

Original article

ASSESSMENT OF ROCK ART PRESERVATION AWARENESS AMONG HAIL
UNIVERSITY STUDENTS FOR SUSTAINABLE DEVELOPMENT PURPOSE IN KSA

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Abstract:

Numerous rock art sites dating back to the Paleolithic and Neolithic eras constitute a distinctive feature of Saudi Arabia's archaeological heritage. The Kingdom of Saudi Arabia is recognized as one of the world's richest countries in terms of rock art. Three sites - Jubbah and Shuwaymis in the Hail region, and Himma in Najran - have been listed in the UNESCO World Heritage list. The Saudi authorities and organizations have placed great importance on preserving the archaeological heritage, recognizing its significance in sustainable tourism development. Raising community awareness is a critical component of any archaeological heritage preservation and management effort. This study aims to evaluate the level of awareness among Hail University students regarding the importance of rock art preservation as a source of sustainable development, and to suggest ways to improve their awareness of the preservation process. A quantitative approach was employed by distributing 204 questionnaires to a random sample of Hail University students. The findings indicate that students' awareness of rock art and its preservation is relatively low. Based on the results, several practical activities were proposed to increase the students' level of awareness.

1. Introduction

Over the last few decades, the importance of community members' contributions to the preservation and maintenance of archaeological sites has been increasingly maximized. Having a sufficient level of awareness of archaeological sites is the first step in the community's commitment to its conservation. Inadequate public awareness can often lead to the irreversible vandalism of heritage places. The success of heritage conservation initiatives depends on the awareness and participation of the local community [1]. Cultural heritage conservation has become one of the government priorities of Saudi Arabia since Vision 2030 was launched. According to Vision 2030, culture is a key component of the program to improve the quality of citizens' and residents' lives. To achieve this aim, the Kingdom is relentlessly working towards preserving its cultural heritage, which can contribute significantly to sustainable development processes. Cultural heritage is crucial in achieving smart, inclusive, and sustainable growth [2]. Saudi Arabia possesses a large number of archaeological sites that represent a diverse historical sequence extending from the Palaeolithic era to the present day [3]. These vast archaeological sites represent some of the most important

sources of cultural tourism that Saudi Arabia promotes, both domestically and internationally, to enhance its economic growth. Rock art sites constitute a significant percentage of archaeological sites in Saudi Arabia. The comprehensive surveys conducted by the Antiquities and Museums Sector of the Saudi Commission for Tourism and National Heritage revealed a huge number of rock arts sites, numbering (1500) sites, most of which were concentrated in the north of the Kingdom in Hail, Tabuk, Al-Ula and Taima regions, and in the south in Taif, Najran, Hama, Al-Baha, Abha, and Wadi Tathleeth, in the southwest. All these sites are rich in human and animal inscriptions and hundreds of thousands of Arabic inscriptions and calligraphy [4]. Saudi Arabia ranks fourth among countries in the world in terms of its richness in rock arts after Australia, Africa, and India [5]. Therefore, rock art sites constitute the most important remains of human activity of ancient civilizations, representing an era from the early Neolithic to early Islamic period, and are enriched with a variety of human and animal figures in addition to geometric and non-representational motifs [6]. Rock art plates constitute a significant record of the past that can help us understand

the tangible and intangible aspects of ancient societies in the deserts of Arabia. The knowledge gained from rock art studies fills the gap between the past and the present and increases the awareness of local society about the remarkable value of this heritage. Additionally, rock art can be a major source of economic development by promoting tourism, especially in isolated parts of the world. However, rock art is one of the most fragile elements of cultural heritage and a non-renewable resource that needs to be properly investigated, managed, and preserved [7]. Rock art represents an immovable element of the material culture created on natural rocky supports embedded in the landscape, so it is not isolated from the processes acting on the earth's surface. As rock art sites have a complex relationship with many sectors such as the environment, education, and communities, their preservation requires an interdisciplinary scientific approach. One of the most effective ways to preserve rock art sites is prevention, which is based on raising public awareness of the value of rock art and the necessity to preserve it as a source of cultural and economic development. The rationale behind this research stems from the critical role that cultural heritage, specifically rock art, plays in defining national identity and supporting sustainable economic growth through tourism. Despite the presence of numerous significant rock art sites in Hail, including UNESCO-listed sites, there is a marked lack of awareness among university students about their cultural and economic value. The local population's interest and awareness of national heritage are generally unsatisfactory [8]. This lack of awareness could lead to indifference or even detrimental actions toward these heritage sites. To potentially resulting in their degradation. effectively promote public awareness and increase appreciation of the significance of rock art and the need to conserve it, governmental or civic entities must collaborate in this area. In line with Saudi Arabia's Vision 2030, preserving cultural heritage is essential for fostering a sense of national identity. Thus, understanding and addressing the awareness gap among university students—the future leaders and custodians of cultural heritage—becomes essential. This study identified some dimensions of this gap by assessing the awareness levels of male and female students regarding rock art and exploring potential differences in their knowledge and understanding of the subject, which may influence their attitudes toward rock art preservation. The insights gained from this research could help guide the development of educational initiatives and awareness programs, which would contribute to cultural heritage preservation and enhance sustainable tourism development in Hail region.

2. Methodology

This study aimed to address the following objectives: **1)** To evaluate the levels of awareness regarding rock art among male and female students and to analyze the differences between them. **2)** To explore the correlation between students' knowledge of rock art and their attitudes toward preservation. **3)** To explore the differences between male and female students in their attitudes regarding rock art preservation. In this section, the main points of the research are first pres-

ented through a literature review, followed by a description of the research method used to collect and analyze data to achieve the objectives of the study. Based on the study's objectives and literature review, the following hypotheses can be proposed: *1st hypothesis:* Significant gender-based differences exist at the 0.05 significance level in the lack of awareness about the importance of rock art in the cultural heritage of the Kingdom of Saudi Arabia. *2nd hypothesis:* There is a statistically significant positive correlation at the 0.05 significance level between students' awareness of rock art and their attitudes toward its preservation. *3rd hypothesis:* Significant gender-based differences exist at the 0.05 significance level in attitudes toward rock art preservation.

