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# The Participatory Relationship between Teachers of Art Education and Science in the Elementary Stage in the Development of Environmental Education Based on Arts in Najran Region

Burhan Mahmoud Hamadneh[1], Lamia Khair Eddeen[2]

*Abstract*

*Environmental issues and problems have received the attention of educators. Modern approaches to education stressed the importance of environmental education among students by shaping their environmental awareness, preserving the environment, and appreciating the value of life resources in it. Therefore, in the nineties of the twentieth century, a new approach appeared known as "environmental education based on the arts" by the Finnish art teacher, "Miri Helga Manter". She emphasized the importance of arts in teaching students issues related to the environment, developing positive attitudes towards it, and developing environmental knowledge and rational behavior among them. In addition, environmental education emphasized the participatory relationship between environmental subjects and linking them together through employing various forms of school activities to strengthen the learners' relationship with their environment. Therefore, this study aimed at identifying the level of the participatory relationship between the teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts. The descriptive survey method was used, and the study sample consisted of (123) male and female teachers: (68) Art Education teachers, and (55) Science teachers, who were randomly selected from government elementary schools in Najran region, Saudi Arabia. A questionnaire was used as a data collection tool and consisted of (22) items distributed on three dimensions: participatory planning, participatory implementation, and participatory evaluation. The results showed an average level in the responses of the study sample about the participatory relationship between teachers of Art Education and Science in the elementary stage in developing environmental education based on the arts. Also, there were*

[1] Department of Special Education, Faculty of Education, Najran University, Najran, Saudi Arabia, bmhamadneh@nu.edu.sa

[2] Department of Curriculum and Teaching, Faculty of Education, Najran University, Najran, Saudi Arabia, lmkhaireddin@nu.edu.sa

*statistically significant differences in the responses of the study sample about the level of participatory relationship between the teachers of Art Education and Science in the elementary stage in developing environmental education based on the arts due to the variables of years of experience for the category ten years or more; the educational qualification in favor of the higher studies category, and the teacher's specialization attributed to Art Education. However, there were no statistically significant differences due to the gender variable. The study recommended improving the intermediate level in the participatory relationship between Art Education and Science teachers in developing arts-based environmental education among elementary school students. Those in charge of educational policies in the Ministry of Education must develop a strategic plan to raise the level of competence and ability of these teachers to employ environmental education based on the arts in understanding and awareness of environmental issues and enhancing the value of students' love for the environment and its preservation.*

*Keywords: arts-based environmental education, participatory relationship, Art Education teachers, Science teachers, elementary stage.*

## Introduction

The environment is everything that surrounds a person such as water, air, land, and outer space, and all that these media contain in terms of inanimate objects, plants, animals, and various forms of energy, systems, natural processes, and human activities (Singh, 2011). Natural resources provide means of livelihood for billions of people and from them obtain the sources of their livelihood, survival, and continuity. When well-managed, renewable natural resources, watersheds, and productive terrestrial and marine environments, provide the foundation for inclusive and sustainable development, food security, poverty reduction, and human well-being (Sabawi, 2018). Despite this, the environment has become suffering from many problems that it did not encounter for a long time, as a result of a series of rapid economic, social, and political changes. Societies have witnessed many changes, such as manufacturing, mining, urbanization, service, and production activities (Al Kabeer, 2015). These changes have led to a group of risks and threats to the environment, such as the depletion of natural resources, waste, water pollution, air pollution, radioactive pollution, ozone depletion, pollution of the seas and oceans, and noise (Schmitz & Da Rocha, 2018). Therefore, the issues of the environment and its preservation, and solving environmental problems have received the attention of many countries and international organizations, led by the United Nations. The international conference, sponsored by the United

Nations in 1992 AD in Rio de Janeiro, Brazil, under the slogan "Environment and Evolution is the motto of the twenty-first century", had a distinguished launch on solving many environmental problems. In addition, the United Nations Climate Action Summit, which was held at the United Nations Headquarters in New York City in the United States of America in 2019, worked, together with partners, to help accelerate climate action and assist countries in reducing climate change. It also contributed to achieving the goals of the Paris Agreement on renewable energy on issues such as food security, pollution, and potable water, and promoting a more sustainable and prosperous world for all. At the level of the Kingdom of Saudi Arabia, the government has paid great attention to preserving the environment and its natural resources, in line with the requirements of the Kingdom's Vision 2030. The vision emphasized the development of nature reserves and the preservation of their components, the revitalization of ecotourism, the work to preserve the natural and vegetation environment, beaches, coasts, wildlife, reproduction and development, and the revitalization of ecotourism. It also stipulates limiting hunting and overgrazing, preventing logging, preserving and increasing vegetation cover, and preventing all kinds of encroachments on the environment, to protect the environment and natural resources from extinction (Saudi Arabia’s Vision 2030 document, pp. 20-22).

