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The Science Teachers' Role in Developing Elementary Stage Students' Abilities to Invest Environmental Raw Materials in Producing Handicrafts to Increase their Environmental Awareness in the Kingdom of Saudi Arabia

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Abstract

The study aimed to identify the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. The descriptive survey method was used to achieve the study objective. The study sample consisted of a stratified random sample of (290) Science teachers in government primary schools in Najran region in the Kingdom of Saudi Arabia. The questionnaire was used as a tool for data collection and consisted of (22) items distributed over three areas: planning, implementation, and evaluation, after verifying the indications of validity and reliability. The results showed that there is an average level in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. Also, statistically significant differences existed in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variables of years of experience in favor of the category ten years or more and educational qualification in favor of the postgraduates category. However, there were no statistically significant differences due to the gender variable. The study recommended the need to improve the average level of Science teachers in developing the abilities of elementary stage students to invest in raw materials in producing handicrafts to increase their environmental awareness. Those in charge of educational policies in the Ministry of Education must develop a strategic plan to raise the level of teachers' competence and competence. Through this plan, they will be able to activate teaching practices (planning,

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implementation, and evaluation) to invest environmental raw materials in producing handicrafts to increase environmental awareness among students and enhance the value of students' love for the environment and attitudes toward preserving it.

Keywords: Science teachers, elementary stage students, environmental materials, handicrafts, environmental awareness.

Introduction

Environment means the environment in which a living organism or other living organisms live. It constitutes the sum of the conditions and factors that help the organism to survive and sustain its life. Another party tries to focus on the human being as one of the active components of the environment. The environment was defined as all the components of the environment with which man interacts influencing and being affected (Al-Kabeer, 2015). The environment is one of the most important issues that have occupied man since he was found on Earth. It is the environment in which he lives, and from which he obtains his sources of subsistence, survival, and continuity (Al-Sabawi, 2018). Nowadays, the environment has begun to suffer from many problems that it did not encounter in a not-so-long time as a result of a series of rapid economic, industrial, social, and political developments and changes witnessed by societies. Among these problems are manufacturing and mining, construction and urbanization, various media and communication, service and production activities, etc. (Al-Asmi, 2015). With these developments and changes, environmental problems have diversified with it and branched out according to the diversity and complexity of human activities, which constantly turn to the environment and its sources to satisfy needs and desires. The first of these problems came from the problem of environmental pollution resulting from water, soil, and air pollution. Environmental pollution also resulted from the pollution of aquatic and marine life resulting from the dumping of residues and waste on the roads and in the course of water resources, medicines, torrents, rivers, and attacks on living organisms (Singh, 2011). Therefore, the issue of pollution of the environment and the sources of life on it has become one of the most dangerous threats to life on the planet and prevents the ability of the environment to continue giving and renewing to meet human demands (Pavasileiou et al., 2020).

Seminars and conferences have increased to talk about environmental issues, their consequences, and appropriate ways to address them (Al-Refai & Al-Omari, 2020). The International Environment Conference held in Stockholm, Sweden, in 1972 stated that environmental education is an effective tool for addressing environmental problems (Saglam, 2016). In 1982, the Nairobi Conference was held, which was

concerned with addressing the problem of desertification and drought, and emphasizing the need for cooperation between countries in order to protect the environment (Pinto & Totti, 2020). The international conference, sponsored by the United Nations in 1992 in Rio de Janeiro, Brazil, under the slogan "Environment and development is the motto of the twenty-first century", had a distinguished launch on solving many environmental problems. The United Nations sought to help governments rethink economic development and find ways to stop the pollution of the planet and the depletion of its natural resources. The United Nations Climate Action Summit in 2019, which was held at the United Nations Headquarters in New York City, USA, came to help countries limit climate change. It also came to achieve the goals of the Paris Agreement on renewable energy issues, such as environmental pollution and solve its problems, and promote a more sustainable and prosperous world for all. At the local level represented by the Kingdom of Saudi Arabia, the government has paid great attention to preserving the environment and its natural resources and sources, in line with the requirements of the Kingdom's Vision 2030. These requirements emphasized the development of nature reserves and the preservation of their components, and work to preserve the natural environment, plants, and wildlife, and their reproduction and development. They also highlighted the revitalization of eco-tourism, the reduction of hunting and overgrazing, the prevention of logging, and the preservation and increase of vegetation cover. In addition, They dealt with regulating movement within reserves and sea beaches, maintaining their cleanliness, and preventing encroachments on the environment of all kinds, to protect the environment and natural resources from extinction (Saudi Arabia’s Vision 2030 document, pp. 20-22).