2.1. Rock art sites in Hail region

Hail is a prominent location in the northern central region of Saudi Arabia, situated at the intersection of the Nafud and Al-Jouf regions to the north, Tabouk area to the west, Al-Madina to the southwest, and Qassim region to the southeast. It represents 6% of the total area of Saudi Arabia, fig. (1).

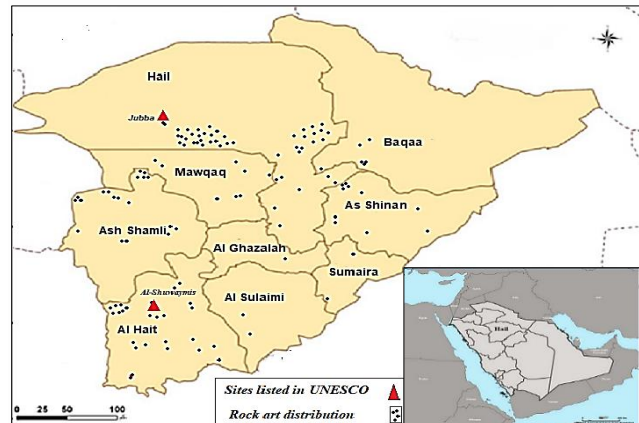


Figure (1) distribution of rock art sites in Hail region, KSA.

The recent statistics of the Heritage Commission confirm that there are 8847 archaeological sites registered in the National Archaeological record, and Hail has more than 560 archaeological sites [9]. Rock art sites constitute a significant percentage of the sites spread across many regions of Saudi Arabia. Hail region is particularly noteworthy for its abundant petroglyphs' corpus. This can be attributed to the geographical and topographical characteristics of the region, which includes vast expanses of mountains with smooth surfaces that were conducive to creating a wide variety of rock art scenes. In 1986, over 144 sites of petroglyphs were documented during the third season of the rock art survey conducted by the department of antiquities in the Hail region [10]. The number of these sites is increasing so far [11]. Two unique rock art sites in Al-Shuwaymis and Jubba had been listed as UNESCO World Heritage Sites since 2015. The two sites contain a substantial amount of rock art dating back to the pre-historic, especially Neolithic periods, as well as some dating back to the early historical and pre-Islamic periods [12]. Another remarkable rock art sites are situated in many areas in Hail including: Al-Malihiya, Sabha, Abraaq Mountain, Ghouth, Mount Hatala, Al-Safn, Jeldiyah, Mount Al-Howayed, Mahaja, Wadi Shoaib, Al-Quba, Towam, Seraan, Al Dahu Heights, Al

Assad Mountain, Al-Hwait, Hayran mountain, Al Masmaa mountain, Twall Al Nafud, Janin, Al Hait, Al Qaad, Yatib and Ash-Shamli governorate, fig. (1). The rock art at these sites is enriched with a variety of human and animal figures that represent hunting and pastoralism scenes, fig. (2).

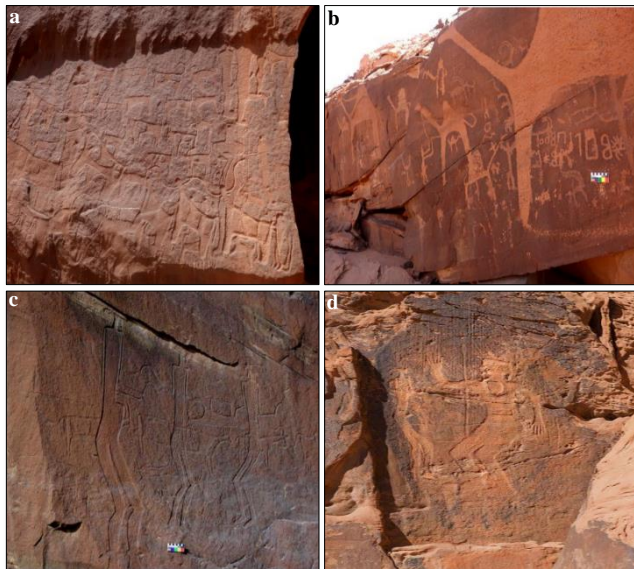


Figure (2) petroglyphs from Hail region listed in the UNESCO world heritage; **a.** Jabal Raat, Shuwaymis site complex, **b.** Jabal al-Manjor, Shuwaymis site complex (After: Bednarik, 2017), **c.** & **d.** human figure at Jubbah site complex. (After: Khan, 2013)

Many rock art panels are associated with the inscriptions of the Thamudic script [13]. The petroglyphs in Hail Province contain valuable information about the prehistoric human population in the Arabian Peninsula by providing a unique dataset related to all aspects of the environment during the prehistoric periods [14]. The Hail region's extensive and diverse collection of petroglyphs provides a significant competitive advantage for sustainable tourism development in the region. The listing of Jubbah and Al-Shuwaymis in the UNESCO World Heritage List magnifies the role of the Hail region in sustainable development domains. According to the United Nations 2030 Agenda, which states that culture is a driver of sustainable development, cultural heritage is an active principle of sustainable development [15]. It is crucial to preserve and protect these rock art sites from human and non-human destructive agents. This can be accomplished through the comprehensive management of archaeological rock art sites, guaranteeing their preservation as a sustainable archaeological resource for future generations. To attain the objectives of rock art sites management, it is essential to involve the local community in protecting, managing, and enhancing these sites as well as raising public awareness about the significance of heritage preservation [16].