Thus, environmental issues and problems received the attention of educators. Modern trends in education see the need to take the environmental approach when developing relevant curricula such as Science and arts in order to achieve the goals of environmental education and sustainable development among students, form environmental awareness among students, and preserve the environment and its sources of life. They also help develop positive attitudes, environmental knowledge, and rational behavior. This is to preserve the environment by using different approaches and teaching strategies that are exciting for motivation and learning about the environment (Schmitz & Da Rocha, 2018). Therefore, educational institutions paid attention to the issues of environmental education for students. Environmental education is in essence one of the effective entrances to protecting the environment and one of the most important goals whose achievement is linked to ensuring the continuity of the environment within the natural pattern. It is seen as a theoretical structure that contributes to consolidating students' sense of their role to participate in solving environmental issues arising from human behavior (Salvador, Prieto, & Pastrana, 2017). Also, environmental education contributes to raising awareness among students to enhance the link between pro-environmental attitudes and behaviors. This is very important for all students of all ages and is

a crucial goal in the contemporary education context. The United Nations Decade of Education for Sustainable Development (UNDESD) stressed the need to include environmental education and environmental education in curricula, study plans, school activities, and teacher preparation programs in order to develop the necessary awareness of the environment and its protection (Padmanabhan, Borthakur, & Mittal, 2017).

Therefore, in the nineties of the twentieth century, a new entry known as "Arts-based Environmental Education" appeared and was coined for the first time by the Finnish art teacher, "Miri Helga Manter". She described arts-based environmental education as a form of learning and teaching that aims to develop environmental understanding and responsibility in learners. They become more receptive to perceptions and observations of sensation and use artistic methods to express personal environmental experiences and ideas. Art experiences improve their knowledge and understanding of the environment; therefore, Manter confirms that environmental education based on the arts can be of high value to learners in helping them to learn about the environment and its preservation and to adopt its issues by employing the different colors of the arts (Vasko, 2016). Arts-based environmental education is defined as an educational strategy that combines Art Education with environmental education and the development of art-related practices that strengthen deep connections between learners and the environment (Raatikainen et al., 2020). Art-based environmental education can also support individuals and learners with pro-environmental mindsets who love the environment and have a high sense of responsibility toward protecting the environment (Vasko, 2016). It has been shown that arts have an important role in environmental education. It explores the creative use of fine arts, such as painting, theatre, dance, sculpture, photography, composition, and artistic models, in order to enhance students' environmental awareness and connection to the environment (Abdulmajid, 2020). The arts, with their colors and shapes, and creativity can activate the senses, stimulate and enrich students' experiences, and develop their imagination.

They provide them with critical thinking using new ways to express feelings, perceptions, and reflections about environment, enhance their creativity, develop their creative thinking about the environment, and find solutions to its problems. The educational use of the arts in educational programs to enhance children's communication with the environment helps them deepen their knowledge of the environment and strengthen their relationship with it. Arts also contribute significantly to environmental education and environmental issues among learners, as they instill in their passion and positive attitudes towards the environment and its wealth and the

importance of preserving it. Therefore, it is important for educational planning and implementation to take advantage of art forms to form generations of young people to be active citizens who love the environment and are interested in its issues (Pavasileiou et al., 2020).

Therefore, the importance of the Art Education subject and the teacher of this subject appears in providing students with a good emotional, philosophical, and cognitive understanding and awareness of environmental issues by encouraging them to mold by recycling environmental materials in the production of artistic and creative works. It is also important to adopt the problems of environmental pollution through theatrical work, drawing, and displaying photographs that show the extent of environmental pollution and visual distortion and the resulting bad effects on humans and wildlife (Apritosoaie-Iftimi, 2020). It also allows students to express and address their feelings about environmental problems. This represents an important contribution to increasing students' understanding, commitment, and competence to work for sustainable development and environmental conservation (Stoll, Gårdvik, & Sørmo, 2022). In addition, it contributes to preparing various means and tools that serve the student and the community and enhance the value of the environment and their attitude towards it (Brinia et al., 2018). Therefore, the educational value of the Art Education subject and its teacher is evident in employing the colors of the arts in a way that contributes to the development of environmental education (Warskow, 2014). This can be done through the teacher employing appropriate teaching practices when planning, implementing, and evaluating Art Education subject matter and subject matter. Therefore, the present time requires the teacher of Art Education to invest all his abilities, capabilities, and experiences in order to teach Art Education, which leads to promoting environmental education and the preservation of the environment (Brinia et al., 2018).