Environmental issues and solving their problems have received the attention of educators, as many international organizations, such as UNESCO, have made great efforts to make education a basic solution to many environmental issues and environmental problems (Sevim, 2020). In addition, recent trends in education consider that the environmental approach should be taken into account when developing relevant curricula in order to achieve the goals of environmental education and sustainable development among students. This entrance is considered one of the most appropriate entrances for students in terms of linking them to the environment and society, which enhances the interaction process between them. The curriculum’s connection with the students’ environment also helps increase their motivation to learn, develop their scientific inclinations, and desire for discovery and exploration in the environment, and enhance their environmental awareness (Al-Turki & Al-Subaie, 2016). State institutions, including educational institutions,

have an important role in educating students about the environmental problems that they may face and the most important basic factors through which they can form their environmental awareness and preserve the environment (Sarhan, 2016). Moreover, it has a role in developing positive attitudes, environmental knowledge, and rational behavior among them and preserving the environment by using different teaching approaches and strategies that stimulate motivation and learning and help them understand this phenomenon (Schmitz & Da Rocha, 2018). Therefore, the teacher needs to use various strategies by which he can work to attract students' attention and excite them, which are crucial in imparting knowledge, skills, and experiences to them about the environment and environmental awareness (Nasser, 2015). Thus, the environmental education approach appeared and focused on the organized process of forming the values, attitudes, and skills necessary to understand the relationship that binds the student and his civilization to the environment. The entrance to environmental education also deepens environmental knowledge among the student community and motivates them to contribute and participate individually and collectively in protecting the environment and preserving its resources and reducing potential environmental risks from environmentally unsound behaviors in addition, it helps to make and take the appropriate decision to solve existing environmental pollution problems and work to prevent the emergence of new environmental problems (Sabawi, 2018). Moreover, it increases environmental awareness among school students in terms of developing preventive awareness that aims to prevent the occurrence of environmental problems. Finally, it promotes therapeutic awareness, which aims to help students confront environmental problems resulting from the misuse of various environmental elements and their risks that lead to environmental pollution (Awad, 2019).

As for Science teachers, their role in developing environmental awareness among learners, compared to teachers of other disciplines, is highlighted by the nature and content of the Science subject. It deals with many environmental issues advocated by environmental sustainability goals, including climate change, biodiversity, wildlife conservation, marine life and water resources, and other issues closely related to science curricula. In addition, the nature of knowledge reflected in science curricula and its focus on educational methods is based on investigation 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 awareness

among students stems from the need to prepare an environmentally educated generation with a more sustainable environmental awareness. This is vital in transmitting the inherent respect for nature among society and promoting general environmental culture (Bashir et al., 2022), especially in light of the vital role 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 how to maintain the sustainability of environmental resources to take into account future generations' needs (Talib & Malkawi, 2020). In line with the importance of the role of Science teachers in enhancing the environment among learners in general, and identifying patterns of behavior harmful to the environment and working to address them, an educational trend has emerged calling for the importance of the role of Science teachers in employing extracurricular activities using handicrafts. These handicrafts develop students' abilities towards recycling environmental materials to produce various works and mean in order to enhance understanding and awareness of the environment and ways to preserve it (Hamdi, 2023).

Environmental raw materials are defined as the remaining raw materials as a result of their consumption by individuals and are no longer of use from the point of view of their consumers. They have become waste, and it is possible to invest and treat them in a new, unfamiliar way, and employ them in other works to reduce the volume of waste to contribute to preserving the environment, or they are a group of natural and industrial environment raw materials consumed (soft-hard) by individuals and no longer have any benefit from their point of view. They can be recycled in designing and producing works of art of artistic value and financial return, characterized by flexibility, fluency, originality, detail, and sensitivity to problems in design aspects (Al-Khouli, 2015). Environmental raw materials are divided into several sections according to their source, including raw materials derived from natural elements, animals and plants, sea shells, coral, bird feathers, eggshells, fish scales, leather, bones, animal horns, plant leaves, bark, seeds, palm branches, straw. They also include brick materials, such as gravel, stones, sand, clay, rocks, and materials derived from industrial elements, such as materials related to textile cutting, threads, ropes, glass, wires, empty cans, wood pieces, aluminum foil, glass and plastic bottles, cardboard, synthetic rubber, and synthetic fibers (Ibrahim & Hussein, 2016). It is possible to take advantage of environmental materials and use them in the Science subject to recycle them and develop products from them to increase creativity and allow students to express their feelings and address those regarding environmental problems. This represents an