2.2. Public awareness of rock art preservation

Rock art sites in Saudi Arabia are a substantial and noteworthy component of the country's archaeological heritage in terms of both quantity and diversity. Among the six heritage sites listed on the UNESCO World Heritage List, two of them are rock art sites located in Hail (Jubba and Al-Shuwaymis) and Najran (Abar-Hima). Listing rock art sites on the UNESCO World Heritage List presents both opportunities

and challenges simultaneously. On the one hand, it can provide a source of sustainable economic development by promoting tourism in the region, but on the other hand, it emphasizes the necessity of the sustainable conservation of these sites. The preservation and conservation of rock art sites in the Hail region pose a significant challenge to government and cultural heritage officials in Saudi Arabia concerning UNESCO-registered sites. The remote and isolated locations of these sites, coupled with the necessity of providing basic infrastructure, are the primary factors contributing to this challenge [17]. To effectively address the challenges faced in the preservation and maintenance of rock art sites, it is crucial to develop comprehensive plans that not only consider the technical aspects of preservation and maintenance operations but also consider the human role as a significant contributor to the success of these plans. The tourism policy strategy in Saudi Arabia is based primarily on cultured and heritage aware society in the first class in order to face the future challenges threatening the preservation of the national heritage [8]. It is evident that conservation projects that successfully meet all technical requirements cannot achieve sustainable success unless they are adopted by local people [18]. Without the recognition and appreciation of the intrinsic value of cultural heritage by local communities and the absence of public initiatives to safeguard it, the efforts of governments in the realm of heritage preservation will not be successful [19]. Undertaking efforts to increase public awareness of the cultural and economic value of rock art sites are crucial to their preservation and conservation. The inadequate understanding of petroglyphs' value creates a negative attitude toward them and a lack of commitment to their preservation. Without a sufficient level of awareness and appreciation of cultural heritage among both visitors and community residents, the preservation of cultural heritage is unlikely to be successful [20]. Community members must believe that preserving cultural heritage is closely linked to preserving their national identity [21]. Therefore, there is a great need to promote and disseminate the culture of preservation among all segments of society, particularly youth, so that they can effectively participate in the protection processes of rock art.

2.3. Data collection and processing

To achieve the objectives of this study concerned with the evaluation of Hail University students' awareness of rock art, a quantitative approach was utilized, with questionnaires serving as the primary means of data collection. The questionnaire was comprised of three sections: Part A, Part B, and Part C. Part A contained preliminary data on the respondents' characteristics. Part B contained 16 items focused on students' knowledge of petroglyphs, while Part C consisted of 11 items designed to gauge students' attitudes towards the preservation of rock art as a sustainable development resource in the Hail region. The study population consists of various faculties that represent the main academic disciplines at Hail University. Specifically, the Faculty of Arts represents the humanities sector, the Faculty of Nursing represents the medical sector, and the Faculty of Computer Science and Engineering represents the scientific and engineering sector. tab. (1). This study utilizes a random sampling

method to ensure that the data collected accurately reflects the level of public awareness regarding rock art among the different specialized sectors of the university. Three hundred and twenty (320) questionnaires were distributed electronically to the targeted groups. Two hundred and four (204) questionnaires of them were valid for analysis, while the remaining questionnaires were excluded due to validity issues.

Table (1) demographic features of the students participating in the study

Aspects	No. of respondents	Percentage
Gender		
▪ <i>Female</i>	162	79
▪ <i>Male</i>	42	21
Total	204	100
Faculties		
▪ <i>Humanity</i>	140	68
▪ <i>Scientific and engineering</i>	44	22
▪ <i>Medical</i>	20	10
Total	204	100

2.3.1. Questionnaire validity

The validity of the questionnaire was assessed as follows:

- *) Virtual honesty was assessed by presenting the initial model of the questionnaire consisting of 30 items to 12 arbitrators of archaeology professors. 80% of arbitrators' opinions were approved. Considering the amendments made by the arbitrators and verification of the accuracy of wording in the phrases, three paragraphs have been deleted. After arbitration, the final questionnaire consisted of (27) items.
- *) The honesty of internal consistency was measured by calculating the correlation coefficients (Pearson) between the degree of each paragraph and the total degree of the dimension to which the paragraph belongs to reveal the extent of consistency of the paragraphs in measuring the

dimension contained in it, as shown in tab. (2). The results obtained showed that the (Pearson) correlation coefficient values indicate that all paragraphs of the questionnaire are statistically significant at the level of (0.01) with the sum of the dimension to which they belong, which indicates that all the statements of the questionnaire are honest and valid to measure what they were prepared to measure.

- *) Exploratory Factor Analysis (EFA) was performed using the principal components method, with varimax rotation applied to determine the number of factors based on the sample responses. The analysis was carried out using SPSS statistical program with saturations defined as $> \pm 3$. The correlation matrix between the questionnaire axes is displayed in tab. (3). As can be seen from the previous matrix in table (3), every correlation coefficient value is strong and significant. To finalize the process of determining the factorial validity of the questionnaire, we describe the contributions of the questionnaire's axes, tab. (4) below. These contributions represent the commonality coefficients of the variables under the proposed factor analysis solution before axis rotation. They indicate the proportion of each variable's variance that is shared with the variance of the components". The values of contributions shown in tab. (4) indicate that the variables are effectively explained by the factors. Moreover, these factors capture the relevant information about students' attitudes and knowledge regarding rock art and its preservation. Furthermore, it is important to examine the saturation levels of the questionnaire's sub-axes on two factors, as well as their Eigenvalues and variance ratios before and after rotation, in order to fully understand the findings of the factor analysis, tab. (5).