As for Science teachers, their role in the development of environmental education among learners is highlighted compared to teachers of other disciplines due to the nature and content of the Science subject itself. It deals with many environmental issues advocated by environmental sustainability goals, including climate change, biodiversity, conservation of wild and marine life and water resources, other issues closely related to Science curricula, and the nature of knowledge reflected in Science curricula. It focuses on educational methods based on inquiry and research. This gives importance to the role of Science teachers in enhancing the benefit from the nature of Science curricula and its richness in environmental topics and issues to enhance understanding and awareness of the environment and its preservation (Hogan & O'Flaherty, 2021). The importance of Science teachers and their roles in developing

environmental education among students stems from the need to prepare an environmentally educated generation with a more sustainable environmental awareness. It is vital in transmitting the inherent respect for nature among society and in promoting general environmental culture (Bashir, et al., 2022)), especially in light of the vital role that Science teachers play in helping students acquire knowledge, positive environmental attitudes, and behaviors. Science teachers, through their specialization closely related to the environment, can spread awareness of environmental issues and maintain the sustainability of environmental resources to take into account future generations' needs (Taleb & Malkawi, 2020). Consistent with the importance of the role of Science teachers in promoting environmental education among learners in general and identifying patterns of behavior harmful to the environment and working to address them, Science teachers should employ extracurricular activities such as drawing, theater, drama, and photography in Science subject in cooperation with Art Education teachers to enhance student understanding and awareness of the environment and ways to preserve it (Hamdi, 2023). Hence, the joint teaching between teachers of environmental and sustainable development issues appears in teaching and the emphasis on the participatory relationship between teachers to achieve the goals of environmental education (Sund & Gericke, 2020). Accordingly, the study concluded the importance of integrating and collaborating between teachers of Art Education and Science teachers in supporting the curriculum in the elementary stage to increase students' connection to the environment through environmental education based on arts. The fact that Art Education and Science are among the subjects most related to environmental issues; they are fertile and full of issues that relate to the student in the environment in which he lives. In addition, the learners at this stage have the queen of imagination and curiosity, and exploration. They can be a fertile environment for the use of arts-based environmental education. Therefore, the study is hoped to be a new and important addition and contribution to the field of education, specifically in teaching Art Education and Science subjects at the Arab and international levels. It also shows the value of the participatory relationship between teachers, including Art Education and Science teachers, and cooperation between them in environmental education. Therefore, this study seriously attempted to find out the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts in Najran region. It examined the differences according to the variables of gender, years of experience, educational qualification, and the teacher's specialization, in order to understand this phenomenon in depth.

## Statement of the problem

The problem of this study emerged from the development witnessed by the current era in various fields of humanity, including the fields of art, artistic creation, and environmental education. In this era, Art Education teachers and Science teachers have become an integral part of their main axis in developing positive attitudes towards the environment. They are required to employ appropriate methods that develop different abilities and skills that make students able to become aware of the environment and its capabilities and wealth, appreciate the value of the environment and its innate and natural resources, and support their environmental education (Brinia et al., 2018). Al-Harbi (2018) stressed the need for Art Education teachers and Science teachers to be keen on their role in promoting students' love for the environment through various works and forms of art. Hamdi (2023) also emphasized the importance of the Science teacher's role in developing environmental education among school students by employing extracurricular activities such as artistic activities. Therefore, the researchers conducted an exploratory study on a sample of (30) participants of Art Education and Science teachers at the elementary stage in Najran region in the Kingdom of Saudi Arabia. They tried to identify the nature of the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts. It was found that (46.6)% of the respondents focus low degrees on the participatory relationship between them to develop environmental education based on the arts whereas (26.6)% of the sample tend to focus on the participatory relationship in developing environmental education based on the arts in medium degrees. (16.6)% of the sample use the participatory relationship to develop environmental education based on the arts to high degrees and believe in its importance whereas it was found that (10.2) of the sample do not know anything about this strategy. Accordingly, the problem of this study emerged, which can be identified in the following questions:

1. What is the level of the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts?

2. Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the gender variable?

3. Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and

Science in the elementary stage in the development of environmental education based on arts due to the variable years of experience?

4. Are there statistically significant differences at the significance level of (α = 0.05) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the educational qualification variable?

5. Are there statistically significant differences at the significance level of (α = 0.05) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the teacher's specialization variable?

Objectives of the study

This study aimed to show the level of the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts. Also, it detected the presence or absence of statistical differences in the level of the participatory relationship between teachers of Art Education and Science in the development of environmental education based on the arts according to the variables of gender, years of experience, educational qualification, and teacher specialization.

Significance of the study

The significance of this study comes from the importance of its topic, which dealt with the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts. It is based on the global interest in environmental education and environmental issues, and modern educational trends that focused on environmental education for students. The study focused on a new educational approach, which is environmental education based on the arts, which highlights students' talents and creative abilities in investing in different arts to enhance understanding and awareness of environmental issues. The study is one of the modern and original studies in teaching Art Education and teaching Science. The global, Arab, and local environment represented in the Kingdom of Saudi Arabia lacks studies that reveal the participatory relationship between teachers of Art Education and Science in developing environmental education based on the arts among students and their abilities to employ environmental issues through artistic and creative works. Thus, the study may contribute to shedding light on an important modern teaching approach that is consistent with contemporary global trends that seek to enhance the concept of environmental education among students. It is hoped that the study results will draw the attention of educational supervisors, Art Education teachers, and Science teachers

to the importance of the participatory relationship between them, to contribute to the development of environmental education based on the arts and bringing it to universality. Given the importance of this aspect in the life of young school students and the creation of a generation capable of understanding the values of environmental education and preserving the environment to serve society and its civilized movement and develop a sense of responsibility towards the environment and its preservation.

