personality, and education was decided.

Special programs were used to design and create the webpages, while special programming languages were used to process photographs. In addition, the specifications of the computers to be used in the experiment, such as RAM, processor, and display card, as well as necessary hardware accessories, were set. An integrated work team

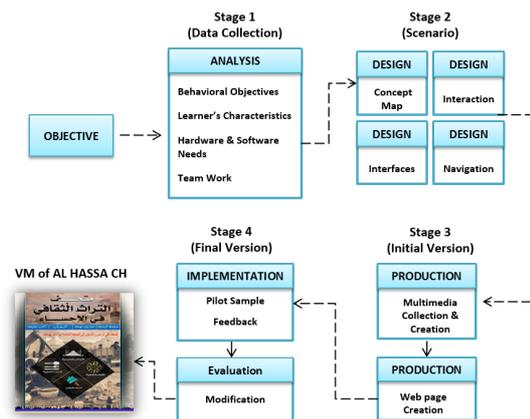


Figure 2. The stages of AI Hass VM design and creation

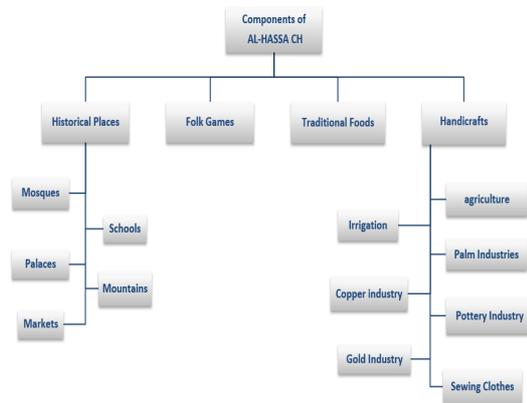


Figure 3. VM of Al Hassa cultural heritage concept map

was identified that included an editor, a designer, a multimedia programmer, and a webpage designer.

Stage 2 involved setting the scenario for the VM where the museum website is designed as a whole with the interfaces and multimedia, including the concept map through which all elements of the museum's website educational content are identified and selected in light of the educational objectives. The museum's content comprises four main elements covering significant components of Al Hassa cultural heritage: historical places, handicrafts, folk games, and traditional food. This is illustrated in Fig. 3.

The interactive interfaces were designed as multiple frame webpages in which each page is formed of three frames (the heading frame, the title of the museum; followed by the tools frame, which contains all the interactive buttons related to the site's different parts; and then the content frame, the display window through which the content of each page of the virtual museum is displayed). In addition, navigation tools on which the design relied were identified: the buttons, icons, image hyperlinks, and hot spots.

Stage 3 involved the production of the actual interactive interfaces, including creating multimedia elements such as photographs and collecting images, while those not readily available were created. Many software programs were used during this stage, including Microsoft PhotoDraw and Adobe Photoshop 8 for photographs and images, Microsoft Word for text, and Macromedia Flash MX for Flash items. Then the whole webpages were created using HTML and JavaScript. Examples of the webpages are shown in Figs. 4 and 5.



Figure 4. The homepage of the VM of Al Hassa cultural heritage



Figure 5. Example of an interactive interface of the VM of Al Hassa cultural heritage

Stage 4 consisted of the implementation and evaluation of the VM. A pilot study with a sample of 20 sixth graders with the same characteristics as the original sample population was conducted to validate the effectiveness, clarity of content, quality of artistic production, navigation and interaction type, as well as the clarity and appropriateness of the texts, photographs, and images. Feedback was sought from the participants. The results of the pilot study raised several technical navigational issues. Modifications were made. In addition, a constructive evaluation for each stage of the VM design was applied in order to implement the VM website in the main sample.

IV. METHODOLOGY

The present study followed experimental methodology as it best suits the objectives of this study, which is to determine the effectiveness of using virtual museums to influence the development of elementary students' attitudes toward cultural heritage in Al Hassa.

A. Instrument

A survey questionnaire was constructed. The questionnaire instrument consisted of 14 closed-ended statements. The participants were asked to choose an answer from a 3-point Likert scale: 1 (*disagree*), 2 (*do not know*), and 3 (*agree*).

Validity of the questionnaire was achieved by seeking the opinion of a group of experts in educational psychology about how well the instrument statements reflected the instrument subject, the accuracy of the statements, and their appropriateness. The experts resulted in large approval of the instrument in general. The experts recommended reformulating some expressions and deleting others, in addition to suggesting using new statements,

which the two researchers completed. Thus, the instrument was ready in its final form to be applied to the pilot study subjects.