important contribution to increasing students' understanding, commitment, and competence in working towards environmental conservation and sustainable development. This is in addition to the importance of helping learners to express some of the deep artistic and creative meanings that the teacher and students want. It makes the teaching and learning processes more exciting and interesting and adds innovative educational, aesthetic, and creative values (Stoll, Gardvik, & Sormo, 2022). Therefore, this study came as a serious attempt to find out the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness in Najran region in the Kingdom of Saudi Arabia. Also, it revealed differences according to the variables of gender, years of experience, and educational qualification 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 human fields, including the field of environmental education, in which Science teachers have become an integral part of their main axis in the development of 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 Science teachers to be keen on their role in promoting students' love for the environment through various works and forms of art. Hamdi's (2023) study also emphasized the importance of the science teacher's role in developing environmental awareness among school students by employing extracurricular activities such as artistic activities. Therefore, the researchers conducted an exploratory study on a sample of (30) Science teachers in the elementary stage in Najran region in the Kingdom of Saudi Arabia. They determine the knowledge of the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. It was found that (56.6)% of the respondents focus in low degrees on developing the abilities of their students to invest environmental raw materials in producing handicrafts to increase their environmental awareness whereas (33.3)% of the sample focus on that in medium degrees, while (10.1%) of the sample focus on that in high degrees. Accordingly, the problem of this study emerged, which can be identified in the following questions:

1. What is the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness?

2. Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness 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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of years of experience?

4. Are there statistically significant differences at the significance level of ($\alpha = 0.05$) in the responses of the study sample about the role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the educational qualification variable?

Objectives of the study

This study aimed to identify the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. Also, it detected the presence or absence of statistical differences in the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness according to the variables of gender, years of experience, and educational qualification.

Significance of the study

It is hoped that this study will be a new and important contribution to the field of education, specifically teaching science at the Arab and international levels, in terms of showing the value of the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness. Thus, this study draws the attention of educational officials, including educational supervisors, school principals, and teachers, to the importance of this trend in developing students' abilities to use environmental materials to produce handicrafts. These handicrafts enhance their creative manual work and appreciate the value and preservation of the environment thus, develop environmental

awareness, one of the most important issues of sustainable development at the global level.

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 (320) of 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 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 Science in government elementary schools in Najran region in the Kingdom of Saudi Arabia. Their number reached (290) male and female teachers. 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	108	37.2
	Female	182	62.8
Years of experience	10 or less	71	24.5
Educational qualification	10 or more	219	75.5
	Bachelor	242	83.4
	Higher studies	48	16.6
	Total	290	100.0

Instrument of the study

To achieve the study objectives, the study tool, a questionnaire, was developed to measure the level of the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. 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: planning (7 items), implementation (7 items), and evaluation (8 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 level of the role of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. 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 version to ten experts of faculty members in 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 (30) male and female teachers of Science 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**	8	.85**	.83**	15	.71**	.61**
2	.85**	.56**	9	.82**	.79**	16	.78**	.75**

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
3	.83**	.66**	10	.80**	.71**	17	.80**	.72**
4	.77**	.71**	11	.80**	.70**	18	.77**	.70**
5	.81**	.70**	12	.74**	.74**	19	.79**	.87**
6	.90**	.85**	13	.82**	.83**	20	.88**	.84**
7	.87**	.83**	14	.85**	.82**	21	.72**	.66**
8						22	.88**	.85**

**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 (0.48-0.88) and the domain (0.59-0.87). 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

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 Science 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	Planning	7	0.83	0.81
2	Implantation	7	0.80	0.70
3	Evaluation	8	0.82	0.79
	Total	22	0.85	0.82

Table 3 shows that the reliability coefficients for the domains of the study tool using the test-retest method ranged between (0.80-0.83), and for the tool as a whole in the same way, the reliability coefficient was (0.85). The reliability coefficients for the domains of the study tool using the internal consistency method ranged between (0.70-0.81)

and the tool as a whole in the same way (0.82). 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 Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. Also, the t-test for the independent samples was sued to explain the statistical differences in the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness according to the variables of gender (male, female), years of experience (less than 10 years and more than 10 years, the educational qualification (Bachelor and higher Studies). 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 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 role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness?