## Methodology

Research design

The descriptive survey method that describes reality as it is was followed in the current study. It is the most appropriate approach to the nature of the current study. An electronic questionnaire was used as a tool to collect the necessary data to achieve the study objectives and answer the questions that were asked.

Population and sample of the study

The study population consisted of all male and female teachers (225) of Art Education at the elementary stage in government schools in Najran region in the Kingdom of Saudi Arabia. It also included all (320) Science male and female teachers in the same schools' teachers for the academic year 2022/2023, according to the statistics of the public administration for education in the Najran region for the academic year 2022-2023. The study sample was selected by the

stratified random sampling method from male and female teachers of Art Education and Science in government elementary schools in Najran region in the Kingdom of Saudi Arabia. Their number reached (123) male and female teachers: (68) teachers of Art Education and (55) teachers of Science in the academic year 2022/2023. The study tool was distributed electronically using an electronic link on the (Google Drive) form to the study sample after it was published in the teachers' groups via the (WhatsApp) application in cooperation with the educational supervisors in the Najran educational region. Table 1 shows the distribution of the study sample according to its variables.

**Table 1. Distribution of the study sample from variables**

| Variable | Group | Freq. | % |
|---|---|---|---|
| Gender | Male | 44 | 35.8 |
| | Female | 79 | 64.2 |
| Years of experience | 10 or less | 40 | 32.5 |
| Educational qualification | 10 or more | 83 | 67.5 |
| | Bachelor | 85 | 69.1 |
| | Higher studies | 38 | 30.9 |
| | Art Education | 68 | 55.3 |

| | | | |
|---|---|---|---|
| Teachers' specialization | Science | 55 | 44.7 |
| | Total | 123 | 100.0 |

Instrument of the study

To achieve the study objectives, the study tool, a questionnaire, was developed to measure the level of the participatory relationship between the teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts. The scales used in previous studies, such as Aprotosoaie-Iftimi (2020), Abdulmajid (2020), Brinia et al. (2018), and Sund & Gericke (2020) were adopted. The final version of the tool consisted of (22) items after verifying its validity and reliability in the Saudi context. The scale was distributed in three domains: participatory planning (8 items), participatory implementation (8 items), and participatory evaluation (6 items). To estimate the responses of the study sample, a five-point scale was used (strongly agree, agree, neutral, disagree, strongly disagree). The respondent puts a sign (√) in front of each item of the tool to express his opinion and evaluation of the role of Art Education teachers in developing environmental education based on arts among elementary school students. To correct the tool, the criterion approved by Hamadneh and Almogbel (2023) was relied on by giving the values, respectively (5, 4, 3, 2, 1) for the degrees (strongly agree, agree, neutral, disagree, strongly disagree). The following scores were approved for the achievement of the study tool items and the overall result: 1.00 - 1.80 = very low, more than 1.80 - 2.60 = low, more than 2.60 - 3.40 = medium, more than 3.40 - 4.20 = high, more than 4.20 - 5.00 = very high.

Validity

The validity of the study content was verified by presenting it in its initial form to ten experts of faculty members in Art Education curricula and teaching methods, Science curricula, and teaching methods in Saudi universities. They were asked to check the suitability of the items for the domain in which they were placed and the tool as a whole. Also, they ensured the accuracy of the linguistic formulation and the tool's suitability to achieve the study objectives. In light of experts' opinions, the required amendments were made, with an agreement of 80% on the importance of amending the items. The most important remarks of the experts were rephrasing some items to be clear and measurable to the respondents. Thus, the study tool was produced in its final version, consisting of (22) items. The validity of the study tool was also verified by extracting the indications of the construct validity of the tool. The correlation coefficients of each item and domain in which it was placed and the total score of the tool were extracted. The study tool was applied to an exploratory sample from the study community and outside the main sample. It consisted of (25)

male and female teachers of Art Education in the elementary stage in Najran region. Table 2 shows the results.