Reliability of the instrument statements was measured by applying the questionnaire to a sample of 20 elementary school students as a pilot sample representing the study's population. The Cronbach alpha coefficient was calculated to determine the internal consistency with a result of 0.70, which is acceptable according to [33].

B. Participants

This study used a probability (random) sampling approach, which is a widely used, popular strategy in quantitative studies [34]. Participants were chosen among six graders from two elementary schools in Al Hassa. The study sample was 118 students; 58 students were male, and 60 students were female.

C. Data Collection and Procedures

The participants were divided by their teachers during the study experiment into smaller groups according to the capacity of the computer lab in the school where the study was implemented. An introductory session with the students was held to provide a concise introduction about the virtual museum's concept, objectives, how to access it, usage instructions, and what they were expected to explore.

After the participants had explored the website, the questionnaire was administered to assess the impact of the study intervention on their attitudes toward their national cultural heritage. The study implementation April 12–16, 2015.

SPSS v.21 was used to conduct the statistical analysis. Descriptive statistical analysis through frequency distribution, percentages, means, and standard deviation of responses was performed for each questionnaire statement. The descriptive analysis aimed to provide descriptions of the participants' demographic information, as well as to gain general insights into how the VM influenced the students' attitudes toward their national cultural heritage.

A chi-square test of statistical independence was performed in order to determine the differences in the frequencies of the participants' attitudes toward the 14 statements. In addition, an independent samples *t*-test was performed to measure the statistical differences between the means of the male and female participants in relation to their attitudes toward the cultural heritage. For the chi-square test and the *t*-test, the 0.05 alpha level was used as the criterion for statistical significance. The results are discussed in the following section.

V. RESULTS AND DISCUSSION

Quantitative data were collected through the distribution of a questionnaire instrument from a range of elementary school students within two elementary schools at Al Hassa. The data were analyzed to show students' attitudes toward cultural heritage and gender differences in the attitudes toward their cultural heritage.

A. Significance of Attitudes Toward Cultural Heritage

After the intervention implementation, student participants rated their agreement with 14 statements related to Al Hassa cultural heritage through the use of VM. Table I displays the descriptive statistics for the 14 statements and the chi-square test results.

TABLE I.
THE CHI-SQUARE TEST OF STATISTICAL INDEPENDENCE FOR ALL
QUESTIONNAIRE ITEMS (N = 118)

Items	M	SD	Test Result		
			X ²	df	p
1. Importance of identification of cultural heritage	2.93	0.31	201.4	2	.000
2. Participation in a school project about cultural heritage	2.90	0.36	190.4	2	.000
3. Importance of maintaining cultural heritage	2.95	0.27	218.3	2	.000
4. VM is an interesting tool to exhibit cultural heritage content	2.73	0.65	146.5	2	.000
5. VM helps to gain new information about cultural heritage	2.96	0.25	110.1	1	.000
6. VM enriches knowledge about cultural heritage	2.90	0.36	190.4	2	.000
7. VM helps maintain cultural heritage	2.76	0.51	120.3	2	.000
8. Enjoy participating in VM of Al Hassa Cultural Heritage	2.93	0.33	206.9	2	.000
9. Like the VM presentations of cultural heritage contents	2.88	0.41	179.8	2	.000
10. Like to view the VM contents in reality	2.90	0.36	190.4	2	.000
11. VM increases enthusiasm to actually visit VM contents	2.89	0.42	195.9	2	.000
12. Cultural heritage should become part of the social studies curriculum	2.39	0.84	50.66	2	.000
13. Like to explore more VMs that show the cultural heritage of other regions in Saudi Arabia	2.45	0.78	48.52	2	.000
14. Like to use VM again	2.59	0.74	90.78	2	.000

Note. ^a Items were measured on a 3-point Likert-type scale: 1 = disagree, 2 = do not know, 3 = agree. ^b The p value was tested at alpha level below 0.05.

The chi-square tests of statistical independence were significant for all 14 statements of the study questionnaire. The chi-square values, with two degrees of freedom for Items 1–4 and 6–14 and one degree of freedom for Item 5, ranged from 218.3 to 48.52. All p values were less than .05. The proportion of responses was not the same for all three options, and this was true for all 14 items. Most participants selected agree for all items. This result confirmed the results of [14] and [31].

The importance of cultural heritage education has been underlined in the literature review [2-4, 30]. This was supported by the findings of this study as statements 1 (M = 2.93), 2 (M = 2.90), and 3 (M = 2.95) revealed the students' positive attitudes. The result of this study is worthwhile to the leadership of Saudi Arabia with their special interest in their cultural heritage by raising awareness and knowledge of national heritage directed at academic institutions.