Table (2) the values of the correlation coefficients (Pearson) of the questionnaire paragraphs

The first dimension (part B)				The second dimension (part C)			
Items	Correlation coefficients	Items	Correlation coefficients	Items	Correlation coefficients	Items	Correlation coefficients
1	0.756	9	0.821	1	0.694	7	0.725
2	0.821	10	0.795	2	0.722	8	0.756
3	0.785	11	0.752	3	0.824	9	0.826
4	0.823	12	0.818	4	0.814	10	0.699
5	0.791	13	0.715	5	0.715	11	0.714
6	0.852	14	0.756	6	0.851		
7	0.749	15	0.836				
8	0.658	16	0.799				

Table (3) matrix of correlation of the questionnaire dimensions (axes)

Dimensions	1: Knowledge related to rock art among students.	2: Students' attitudes towards the preservation of rock art as a source of sustainable development
1: Knowledge related to rock art among students.	1.00	0.736
2: Students' attitudes towards the preservation of rock art as a source of sustainable development	0.742	1.00

Table (4) contributions of questionnaire dimensions

Dimension 1	Contributions	Dimension 2	Contributions
Knowledge related to rock art among students.	0.668	Students' attitudes towards the necessity of preserving rock carvings due to their importance as a source of sustainable development	0.701

Table (5) saturation of questionnaire axes items, eigenvalues, and variance ratios before and after rotation.

No.	Paragraphs	Factor solution before rotation		Factor solution after rotation	
		The 1 st factor	The 2 nd factor	The 1 st factor	The 2 nd factor
The first dimension					
1	Petroglyphs represent one of the most important types of archaeological heritage in the kingdom	.710		.739	
2	The kingdom occupies an advanced ranking among countries that possess an archaeological heritage of petroglyphs	.815		.888	
3	There are many sites of Petroglyphs in Hail region	.822		.898	
4	The history of petroglyphs in Hail dates to about 10,000 BC	.787		.852	
5	The number of petroglyphs sites in Hail is approximately 6 sites	.717		.735	
6	It is easy to visit the places of petroglyphs in Hail	.833		.878	
7	There are four sites of petroglyphs in Hail listed in the UNESCO World Heritage list	.842		.858	
8	I visited site of Jubbah in Hail	.810		.839	
9	I visited the site of Shuwaymis in Hail	.714		.833	
10	I visited one of the other petroglyphs sites in Hail	.734		.821	
11	Petroglyphs reflect the nature of the economic and social life of the human groups that inhabited the Hail region	.735		.898	
12	Petroglyphs is found on mountain surfaces in open areas	.745		.788	
13	Petroglyphs is found in closed areas away from various environmental influences	.890		.845	
14	I learned about the petroglyphs through the audio-visual and print media	.747		.801	
15	I learned about petroglyphs through extracurricular activities at the college (field visits – attending seminars – cultural events. etc.).	.854		.744	
16	I learned about the Petroglyphs through social media	.889		.785	
The second dimension					
1	Petroglyphs are a distinctive way to introduce the history and civilization of the kingdom		.789		.865
2	Petroglyphs are one of the means of cognitive and intellectual development for members of society		.765		.763
3	Petroglyphs are one of the components of sustainable tourism development		.799		.821
4	Visiting the sites of petroglyphs is an opportunity for cultural exchange and acquaintance with other international and local communities		.853		.777
5	Attention to the preservation and maintenance of petroglyphs contributes to improving the standard of living of local communities		.786		.860
6	Preservation of petroglyphs enhances the level of cultural awareness and cultural identity of community members		.764		.758
7	Members of society play a key role in preserving petroglyphs		.811		.833
8	Preservation of petroglyphs indicates the level of urbanization of community members		.765		.821
9	Preservation of petroglyphs and is linked to the level of national belonging of community members		.711		.866
10	I have a good idea of the role of the citizen in the preservation and maintenance of petroglyphs		.743		.819
11	I have a good idea of the primary means of preserving and maintaining petroglyphs		.755		.838
Eigenvalues				4.148	2.161
Variance ratios				46.085	24.016

The analysis findings in tab. (5) illustrate that the students' questionnaire was saturated on two factors, as indicated by the prior exploratory factor analysis and the higher saturation of the included subscales: **1st Factor**: It is positively saturated in dimensions with an eigenvalue of 4.148, which accounts for approximately 46.085% of the overall variance of the matrix. **2nd Factor**: This factor also shows a positive saturation in dimensions with an eigenvalue (2.161), accounting for approximately 24.016 % of the overall variance of

the matrix. Overall, these two factors explain about 70.101% of the total variance in the matrix. Furthermore, as their eigenvalues exceed one, the questionnaire is appropriate for implementation.

2.3.2. Assessing questionnaire reliability

After verifying the internal consistency of the questionnaire, its reliability was assessed using Cronbach's alpha coefficient. The results in tab. (6) showed that the stability coefficient using Cronbach's alpha coefficient was (0.868) for the first

dimension and (0.855) for the second dimension, which are high stability coefficients, indicating the strength of the stability of the questionnaire and its full validity for application to the study sample.

Table (6) Cronbach's alpha coefficient for the questionnaire reliability.

Questionnaire Dimensions	N of items	Cronbach's alpha coefficient
The 1 st dimension	16	0.868
The 2 nd dimension	11	0.855

After collecting all the data from the study sample, they were analyzed using the Statistical Package for Social Sciences (SPSS) through the application of various statistical methods, including means, standard deviations, *t*-test, and correlation coefficients (Pearson) test. The Likert scale, which consists of five dimensions (strongly agree, agree, neuter, disagree, and strongly disagree), was used for the questionnaire. The five scores were given an estimated balance respectively (1,2,3,4,5). The weighted average values, which are expressed in the responses of the study sample, are shown in tab. (7).

