

Research Title

**the Degree of Science Teachers' Awareness in the
Methods of Achieving the Sustainable
development goals (2030)**

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Abstract

Taking into considerations the social, economic and health crises as a result of the coronavirus (COVID-19) pandemic coupled with threats posed by climate change, famine, poverty, wars and environmental pollution, the achievement several of the Sustainable Development Goals (SDGs) may be delayed or affected at different levels and in various ways. Thus, there is need for the United Nations to pay more attention to it; create more awareness (among teachers) and ensure the timely achievement of the SDGs. This study keeps pace with global trends in achieving the goals of sustainable development (2030). The study sample consisted of 180 science teachers (physics, chemistry, life sciences, earth sciences and environment) in the Directorate of Education for the University District in the capital Amman, and they constitute 88.7% of our study population (203). Since the current study requires determining the degree of awareness of science teachers of methods for achieving the Sustainable Development Goals (2030), it was necessary to develop a tool to measure the required purpose. The tool included three areas: people, the planet and prosperity. The results of this study revealed that the degree of science teachers' awareness of the methods of achieving the Sustainable Development Goals (SDGs) from their point of view was moderate. The results also revealed that there are no statistically significant differences ($p = 0.815$) due to the effect of gender, specialization and experience in all fields, while there are statistically significant differences ($p = 0.012$) attributed to academic qualification, and this may be attributed to the fact that teachers who have enrolled in graduate studies programs usually have the most knowledge. The results of this study led to the recommendation that efforts should be made to raise the awareness and level of teachers' knowledge of the Sustainable Development Goals (SDGs) by providing awareness trainings, courses and workshops for teachers, as this would positive influence their students.

Study background and importance

Introduction

In light of the many environmental, social, economic and health crises and challenges that the world is witnessing at the present time, such as: global warming, famines, poverty, wars, environmental pollution, climate change, waste, emerging diseases and epidemics such as the Corona virus(COVID-19) , and other issues that have been reflected. They negatively affect human life and make it difficult to achieve the 2030 Sustainable Development Goals,Therefore, the world had to stand with all its strength on the 2030 Sustainable Development Goals in general and on the methods of achieving them in particular and in a sustainable manner for current and future generations, because they have an impact on the whole world and not on a country or region.

On September 25, 2015, the United Nations Summit for Sustainable Development was held, in which the action plan contained 17 goals to achieve sustainable development (SDGs) as mentioned in the UNESCO report (UNESCO, 2015), which were agreed upon as an alternative to the Millennium Development Goals reached in 2000. The concept of sustainable development was not spur of the moment, but grew over the years in different stations, and Table (1) shows the most important of these stations:

Table (1) the emergence and development of the concept of sustainable development:

History	Event
1982	The first appearance of the concept of sustainable development in environmental contexts was in the World Charter for Nature.
1992	At the 21st Century Earth Summit, there was a successful experience in linking environmental protection, resources and uneconomical growth.

History	Event
1995	The main function of social development was to maintain global social development through the Copenhagen World Summit on Social Development.
2000	Establishing a definition of sustainable development through the World Summit on Sustainable Development in Johannesburg. A set of global goals have been reached that the member states of the United Nations will implement over the next fifteen years.
2012	A document entitled "The Future we want" appeared in Rio de Janeiro, focusing on the social aspect.
2015	The goals reached in the year 2000 were developed by a working group (OWG) It has reached 17 targets, including 169 targets, which will be implemented during the period 2015-2030 .

(Hak et al., 2016:565)

The concept of sustainable development

The concept of sustainable development has been defined by many researchers, as Al-Hamid defined it as “the process that leads to the improvement of social welfare as much as possible, while taking care to preserve the available natural resources and with the least possible damage and harm to the environment” (2005: 40)

The Brunt land Commission defined sustainable development referred to in al-Qareed and Bouafia (2009: 57) as: “Development that takes into account the current needs of society without prejudice to the rights of future generations to meet their needs.”

Al-Nasr and Muhammad (2017) affirm that sustainable development differs from development in that it is more intertwined and complex, especially in the social and natural aspects in addition to the spiritual aspect, and focuses on the needs of the poorest strata of society, which is an update of the concept of development to suit the requirements of

the age, Also, the dimensions of sustainable development and its indicators cannot be separated due to the overlap of its qualitative and quantitative dimensions that it contains, in addition to the fact that it focuses on all kinds of societal, environmental and human resources.

Al-Rikabi (2018) indicates that sustainable development is concerned with preserving natural resources to ensure the right of future generations, and puts the basic needs of individuals first and takes into account their religious and cultural privacy while preserving the environment in all its components, and that sustainable development seeks to achieve international regulation of resource exploitation, especially between poor and rich countries.

Sustainable development is based on three main interrelated dimensions: the environment, the economy, and society, and they are closely related to achieving the existing sustainability mainly to preserve resources and not deplete them for future generations while meeting the needs of the present time as they are classified into three dimensions, namely:

Environmental sustainability, social sustainability, and economic sustainability (Hajira, 2007).