Data for statements 4 (M = 2.73), 7 (M = 2.76), 8 (M = 2.93), 9 (M = 2.88), and 14 (M = 2.59) indicated a significantly high level of student motivation and enjoyment of the use of VM in identifying and preserving Al Hassa cultural heritage, as evident in the literature review [8, 9, 13, 30]. Moreover, the results for statements 10 (M = 2.90) and 11 (M = 2.89) confirmed the claim in the literature [13, 24, 29] that most people who visit a museum website would subsequently be more likely to go and visit the physical museum.

VMs are a powerful ICT tool for enhancing learning and knowledge acquisition [4, 14-16, 30]. Students' responses to statements 5 (m=2.96) and 6 (m=2.90) showed significant agreement with the role of VMs in learning and enriching their knowledge of their cultural heritage. That is due to several innovative learning approaches that VMs underpin in terms of providing an interactive and interdisciplinary learning environment that is responsive to students' needs, learning styles, character, and interests in a cultural and social context.

The mean score for statement 1 to statement 11 and statement 14 ranged from 2.9 to 2.6 provided a high mean score for agreement, as shown in Table 1. Comparatively, the mean score of 2.39 for statement 12 ("I think it is essential that cultural heritage becomes part of the social studies curriculum") and the mean score of 2.45 for statement 13 ("I would like to explore more VMs that show the cultural heritage of other regions in Saudi Arabia") was lower than that for the other statements in the questionnaire.

A possible explanation for the slightly high percentage of student participants who disagreed with the inclusion of cultural heritage in social studies curriculum might be due to their fear of overloading the curriculum with cultural heritage content as an addition to the original curriculum content. The student participants who disagreed about exploring more VMs in other regions in Saudi Arabia, might have influenced by the tribal and regional prejudice that characterizes Saudi society. This suggests the importance of reinforcing national unity values in young Saudi citizens in order to form a comprehensive national identity.

B. Gender Differences in Attitudes Toward Cultural Heritage

The present study hypothesized that there were no statistical significant gender-based differences at the 0.05 level between the means of female attitudes and male attitudes toward the use of the Virtual Museum of Al Hassa Cultural Heritage. Therefore, gender differences were examined using the independent samples t-test in SPSS. The data in Table II show the means and standard deviations for male (M = 40.13, SD = 2.80) and female (M = 38.36, SD = 3.04) participants.

TABLE II.
GENDER DIFFERENCE IN PARTICIPANTS' ATTITUDES TOWARD THE USE
OF VM OF AL HASSA CULTURAL HERITAGE (N = 118)

Gender	N	M	SD	df	t-test	p
Male	58	40.13	2.806	116	3.285	0.389
Female	60	38.36	3.041			

Note. The p-value was tested at alpha level below 0.05.

The t-test reported that there were no significant statistical differences between male and female students' mean scores for the statements. This indicates a similar level of enjoyment and motivation to learning through using an interactive ICT tool such as VMs. This result supports the claim in the literature that 21st-century learners are digital natives who are driven in their learning to use interactive ICT applications despite gender or personal differences [1, 4, 22].

VI. CONCLUSION

The purpose of this study was to investigate the impact of the use of an interactive VM on the development of the attitudes of elementary school students toward their cultural heritage in Al Hassa, Saudi Arabia. This investigation provides insights into the design and use of VMs as an interactive learning application that raises the awareness and knowledge of students (who are considered young citizens of Saudi Arabia) toward their national cultural heritage and VM role in supporting cultural heritage education. The result of this study opens up new horizons for educational policymakers and curriculum designers—and those in charge of King Abdullah project—in the development of strategies that support the inclusion of national cultural heritage in the curricula as an essential component that forms the identity of Saudi citizens, through the educational process within academic institutions.

The findings of this study highlight the importance of educational value provided by virtual museums to strengthen the educational process as a source of enrichment that complements the curriculum, which works to expand the resources of traditional educational institutions and provides students with the culture and the context of diverse activities. VM is the promising future of museums in the educational process, where represents an opportunity to provide access to collectibles stored in museums, which is signifies a considerable diverse and unique advantage that can create learning environments rich and help to full integration of the learner in the learning process—that cannot be provided by any other environment. Thus, educational institutions must pay more attention to these kinds of museums to expand and enhance the learning experience.

It is essential to increase the awareness, consideration, reintegration, and development of the national cultural heritage components through the educational process and make them part of the life and memory of Saudi citizens to make them proud. Finally, this distinctive study has confirmed a number of useful findings and implications that would facilitate further research in the study area.

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