To answer this question means and standard deviations were extracted for the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness. Table 4 shows the results.

Table 4. Means and standard deviations for the role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness in descending order

Rank	No.	Domain	Mean	Standard deviation	Degree
1	1	Planning	3.07	.840	Medium
2	2	Implantation	2.98	.750	Medium
3	3	Evaluation	2.71	.930	Medium
		Total	2.92	0.77	Medium

Table 4 shows that the means for the domains of the study tool ranged between (2.71-3.07). The domain of planning ranked first with the highest mean (3.07) and standard deviation (0.84) at an average level. In second place came the domain of implementation with a mean of (2.98) and a standard deviation of(0.75) at an average level. The evaluation domain scored last with a mean of (2.71) and a standard deviation of (0.93) at an average level. The mean on the tool as a whole was (2.92) with a standard deviation of (0.77) and 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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the gender variable?

To answer this question, the means and standard deviations were extracted for the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness due 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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the gender variable

Domain	Gender	No.	Mean	Standard deviation	t	df	Sig.
Planning	Male	108	3.00	.950	1.101	288	.272
	Female	182	3.11	.770			
Implantation	Male	108	2.91	.750	1.141	288	.255
	Female	182	3.02	.740			
Evaluation	Male	108	2.75	.940	.586	288	.558

	Female	182	2.68	.930			
Total	Male	108	2.89	.810	.555	288	.579
	Female	182	2.94	.750			

Table 5 shows that there were no statistically significant differences at the significance level of (0.05) in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness in all domains of the study tool (planning, implementation, evaluation) due to the effect of the gender variable. The calculated t-values of the domains of the study tool (planning, implementation, and evaluation) were (1.101), (.1411), (.586) with statistical significances of (.272), (.255), and (.558) respectively. It was also found that there were no statistically significant differences at the significance level of (0.05) in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness on the total score due to the effect of the gender variable. The calculated t-value was (.555) with a statistical significance of (.579).

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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of years of experience?

To answer this question, the means and standard deviations were extracted for the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of years of experience. 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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of years of experience

Domain	Experience	No.	Mean	Standard deviation	t	df	Sig.
Planning	-10 years	71	2.78	.830	3.354	288	.001
	+ 10 years	219	3.16	.820			
Implantation	-10 years	71	2.76	.740	2.836	288	.005
	+ 10 years	219	3.05	.740			
Evaluation	-10 years	71	2.50	.910	2.167	288	.031

	-10 years	219	2.78	.930			
Total	+ 10 years	71	2.69	.750	2.991	288	.003
	-10 years	219	3.00	.770			

Table 6 shows that there were statistically significant differences at the significance level of (0.05) in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness in all domains of the study tool (planning, implementation, evaluation) due to the variable of years of experience. The calculated t-values of the domains of the study tool (planning, implementation, and evaluation) were (3.354), (.8362), and (2.167) with statistical significances of (.001), (.005), (.031) respectively. It was also found that there were statistically significant differences at the significance level of (0.05) in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness on the total score due to the effect of the experience variable. The calculated t-value was (2.991) with a statistical significance of (.003).

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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of educational qualification?

To answer this question, the means and standard deviations were extracted for the role of Science teachers in developing elementary stage students' abilities to invest in environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of educational qualification. 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 role of Science teachers in developing elementary stage students' abilities to invest environmental raw materials in producing handicrafts to increase their environmental awareness due to the variable of educational qualification

Domain	Educational qualification	No.	Mean	Standard deviation	t	df	Sig.
Planning	Bachelor	242	3.02	.830	2.474	288	.014
	Higher studies	48	3.34	.840			
Implemnetation	Bachelor	242	2.93	.740	2.783	288	.006

	Higher studies	48	3.25	.710			
Evaluation	Bachelor	242	2.66	.950	2.146	288	.033
	Higher studies	48	2.97	.830			
Total	Bachelor	242	2.87	.770	2.661	288	.008
	Higher studies	48	3.19	.750			

Table 7 shows that there were statistically significant differences at the significance level of (0.05) in the study sample's responses about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness 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 (planning, implementation, evaluation) were (2.474), (.7832), and (2.146) with statistical significances (.014), (.006), (.033) respectively. It was also found that there were statistically significant differences at the significance level of (0.05) in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness 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 (2.661) with a statistical significance of (.008).