Table (7) the weighted mean values of the study sample responses

The Weighted mean	The responses	The indication
1-1.79	Strongly disagree	very low awareness
1.80-2.59	Disagree	Low awareness
2.60-3.39	Neuter	Moderate awareness
3.40-4.19	Agree	High awareness
4.20-5	Strongly agree	Very high awareness

3. Results

According to the collected data, 79% of the respondents were female and 21% were male as shown in tab. (1). Most respondents (68%) were from humanities faculties, while 17% were from scientific faculties. The remaining participants (10% & 5%) were from the medical and engineering faculties, respectively. The findings from the questionnaire, which was designed to gather data on students' knowledge of rock art and their attitudes towards preserving it as a source of sustainable development, are presented and analyzed according to its dimensions and paragraphs as follows:

3.1. The 1st dimension: identifying the degree of the students' knowledge of rock art

Table (8) provides a summary of responses from the first dimension. The table shows the mean values and standard deviations for each paragraph of the dimension. Moreover, an order for each paragraph in the dimension in accordance with the mean values was included such that the highest value of the mean was assigned the number (1) and the lowest value was assigned the number (16). The data in table 5 indicates that the responses of the university students, both male and female, regarding information about rock art were at a level of disagreement, as the overall mean score was 2.17 out of 5 on a five-point Likert scale. This finding suggests that most students lacked knowledge of rock art. Furthermore, the analysis of the data presented

in the table reveals the absence of agree or strongly agree responses among the responses, confirming the lack of awareness among students regarding the significance of rock art. Concerning the paragraphs that elicited a neutral response from both male and female students, it is noteworthy that only three out of 16 paragraphs received such a response. This indicates that approximately 18.75% of the information about rock art in Saudi heritage is known to some extent among half of the sample of university students. This presents a significant challenge for developing procedures that can enhance university students' knowledge and understanding of rock art in Saudi archaeological heritage. On the other hand, a considerable number of responses (13 in total) were in the disagree and strongly disagree categories, indicating that the majority of university students were unaware of a substantial portion (81.25%) of the knowledge related to rock art. Based on the responses of male students regarding information related to rock art, their overall score was neutral, with a mean of 3.07 out of 5, on a five-point Likert scale. This suggests that approximately half of the male students lack adequate knowledge of rock art information. Specifically, 5 out of 16 paragraphs received scores (agree, strongly agree), indicating that the percentage of (31.25%) of the information on rock art is well known to male students. A neutral score on 4 items indicates that half of the majority of male students have a moderate awareness of only 25% of the rock art information. On the other hand, male students responded with disagree and strongly disagree to 7 paragraphs, indicating their lack of awareness of 43.75% of the information related to rock art. According to the responses of female students in this dimension, their overall score was disagreed, with an average of 1.93 out of 5, on a five-point Likert scale. This suggests that the majority of female students lack sufficient awareness of information related to rock art. Surprisingly, none of the 16 paragraphs received a score of agree or strongly agree, indicating that all the female students lack complete awareness of most information about rock art. Only one paragraph received a neutral response score, indicating that half of the majority of female students have an average awareness of only 6.25% of the information related to rock art mentioned in this paragraph, whereas the other half of them do not have sufficient awareness of 93.75% of the information related to rock art. Furthermore, we observed that 15 paragraphs received a response of disagree or strongly disagree. This indicates that female students do not have any awareness of 93.75% of the information related to rock art. The first dimension of the questionnaire reveals a critical finding. Students have an alarming deficiency in their knowledge of rock art. This lack of knowledge contributes to a lack of awareness regarding the significance of this archaeological heritage and the necessity to preserve it. It is vital to address this issue and ensure that students are educated on the importance of rock art and its preservation.

Table (8) knowledge related to rock art among students

No.	Paragraphs	Cat.	Weighted mean	STD	Response	Order
1	Petroglyphs represent one of the most important types of archaeological heritage in the Kingdom	M	2.33	1.02	<i>D</i>	16
		F	1.48	0.73	<i>SD</i>	16

		Total	1.66	0.86	<i>SD</i>	16
2	The kingdom occupies an advanced ranking among countries that possess an archaeological heritage of petroglyphs	M	2.38	0.92	<i>D</i>	15
		F	1.63	0.77	<i>SD</i>	13
		Total	1.78	0.85	<i>SD</i>	14
3	There are many sites of petroglyphs in Hail region	M	2.43	0.98	<i>D</i>	14
		F	1.58	0.65	<i>SD</i>	15
		Total	1.75	0.80	<i>SD</i>	15
4	The history of petroglyphs in Hail dates back to about 10,000 BC	M	2.62	0.80	<i>N</i>	10
		F	1.79	0.80	<i>SD</i>	10
		Total	1.96	0.87	<i>D</i>	12
5	The number of Petroglyphs sites in Hail is approx. 6 sites	M	2.67	0.73	<i>N</i>	8
		F	2.22	1.02	<i>D</i>	3
		Total	2.31	0.98	<i>V</i>	5
6	It is easy to visit the places of petroglyphs in Hail	M	3.10	1.30	<i>N</i>	7
		F	2.01	0.90	<i>D</i>	6
		Total	2.24	1.08	<i>D</i>	6
7	There are four sites of petroglyphs in Hail listed in the UNESCO World Heritage list	M	2.57	0.75	<i>D</i>	11
		F	1.86	0.82	<i>D</i>	9
		Total	2.01	0.85	<i>D</i>	10
8	I visited site of Jubbah in Hail	M	4.29	1.35	<i>SD</i>	2
		F	17.2	1.33	<i>D</i>	5
		Total	2.61	1.58	<i>N</i>	3
9	I visited the site of Shuwaymis in Hail	M	4.43	1.25	<i>SD</i>	1
		F	2.74	1.39	<i>N</i>	1
		Total	3.09	1.52	<i>N</i>	1
10	I visited one of the other petroglyphs sites in Hail	M	3.81	1.57	<i>A</i>	4
		F	2.21	1.25	<i>D</i>	4
		Total	2.54	1.47	<i>D</i>	4
11	Petroglyphs reflect the nature of the economic and social life of the human groups that inhabited the Hail region	M	2.44	0.87	<i>D</i>	13
		F	1.69	0.79	<i>SD</i>	12
		Total		0.87	<i>D</i>	13
12	Petroglyphs is found on mountain surfaces in open areas	M	2.52	0.75	<i>D</i>	12
		F	1.95	0.97	<i>D</i>	7
		Total	2.08	0.96	<i>D</i>	8
13	Petroglyphs is found in closed areas away from various environmental influences	M	2.69	0.66	<i>N</i>	9
		F	1.91	0.94	<i>D</i>	8
		Total	2.07	0.94	<i>D</i>	9
14	I learned about the petroglyphs through the audio-visual and print media	M	3.52	1.66	<i>A</i>	5
		F	1.75	0.87	<i>SD</i>	11
		Total	12.2	1.29	<i>C</i>	7
15	I learned about petroglyphs through extracurricular activities at the college (field visits – attending seminars – cultural events. etc.).	M	3.90	1.55	<i>A</i>	3
		F	2.31	1.36	<i>D</i>	2
		Total	2.64	1.53	<i>N</i>	2
16	I learned about the Petroglyphs through social media	M	3.48	1.86	<i>A</i>	6
		F	1.60	0.72	<i>SD</i>	14
		Total	1.97	1.30	<i>D</i>	11
General Average		M	3.07		<i>N</i>	
		F	1.93		<i>D</i>	
		Total	2.17		<i>D</i>	