**Table 2. Correlation coefficients between items, domains, and the whole scale**

| Item | Correlation coefficient with domain | Correlation coefficient with scale | Item | Correlation coefficient with domain | Correlation coefficient with scale | Item | Correlation coefficient with domain | Correlation coefficient with scale |
|---|---|---|---|---|---|---|---|---|
| 1 | .80** | .72** | 9 | .90** | .39** | 17 | .88** | .67** |
| 2 | .85** | .56** | 10 | .86** | .53** | 18 | .81** | .80** |
| 3 | .83** | .66** | 11 | .75** | .45** | 19 | .83** | .91** |
| 4 | .77** | .71** | 12 | .74** | .40** | 20 | .46** | .70** |
| 5 | .81** | .70** | 13 | .70** | .86** | 21 | .50** | .71** |
| 6 | .90** | .85** | 14 | .88** | .89** | 22 | .58** | .59** |
| 7 | .87** | .83** | 15 | .80** | .81** | | | |
| 8 | .80** | .75** | 16 | .62** | .59** | | | |

**Statistically significant at the significance level (0.05).

Table 2 shows that the correlation coefficients of the items with the tool as a whole ranged between (0.39-0.91) and the domain (0.46-0.90). It should be noted that all correlation coefficients were of acceptable and statistically significant degrees. Therefore, none of these items was deleted. These results confirm the tools' validity to measure what is intended to measure.

Reliability of the study tool

The reliability of the study tool was verified in two ways: the test-retest method. The tool was applied to a survey sample consisting of (30) male and female teachers of Art Education in Najran region. They were chosen from the study population and outside its sample. Then, in two weeks, the tool was re-applied to the same sample. After that, the Pearson correlation coefficient was calculated between the respondents' scores on the tool total and its domains in the two application times. As for the second method, the internal consistency reliability coefficient (Cronbach's Alpha) was calculated for the tool as a whole and its domains. Table 3 shows the results.

**Table 3. The coefficients of test-retest and internal consistency "Cronbach's alpha" on the domains and overall score of the study tool**

| No | Domain | No. of items | Test-retest | Internal consistency |
|---|---|---|---|---|
| 1 | Participatory planning | 8 | 0.85 | 0.85 |

| | | | | |
|---|---|---|---|---|
| 2 | Participatory implantation | 8 | 0.89 | 0.74 |
| 3 | Participatory evaluation | 6 | 0.81 | 0.78 |
| | Total | 22 | 0.91 | 0.83 |

Table 3 shows that the reliability coefficients for the domains of the study tool using the test-retest method ranged between (0.81-0.89), and for the tool as a whole in the same way, the reliability coefficient was (0.91). The reliability coefficients for the domains of the study tool using the internal consistency method ranged between (0.74-0.85) and the tool as a whole in the same way (0.83). These values were considered appropriate for the study.

Data analysis

To answer the study questions, the means and standard deviations were used to know the role of Art Education teachers in developing environmental education based on artistic elementary students. Also, the t-test for the independent samples was sued to explain the statistical differences in the role of Art Education teachers in developing environmental education based on the arts of elementary school students according to sex variables (male, female), years of experience (less than 10 years and more than 10 years, the educational qualification (Bachelor and higher Studies), and the teacher's specialization (Art Education, Science). From the point of view of Audah and Alqadi (2016), the t-test for independent samples is appropriate when comparing the mean derived from independent samples that may be the variable used in the composition of the groups already exists. However, a cutting point can be provided on a constant variable to create groups dynamically during the analysis. The test was used after its conditions were achieved to indicate the mean differences. They are the size of each sample, where each category exceeds (30) individuals, the difference between the size of research samples was close, and the extent of homogeneity of the sample in terms of its affiliation to one nature, which is teachers of the Science subject and teachers of the Art Education subject in the elementary stage in Najran region of the Kingdom of Saudi Arabia. They are similar in their cultural and social characteristics and the extent of moderation of the repetitive distribution of both research samples. The data was free from extreme or random values, and the data curve was moderate and similar to the shape of the bell as confirmed by Kolmogorov-Smirnov Test for Normality.

## Study results

Results of the first research question: What is the level of the participatory relationship between teachers of Art Education and

Science in the elementary stage in the development of environmental education based on the arts?

To answer this question means and standard deviations were extracted for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students. Table 4 shows the results.

Table 4. Means and standard deviations for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students in descending order

| Rank | No. | Domain | Mean | Standard deviation | Degree |
|---|---|---|---|---|---|
| 1 | 1 | Participatory planning | 3.30 | 1.18 | Medium |
| 2 | 2 | Participatory implantation | 3.26 | 0.88 | Medium |
| 3 | 3 | Participatory evaluation | 3.15 | 0.89 | Medium |
| | | Total | 3.23 | 0.93 | Medium |

Table 4 shows that the means for the domains of the study tool ranged between (3.15-3.30). The domain of participatory planning ranked first with the highest mean (3.30), and standard deviation (1.18) with a medium level. The domain of participatory implementation came in second place with a mean of (3.26) and a standard deviation of (0.88) at a medium level whereas the domain of participatory evaluation came in third place with a mean of (3.15) and a standard deviation of (0.89) at a medium level. The mean of the level of the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts as a whole was (3.23) and a standard deviation of (0.93) with an average level.