Discussion

Discussion of the results of the first research question

The results showed that there was an average level in the role of Science teachers in developing the abilities of elementary stage students to invest the raw materials of the environment in producing handicrafts to increase their environmental awareness. This result may be due to some challenges facing Science teachers in the elementary stage, such as the weak conviction of students and teachers of the importance of investing raw materials in producing handicrafts to increase their environmental awareness, and the lack of material and moral support for planning and implementing science lessons in such a way (Hamdi, 2023). Also, the result may be attributed, according to Vasko (2016), to Science teachers' lack of awareness of the importance of developing students' abilities to invest in environmental raw materials in producing handicrafts to increase

environmental awareness. This comes as a result of their weakness in planning, implementing, and evaluating lessons due to the large burdens on them. Which makes them carry out such lessons in the usual ways. Perhaps, the current result is due to teachers' non-positive attitudes towards collecting natural and industrial environmental materials that stimulate the learners' sense of beauty and motivate them towards artistic and creative work.

Discussion of the results of the second research question

The results showed that there were no statistically significant differences in the responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness in all areas of the study tool (planning, implementation, evaluation) and the total score on the tool. attributed to the effect of the gender variable. This result may be attributed to the equal knowledge of the study sample, male and female teachers, about the importance of developing the abilities of elementary stage students to invest in environmental raw materials in producing handicrafts to increase 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 Science teachers to have knowledge and values about the environment and how to benefit from environmental issues and problems and employ them in producing artwork that contributes to the development of environmental awareness among students. It also confirmed practicing it in the classroom. Over the past years, the Ministry of Education has also implemented a set of training programs for teachers aimed at training on teaching practices, such as planning, implementation, and evaluation to develop environmental awareness among students. Perhaps, that male and female teachers attended 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 responses of the study sample about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness in all areas of the study tool (planning, implementation, evaluation) and the total score on the tool. The effect of the variable was attributed to years of experience. The differences came 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 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 awareness (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 developing the abilities of their students to invest in environmental raw materials in producing handicrafts to increase their environmental awareness and enhance their deep connection to and preservation of the environment.

Discussion of the results of the fourth research question

The results revealed statistically significant differences in the study sample's responses about the role of Science teachers in developing the abilities of elementary stage students to invest environmental raw materials in producing handicrafts to increase their environmental awareness in all areas of the study tool (planning, implementation, evaluation) and the total score on the tool 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 educational qualifications (higher studies) has full knowledge of how to invest in environmental raw materials in producing handicrafts to increase their environmental awareness through their university studies. Study plans at the postgraduate level may have focused on the abundance of information, knowledge, and artistic applications, and benefit from the work of handicrafts in promoting a love of the environment in the hearts of students, preserving it, and awareness of the problems that surround it and limiting them. This is done by recycling environmental materials and producing useful works for students and their community and reducing environmental pollution.

Recommendations

In light of the results of the study, it is recommended to improve the average level shown by the results of the study about the level of Science teachers in developing the abilities of elementary stage students to invest in environmental raw materials in producing

handicrafts to increase their environmental awareness. Those in charge of educational policies in the Ministry of Education must adopt a strategic plan to raise the level of competence and ability of Science teachers in the elementary stage to activate teaching practices (planning, implementation, evaluation). Accordingly, teachers can invest in environmental raw materials in producing handicrafts to increase environmental awareness among students and enhance the value of student love environment and trends towards preserving it. Also, educational officials in educational departments and educational supervisors should hold training programs to support the role of Science teachers in the elementary stage and urge them to invest in environmental raw materials in producing handicrafts to increase their environmental awareness and enhance their sense of responsibility towards the environment and its protection. Teachers with educational qualifications less than postgraduate studies and those with less teaching experience should be urged to attend and participate in them. Finally, there is a need to direct educational research centers in universities and researchers to conduct more descriptive and comparative future studies to include all Science teachers of all educational levels in the Kingdom of Saudi Arabia to give a degree of knowledge diversity and understand the phenomenon in depth and a comprehensive view.

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