N= Neutral, A= Agree, D= Disagree, SD= Strongly disagree

3.2. The 2nd dimension: Identifying students' attitudes towards the need to preserve the rock art due to their importance as a source of sustainable development

Table (9) displays the responses from the second dimension of the survey, which assessed the students' attitudes towards rock art preservation. For each paragraph in this dimension, the table shows the mean values and standard deviations, along with an order based on the mean value, where the paragraph with the highest mean is assigned number (1) and the lowest mean is assigned number (16). The data in tab. (6) indicates that the male and female university students surveyed have a negative attitude towards preserving rock art, with an overall mean of 1.80 out of 5 on the five-point Likert scale. All of the students' responses fell into the disagree or strongly disagree categories, indicating a negative view towards rock art preservation. For male students, the overall score was neutral, with a mean of 2.6 out of 5 on the

five-point Likert scale. Half of the male students showed a moderate degree of positive trends towards preservation, while the other half showed a moderate degree of negative trends. Only two out of the 11 paragraphs were rated as agree, indicating that the majority of male students had a negative attitude towards 81.8% of the paragraphs related to preservation. Two more paragraphs were rated as neutral, indicating that half of the students had a moderate degree of negative attitude towards 81.8% of the paragraphs. The remaining seven paragraphs received disagree and strongly disagree ratings, indicating that the majority of male students had negative attitudes towards 63.6% of the paragraphs related to preservation. For female students, the overall score was disagreed, with a mean of 1.60 out of 5 on the five-point Likert scale.

All of the paragraphs in the female students' responses received disagree or strongly disagree ratings, indicating that nearly 100% of the sample members had negative views on rock art preservation. This result highlights the need to

identify the causes of negative student attitudes and take prompt action to foster a positive attitude toward preserving rock art heritage.

Table (9) students' attitudes towards the preservation of rock art

No	Paragraphs	Cat.	Weighted mean	STD	Response	Order
1	Petroglyphs are a distinctive way to introduce the history and civilization of the kingdom	M	2.17	0.99	D	9
		F	1.44	0.69	SD	11
		Total	1.60	0.81	SD	11
2	Petroglyphs are one of the means of cognitive and intellectual development for members of society	M	2.43	0.93	D	4
		F	1.58	0.74	SD	6
		Total	1.75	0.85	SD	5
3	Petroglyphs are one of the components of sustainable tourism development	M	2.18	0.98	D	8
		F	1.56	0.71	SD	7
		Total	1.69	0.81	SD	7
4	Visiting the sites of petroglyphs is an opportunity for cultural exchange and acquaintance with other international and local communities	M	2.33	0.86	D	5
		F	1.49	0.73	SD	9
		Total	1.67	0.82	SD	8
5	Attention to the preservation and maintenance of petroglyphs contributes to improving the standard of living of local communities	M	2.67	1.11	N	3
		F	1.63	0.80	SD	4
		Total	1.84	0.96	D	3
6	Preservation of petroglyphs enhances the level of cultural awareness and cultural identity of community members	M	2.14	0.79	D	10
		F	1.47	0.67	SD	10
		Total	1.63	0.74	SD	10
7	Members of society play a key role in preserving petroglyphs	M	2.00	0.89	D	11
		F	1.75	0.83	SD	2
		Total	1.83	0.83	D	4
8	Preservation of petroglyphs indicates the level of urbanization of community members	M	20.2	0.75	D	6
		F	1.59	0.76	SD	5
		Total	1.71	0.79	SD	6
9	Preservation of petroglyphs and is linked to the level of national belonging of community members	M	2.19	12.1	D	7
		F	1.53	0.81	SD	8
		Total	1.66	0.92	SD	9
10	I have a good idea of the role of the citizen in the preservation and maintenance of petroglyphs	M	3.81	1.40	A	2
		F	1.73	0.85	SD	3
		Total	2.13	1.31	D	2
11	I have a good idea of the primary means of preserving and maintaining petroglyphs	M	4.05	1.36	A	1
		F	1.85	0.95	D	1
		Total	2.30	1.37	D	1
12	General Average	M	2.6		N	
		F	1.60		SD	
		Total	1.80		D	