Results of the second research question: Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the gender variable?

To answer this question, the means and standard deviations were extracted for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to the gender variable. To show the statistical differences between the means, the t-test for independent samples was used. Table 5 shows the results.

**Table 5. Means, standard deviations, and the t-test for independent samples of the impact of the gender variable on the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students**

| Domain | Gender | No. | Mean | Standard deviation | t | df | Sig. |
|---|---|---|---|---|---|---|---|
| Participatory planning | Male | 44 | 3.41 | 1.19 | .558 | 121 | .578 |
| | Female | 79 | 3.24 | 1.18 | | | |
| Participatory implemnetation | Male | 44 | 3.26 | 1.04 | .036 | 121 | .971 |
| | Female | 79 | 3.26 | 0.79 | | | |
| Participatory evaluation | Male | 44 | 3.26 | 1.00 | 1.078 | 121 | .283 |
| | Female | 79 | 3.08 | 0.81 | | | |
| Total | Male | 44 | 3.31 | 1.04 | .639 | 121 | .524 |
| | Female | 79 | 3.19 | 0.86 | | | |

Table 5 shows that there were no statistically significant differences at the significance level of (0.05) in the study sample's response about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in developing environmental education based on arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) was attributed to the effect of the gender variable. The calculated t-values on the domains of the study tool (participatory planning, participatory implementation, participatory evaluation) were (.558), (.036), (1.078) with statistical significances (.578), (.971), (.283) respectively. It was also found that there were no statistically significant differences at the significance level (0.05) in the study sample's responses about the level of the participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts on the total score due to the effect of the gender variable. The calculated t-value was (.639) with a statistical significance of (.524).

Results of the third research question: Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the variable years of experience?

To answer this question, the means and standard deviations were extracted for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to the experience variable. To show the statistical differences between the means, the t-test for independent samples was used. Table 6 shows the results.

**Table 6. Means, standard deviations, and the t-test for independent samples of the impact of the experience variable on the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students**

| Domain | Experience | No. | Mean | Standard deviation | t | df | Sig. |
|---|---|---|---|---|---|---|---|
| Participatory planning | -10 years | 40 | 3.01 | 0.96 | 2.117 | 121 | .036 |
| | + 10 years | 83 | 3.44 | 1.25 | | | |
| Participatory implemnetation | -10 years | 40 | 3.03 | 0.69 | 2.060 | 121 | .042 |
| | + 10 years | 83 | 3.38 | 0.94 | | | |
| Participatory evaluation | -10 years | 40 | 2.87 | 0.71 | 2.488 | 121 | .014 |
| | -10 years | 83 | 3.28 | 0.92 | | | |
| Total | + 10 years | 40 | 2.96 | 0.71 | 2.269 | 121 | .025 |
| | -10 years | 83 | 3.37 | 0.99 | | | |

According to Table 6, there were statistically significant differences at the significance level of (0.05) in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in developing environmental education based on the arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) due to the effect of the variable years of experience. The differences were in favor of the category 10 years and over. The t-calculated values on the domains of the study tool (participatory planning, participatory implementation, participatory evaluation) were (2.117), (2.060), (2.488) with statistical significances of (.036), (.042), (.014), respectively. It was also found that there were statistically significant differences at the significance level of (0.05) in the study sample's responses to the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts on the total score due to the effect of years of experience. The differences were in favor of the category 10 years and over. The calculated t-value was (2.269) with a statistical significance of (.025).

Results of the fourth research question: Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts due to the educational qualification variable?

To answer this question, the means and standard deviations were extracted for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to the educational qualification variable. To show the statistical differences between the

means, the t-test for independent samples was used. Table 7 shows the results.

**Table 7. Means, standard deviations, and the t-test for independent samples of the impact of the educational qualification variable on the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to qualification**

| Domain | Educational qualification | No. | Mean | Standard deviation | t | df | Sig. |
|---|---|---|---|---|---|---|---|
| Participatory planning | Bachelor | 85 | 3.03 | 1.06 | 3.947 | 121 | .000 |
| | Higher studies | 38 | 3.89 | 1.24 | | | |
| Participatory implemnetation | Bachelor | 85 | 3.08 | 0.81 | 3.674 | 121 | .000 |
| | Higher studies | 38 | 3.68 | 0.90 | | | |
| Participatory evaluation | Bachelor | 85 | 2.97 | 0.79 | 3.401 | 121 | .001 |
| | Higher studies | 38 | 3.54 | 0.96 | | | |
| Total | Bachelor | 85 | 3.03 | 0.83 | 3.894 | 121 | .000 |
| | Higher studies | 38 | 3.70 | 0.98 | | | |

Table 7 shows that there were statistically significant differences at the significance level of (0.05) in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) due to the effect of the educational qualification variable. The differences were in favor of the higher studies category. The calculated t-values of the domains of the study tool (participatory planning, participatory implementation, participatory evaluation) were (3.947), (3.674), (3.401) with statistical significances (.000), (.000), and (.001), respectively. It was also found that there were statistically significant differences at the level of significance (0.05) in the estimates of the study sample about the level of the participatory relationship between the teachers of Art Education and Science in the elementary stage in developing environmental education based on the arts on the total score due to the effect of educational qualification. The differences were in favor of the higher studies category. The calculated t -value was (3.894) with a statistical significance of (.000).