N= Neutral, A= Agree, D= Disagree, SD= Strongly disagree

3.3. Testing of Hypotheses

Hypothesis 1: Significant gender-based differences exist at the 0.05 significance level in the lack of awareness about the importance of rock art in the cultural heritage of the Kingdom of Saudi Arabia. The analysis of the first-dimension data reveals the lack of the students' knowledge regarding the rock art sites in Hail region with an overall mean 2.17, which in turn reflects their lack of awareness. To validate the first hypothesis, an Independent Samples t-test was carried out to examine the significant difference between male and female students as shown in tab. (10). The data in the table indicate that the t-value for the difference between male and female students regarding their lack of awareness of the importance of rock art is statistically significant at the 0.05 level. The results show that female students (mean = 4.27) exhibit a greater lack of awareness compared to male students, which is possibly due to the novelty of female students being exposed to academic activities related to tourism and cultural events associated with archaeological heritage sites in the KSA held in the university. **Hypothesis 2:** There is a sta-

tistically significant positive correlation at the 0.05 significance level between students' awareness of rock art and their attitudes toward its preservation. To validate the second hypothesis, a Pearson correlation analysis was carried out to examine the correlation between students' awareness of rock art and their attitudes toward its preservation, tab. (11). This table demonstrates a statistically significant positive correlation between students' awareness of the importance of rock art and their attitudes toward its preservation. The correlation coefficient of 0.50 indicates a strong positive relationship. This means that as students become more aware of the value of rock art, their commitment to preserving it also increases. **Hypothesis 3:** Significant gender-based differences exist at the 0.05 significance level in attitudes toward rock art preservation. The results from the second dimension indicate that both male and female students generally hold a negative attitude toward the preservation of rock art, with an overall mean score of 1.80. However, when comparing the means for both genders, it is observed

that the mean for males is 2.6, which is slightly higher than the mean for females at 1.60. To investigate these differences further and assess the validity of the third hypothesis, an independent samples t-test was conducted to examine significant differences in attitudes toward rock art preservation

based on gender, tab. (12). The results show that male students (mean = 4.65) tend to preserve rock art more than females. This means they are more willing to conserve rock art, which is positively correlated with increasing their level of awareness compared to females.

Table (10) results of independent samples t-test for differences in awareness of the rock art in Saudi Arabia's cultural heritage according to gender

Gender	Number	Mean	STD	T	Significance Level
Males	42	3.74	0.58	-8.827	0.05
Females	162	4.27	0.62		

Table (11) Pearson correlation coefficient analysis between students' awareness of the rock art and their attitudes towards its preservation.

Variable	Preservation of rock art		
	Correlation value	Significance	Strength of relationship
Awareness of the rock art	0.50	0.05	High

Table (12) results of independent samples t-test for differences in attitudes toward rock art preservation according to gender.

Gender	No.	Mean	STD	T	Significance level
Males	42	4.65	0.64	-7.986	0.05
Females	162	3.88	0.75		

4. Discussion

4.1. The indications of questionnaire's results

The results of the first dimension of the study which identified the degree of the students' knowledge of rock art, revealed that both males and females had a low level of awareness about the importance of rock art and the need to preserve these sites as part of their cultural identity, with an average score of 2.17 out of five on a Likert scale. These findings were consistent with other studies [8] where he stated that the awareness of the importance of the national heritage on the part of local residents is not satisfactory. However, male students demonstrated a slightly better knowledge of rock art, with 5 out of 16 paragraphs falling into the agree and strongly agree categories compared to none among female students. Additionally, 4 paragraphs obtained a neutral level, whereas only one paragraph obtained such a grade for female students. It is noteworthy that among the responses of female students, there were no agree or strongly agree scores, which emphasizes their lack of knowledge about rock art. The t-test results confirmed the existence of gender-based differences in awareness levels, validating the first hypothesis. This difference between male and female knowledge levels may be due to the fact that the male section of the university had tourism and antiquity departments earlier than the female section and the accompanying organization of events related to archaeological heritage in general, which may have provided information about rock art. In any case, it is imperative to take immediate and practical corrective actions to increase knowledge related to rock art among both genders. The implementation of several recommendations presented in this study could contribute to bridging this knowledge gap. It is crucial to ensure that knowledge related to rock art is disseminated equally between both genders. The findings of the second dimension, which evaluated the students' attitudes towards the preservation of rock art, indicated that both male and female students had a negative attitude towards preserving rock art, with an overall mean of 1.80 out of 5 on a five-point Likert scale. It is worth noting that male

students demonstrated a slight progress compared to female students in the grades of this dimension. Two of the 16 paragraphs were in the agree category, while none were among the female students' responses. Furthermore, the male students' responses had two paragraphs in the neutral category, which was absent in the female students' responses, all of which fell under the disagree and strongly disagree categories. The t-test results confirmed the existence of gender-based differences in students' attitudes towards the preservation of rock art which validates the third hypothesis. The results show that male students tend to preserve rock art more than females which is positively correlated with increasing their level of awareness compared to females as was detected in the first dimension. The analysis of male and female students' responses in both dimensions revealed a direct correlation between their knowledge of rock art and their attitudes towards it. For male students, the overall weighted mean of the first dimension, which assessed knowledge, fell into the neutral category, and the overall weighted mean of the second dimension, which assessed attitudes, also fell into the neutral category. A similar pattern was observed for female students, as the overall weighted mean for the first dimension fell into the disagree category and the overall weighted mean for the second dimension fell into the strongly disagree category. The Pearson correlation analysis shows a strong positive correlation between students' awareness of the importance of rock art and their attitudes toward preserving it. The analysis of the questionnaire results suggests that students' lack of knowledge about rock art contributes to a negative attitude towards its preservation. Undoubtedly, this attitude is expected to directly influence students' behaviour towards rock art in their surrounding environment. The findings of this study align with previous research [1], which indicated that a lack of community awareness contributes to the degradation of cultural heritage sites. The study emphasized that raising awareness about the importance of these sites is crucial for their preservation and fosters sustainable tourism development. Additionally, the results are

consistent with other studies [2], which demonstrated that community awareness is fundamental to heritage conservation. This study found that increased awareness strengthens the community's commitment to preservation. Furthermore, the findings are consistent with other studies [21], which reported that limited knowledge of cultural heritage can lead to a lack of interest in preservation, highlighting the necessity for educational initiatives to improve community awareness. Lastly, the findings echo those of other studies [22], which indicated that when individuals have a greater understanding of environmental issues, they are more likely to be aware of problems and motivated to act responsibly. This concept applies to the findings from analysing the university students' responses in this study. The study showed that many students lacked sufficient knowledge about rock art, which resulted in a lack of interest in preserving it. Consequently, their actions towards rock art sites located in their surroundings might be detrimental and irresponsible, leading to negative outcomes, such as distortion, vandalism, or even destruction of rock art. This trend highlights the importance of developing policies and programs that foster a positive relationship between students and their environment. Providing students with the necessary knowledge, skills, and values to preserve their heritage, including understanding the importance of heritage and archaeological sites, particularly rock art, can encourage them to maintain and protect these valuable cultural assets. Developing positive attitudes and behaviour toward preserving rock art heritage is crucial for promoting sustainable development. Therefore, it is important to address the negative trends highlighted by the data.

4.2. Proposed actions for creating awareness of rock art among the university students

Public awareness of rock art is a key factor that should form the basis of policies and practices for its preservation [23]. It is essential to raise awareness about rock art, its different forms, the extent of the risks it faces, and the need for comprehensive measures to address them. This is crucial for effective planning and budgeting for conservation and management. Increasing awareness of rock art heritage among the general community, especially young people, presents a significant challenge due to its unique nature, which differs from other cultural heritage that is more readily understood by the public. Therefore, it is essential for awareness campaigns on rock art to focus on creating appreciation and respect for this type of cultural heritage by fostering a thorough comprehension of it. This can be achieved by disseminating accurate information about the cultural significance of rock art at both local and global levels. Raising awareness among youth is a collaborative effort that requires the coordination of various governmental and civil organizations, including cultural institutions, educational institutions, local specialized organizations, the investment sector, and relevant stakeholders. When developing programs to raise awareness among university students, it is important to consider both the knowledge and emotional dimensions, as the latter greatly influences their behaviour. In this regard, higher education institutions play a significant role, with their specialized faculty members who can implement initiatives to increase students' awareness of the importance of preserving archaeological heritage,

including rock art. The following initiatives are proposed to increase awareness of archaeological rock art sites among the university's internal and external communities: *) Conducting interactive workshops, seminars, and events that combine theoretical concepts about rock art with practical activities that showcase various rock art artistic styles found in the Hail region. These kinds of interactive activities are highly valued by university students due to their interactive nature and the opportunity for participants to engage with one another [24]. *) Undertaking supervised field trips to rock art sites in the Hail region, with the guidance of specialized archaeologists, to disseminate general information about unintentional and intentional human destructive agents on rock art, as well as to introduce fundamental preservation and maintenance techniques. To ensure these trips are given official and mandatory status, they could be integrated as part of the extra-curricular activities for specific courses, with a designated percentage of the course evaluation grades allocated to these activities. *) Encouraging university students, especially those in the arts departments, to create replicas of the petroglyphs from the renowned sites in the Hail region - particularly those listed by UNESCO from the Jubah and Al-Shuwaymis locations. Positioning these replicas in university courtyards and areas where students congregate can familiarize students with them and increase their appreciation for their cultural significance, ultimately motivating the preservation of these sites that are an essential aspect of their heritage. *) Partnerships with cultural institutions such as museums, cultural clubs, and libraries to organize exhibitions, workshops, and cultural events that focus on rock art preservation. *) The incorporation of educational programs that focus on the various types of archaeological heritage in the country, with a particular emphasis on rock art, into both university and pre-university curricula can play a crucial role in fostering the sustainable development of knowledge, skills, and values related to cultural heritage and the importance of preserving it as a vital component of national identity. *) Develop digital platforms to promote the dissemination of the heritage preservation culture among students. This can be achieved by designing educational websites, mobile applications, and online resources that showcase interactive and visually engaging content on rock art sites. Virtual tours, interactive maps, multimedia content, and social media campaigns can be integrated to provide a rich learning experience. The widespread use of multimedia among members of society, especially young people, can be relied upon to raise community awareness of cultural heritage [25]. *) To enhance student engagement and promote interest in rock art, academic departments should consider activating student clubs and setting aside a designated time each year to showcase topics related to rock art in the Kingdom, with a particular focus on the Hail region. *) Developing a digital newspaper for the university's website that centres on publishing content related to the archaeological heritage of Saudi Arabia, with a particular emphasis on the archaeological sites in the Hail region, particularly UNESCO-registered rock art sites and other significant locations. *) Utilizing international and national days related to cultural heritage and tourism as an opportunity to educate students and other university staff about rock art, and the importance of preserving it. *) Undertaking creative competitions that

focus on archaeological heritage and providing valuable prizes to motivate students to participate in these competitions and present innovative ideas aimed at increasing students' and the public's awareness of rock art. Such competitions can be held during cultural festivals and annual celebrations in Saudi Arabia.

5. Conclusion

The study's outcomes highlight the pressing requirement to implement various initiatives to raise awareness among Hail University students about the critical significance of rock art as a vital component of Saudi Arabia's cultural heritage. The universities must take the lead in this effort by implementing practical procedures, as suggested in this study, to promote awareness about rock art. Adequate awareness of rock art is the primary factor that helps safeguard this delicate form of archaeological heritage. The success of sustainable development initiatives for rock art sites depends on the active involvement of community members who have a thorough awareness of the significance of these sites and the need to preserve them not only as a fundamental aspect of identity but also as a means of promoting economic growth. Despite the findings of this study, future research could include a more diverse sample population, incorporating students from various universities across Saudi Arabia, as well as community members of different ages and backgrounds. This approach would help gain broader insights into public awareness of rock art. Additionally, conducting longitudinal research would allow for an examination of how awareness programs and educational interventions impact students' attitudes and behaviors over time, providing valuable insights into the sustainability of these initiatives. Future research could also investigate the effectiveness of specific types of awareness campaigns, such as those utilizing digital platforms, field trips, and interactive workshops, in enhancing students' knowledge and attitudes toward rock art.

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