Results of the fifth research question: Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the

development of environmental education based on arts due to the teacher's specialization variable?

To answer this question, the means and standard deviations were extracted for the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to the specialization variable. To show the statistical differences between the means, the t-test for independent samples was used. Table 8 shows the results.

**Table 8. Means, standard deviations, and the t-test for independent samples of the impact of the educational qualification variable on the participatory relationship between Science and Art Education teachers in developing environmental education based on the elementary stage students according to specialization**

| Domain | Specialization | No. | Mean | Standard deviation | t | df | Sig. |
|---|---|---|---|---|---|---|---|
| Participatory planning | Art Education | 68 | 3.51 | 1.30 | 2.551 | 121 | .012 |
| | Science | 55 | 3.03 | 0.96 | | | |
| Participatory implemnetation | Art Education | 68 | 3.43 | 0.96 | 2.431 | 121 | .017 |
| | Science | 55 | 3.05 | 0.73 | | | |
| Participatory evaluation | Art Education | 68 | 3.38 | 0.95 | 3.320 | 121 | .001 |
| | Science | 55 | 2.86 | 0.70 | | | |
| Total | Art Education | 68 | 3.44 | 1.01 | 2.825 | 121 | .006 |
| | Science | 55 | 2.98 | 0.74 | | | |

Table 8 shows that there were statistically significant differences at the significance level of (0.05) in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in developing environmental education based on arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) due to the effect of the teacher's specialization variable. The differences were in favor of the category of Art Education teachers. The calculated t-values on the domains of the study tool (participatory planning, participatory implementation, participatory evaluation) were (2.551), (2.431), and (3.320) with statistical significances of (.012), (.017), (.001) respectively. It was also found that there were statistically significant differences at the significance level of (0.05) in the study sample's responses about the level of the participatory relationship between the teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts on the total score due to the effect of the teacher's specialization variable. The differences were in favor of the category of Art Education teachers. The calculated t-value was (2.825) with a statistical significance was (.006).

## Discussion

Discussion of the results of the first research question

The results showed that there was a medium level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts. This result may be due to the presence of some challenges that stand in front of teachers of Art Education and Science in the elementary stage in the participatory relationship for the development of environmental education based on the arts. Among these challenges is the weak conviction of the school administration of the importance of merging the objectives of Art Education and Science in environmental issues and the lack of material and moral support for planning and implementing extracurricular activities based on arts, such as painting, sculpture, theater, drama, and photography to enhance students' understanding and awareness of the environment and ways to preserve it (Hamdi, 2023). This appears in the existence of an educationally unacceptable level of investment in environmental issues in promoting environmental awareness among students. Also, the result may be attributed, from the point of view of (Vasko, 2016), to the lack of awareness of Art Education and Science teachers of the importance of environmental education based on the arts and their investment in supporting environmental issues and preserving them. This can be done through the production of artistic and creative works of high aesthetic and utilitarian values for learners and society, or perhaps there are tendencies among some teachers towards practicing specific colors of the arts, such as drawing, for example. Art Education teachers believe that this type of art is the easiest and easiest for them in terms of training learners in the elementary stage, dealing with them, planning, implementing, and evaluating their artwork. They do not look at the colors of other arts and their great role in promoting values of preserving the environment and environmental awareness among students in the elementary stage.

Discussion of the results of the second research question

The results showed that there were no statistically significant differences in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in developing environmental education based on the arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) and the total score on the tool attributed to gender. This result may be attributed to the equal knowledge of the study sample, male and female teachers, about the importance of developing environmental education based on the arts among elementary school

students, by investing environmental issues in the production of artistic and creative works that support and enhance the preservation of the environment and environmental awareness. The Education and Training Evaluation Authority in the Kingdom of Saudi Arabia, through the General Elementary Stage Objectives Document in 2019, stressed the need for Art Education and Science teachers to have knowledge and values about the environment and how to benefit from environmental issues and problems. It also urges them to employ Art Education and Science in producing artwork that contributes to the development of environmental education among students. Besides, it emphasized practicing it in the classroom, theater, and Art Education workshops and laboratories. The Ministry of Education has also implemented over the past years a set of training programs for teachers aimed at training on teaching practices, such as planning, implementation, and evaluation for the development of environmental education among students. Perhaps, the presence of male and female teachers in those training courses based on modern educational trends that the Ministry sought to achieve in the region contributed to the absence of statistical differences according to the gender variable (Hamdi, 2023).

Discussion of the results of the third research question

The results revealed that there were statistically significant differences in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in the elementary stage in the development of environmental education based on the arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) and the total score on the tool. The effect of the variable was attributed to years of experience. The differences were in favor of the category 10 years and over. This result may be attributed to the importance of the teaching experience factor in forming the scientific personality of the teacher. Therefore, it is noted that teachers of Art Education and Science with the most experience possess a set of cognitive and physical skills, behaviors, and experiences in technologies, materials, and environmental materials that are used in making and designing artistic and creative works in order to develop environmental education among students in the elementary stage (Al-Muqrin, 2016). In addition, the long experience of teachers in the field of teaching elementary school students pushes them to ensure that they perform their professional and teaching duties with great perfection (Yaghmour & Obeidat, 2016). This made them keener on the participatory relationship between them in the development of environmental education based on the arts to support and enhance their student's understanding of environmental issues and enhance their deep connection to the environment and its preservation.

Discussion of the results of the fourth research question

The results revealed statistically significant differences in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in developing environmental education based on the arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) and the total score due to the effect of the educational qualification variable. The differences came in favor of the graduate studies category. This result can be explained by the fact that educational postgraduate programs provide deep knowledge of how to apply modern teaching strategies. The study plans at this stage focus on the abundance of information, knowledge, and educational applications in the classroom. They also emphasize the principle of the participatory relationship between teachers and the complementary relationship between curricula to achieve the desired educational goals (Shaheen, 2014). Accordingly, the study sample with higher academic qualifications (higher studies) has full knowledge of how to apply the strategy of environmental education based on the arts and invest environmental issues in the production of artistic and creative works through their university studies. The study plans at the postgraduate level may have focused on the abundance of information, knowledge, and artistic applications, and the use of the colors of the arts in promoting and preserving the love of the environment in the hearts of students and awareness of the problems that surround it and reduce them.

Discussion of the results of the fourth research question

The results revealed that there were statistically significant differences in the study sample's responses about the level of participatory relationship between teachers of Art Education and Science in developing environmental education based on the arts in all domains of the study tool (participatory planning, participatory implementation, participatory evaluation) and the total score due to the effect of the teacher's specialization variable. The differences were in favor of the category of Art Education teachers. This result may be attributed to arts-based environmental education, a modern educational strategy that combines Art Education, environmental education, and the development of art-related practices that strengthen the deep bonds between learners and the environment. Therefore, Art Education teachers are more familiar with it. It is related to the fine arts, such as painting, theater, dance, sculpture, photography, and other arts that Art Education teachers have learned well during their undergraduate studies or attending related training programs (Abdulmajid, 2020). Therefore, it appeared that Art Education teachers desire a participatory relationship with Science teachers to benefit from environmental education based on the arts

to enhance students' environmental awareness and their connection to the environment, its issues and problems, and to highlight their creative abilities and their important educational role in the success of the educational and learning process. This result can also be attributed from the point of view of Hamdi (2023) to a large number of teaching burdens imposed on the Science teacher in the elementary stage, the complexities and difficulty of Science subjects, and the great need for preparation and preparation for lessons, which may distract some teachers from employing environmental education based on the arts. Hence, they maintain their reliance on traditional methods, strategies, and means of developing students' understanding and awareness of environmental issues.

## Recommendations

In light of the results of the study, the researchers recommended the need to improve the average level shown by the results of the study concerning the level of the participatory relationship between Art Education teachers and Science teachers in developing environmental education based on arts among elementary school students. This development is based on the adoption of those in charge of educational policies in the Ministry of Education by developing a strategic plan to raise the level of efficiency and ability of these teachers to activate teaching practices (participatory planning, participatory implementation, participatory evaluation). These teaching practices encourage teachers to employ the arts in understanding and awareness of environmental issues and to enhance the value of the student's love for the environment and its preservation. The adoption of educational officials in educational departments and educational supervisors at the elementary stage also includes holding training programs to enhance the participatory relationship between Art Education teachers and Science teachers at the elementary stage and urging them to use environmental education based on the arts to enhance the sense of responsibility of elementary school students towards the environment and its protection. In addition, rational knowledge, attitudes, and behaviors about preserving the environment should be adopted to encourage teachers with scientific qualifications less than postgraduate studies and those with less teaching experience and Science teachers to attend and participate in these training programs. This is in order to give them additional value and knowledge about the importance of the participatory and complementary relationship between teachers in achieving the goals of the elementary stage in environmental education. Besides, there is a need to direct university educational research centers and researchers to conduct prospective, descriptive comparative studies. These studies include all teachers of Art

Education and Science at all levels of education in the Kingdom of Saudi Arabia to give a measure of knowledge diversity and understand the phenomenon with a more in-depth and comprehensive view.

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