Economic development is concerned with the optimal use of economic resources, and solving problems related to this aspect, which leads to the access of members of society to a decent life, The closely related link between this dimension and the environment cannot be ignored, as the environment whose resources are depleted leads to the weakening of the economic aspect (Al-Adwan and Daoud, 2016). Note that social development is based on developing culture, improving human relations and education, and seeks to raise awareness among community members and give them the right to equality, justice and political participation, and improve health aspects for them, which means an increased focus on governments, associations and organizations, and some view social development as services provided to individuals in society, (Al-Sammani, 2020).

Environmental development is concerned with dealing with natural resources and harnessing them for the service of mankind without depleting them, such as caring for biological diversity, exploring resources and wealth, and environmental pollution that harms the health of living organisms (Al Rikabi, 2018).

Zogheib and Omani (2011) indicate that development is based mainly on the economy, but development and the economy cannot be separated from human and natural resources because of their overlap and close connection, so the environmental and social variables of the economy had to be introduced and a balance between them, as the environment is considered a necessity for any human action. It requires the necessity of preserving its resources and relying on renewable energy sources that reduce pollution and taking into account the importance of preserving the ozone layer to ensure the survival of future generations.

Al-Nasr and Muhammad (2017) indicate that sustainable development has a number of characteristics such as: that it is an intentional, continuous, planned and comprehensive process, and that the human being is the intended and the means, taking into account the preservation of the environment and its resources to meet the needs of the present while remaining for future generations, and respect for the culture of All societies, and its importance lies in trying to reduce the difference between developing and developed countries and their economic dependence, improving the nature of their lives, education and income, and achieving social justice.

The adoption of the sustainable development goals has a great impact on the reality of countries in achieving many economic, social and environmental development goals. The sustainable development goals give the authority to exploit natural resources, but while ensuring the right of future generations, and called for the use of renewable energy resources, and the participation of community members in the planning process for the future, And improving the lives of the poor, this requires

all countries to pay attention to education as a cornerstone for reaching these goals (Wade, 2014).

In Jordan, the United Nations seeks to support the 2030 Sustainable Development Goals in order to improve the lives of Jordanians, preserve the climate and the environment, achieve prosperity and community peace, and eradicate poverty in Jordan, through the application of the United Nations development activities in it, By applying the strategic planning framework for cooperation at the country level, which is based on three connected goals, namely: Empowering people by ensuring the rights of the poor and the vulnerable and helping them survive in addition to strengthening institutions by making them more flexible, inclusive and transparent, as well as enhancing opportunities through participation available to all in all social, political, economic and environmental aspects (United Nation, 2020).

On September 25, 2015, after 3 years of work by 60 organizations and international bodies, 11 global consultations, and 100 national consultations in more than 60 countries, a global survey of more than 8 million people, and others from the business and industry world, the scientific and academic community and politicians, was approved. A talk for sustainable development entitled "Transforming our world: the 2030 Agenda for Sustainable Development", by 193 UN member states in New York at the Sustainable Development Summit at the United Nations headquarters, as this program is based on 17 goals revolving around 5 main areas, and 169 A goal that covers three dimensions of sustainable development and 230 global indicators, and the following is an explanation of these areas and goals shown in Table (2):

Table (2): The fields and goals of sustainable development 2030

fields	Field description	Sustainable development goals 2030
People	ending poverty and hunger in all their forms and ensuring dignity and equality	The first goal: Eradicate poverty in all its forms everywhere.
		The second goal: Eradicate hunger, provide food security, improve nutrition and promote sustainable agriculture.
		Third goal: To ensure that everyone enjoys healthy lives and prosperity at all ages.
		Fourth goal: Ensure inclusive and equitable quality education for all, and promote lifelong learning opportunities for all.
		Fifth Goal: Achieve gender equality and empower all women.
Planet	It is represented in protecting the natural resources of our planet and the climate for the survival of present and future generations	Sixth Goal: Ensure availability of water and sanitation services and manage them sustainably for all.
		Twelfth Goal: Ensure sustainable consumption and production patterns.
		Thirteenth Goal: Take urgent action to address climate change and its effects.
		Fourteenth Goal: Preserve the oceans, seas and marine resources and use them in a sustainable manner to achieve sustainable development.
		Fifteenth Goal: Protect and restore terrestrial ecosystems and promote their sustainable use, Sustainable forest management, combating desertification, halting and reversing land degradation and halting the loss of biodiversity
Peace	Promoting peaceful and just societies free from fear and violence	Sixteenth Goal: Encouraging the establishment of peaceful societies in which no one is marginalized in order to achieve sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions for all at all levels.
Prosperity	Enabling all people to live a prosperous life	Seventh Goal: Ensure access to reliable and sustainable modern energy services for all at low cost.

fields	Field description	Sustainable development goals 2030
	that meets their aspirations and is consistent with nature	<p>Eighth Goal: Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.</p> <p>Ninth Goal: Build sustainable infrastructure, promote inclusive and sustainable industrialization and foster innovation</p> <p>The tenth goal: Reducing inequality within and among countries.</p> <p>Eleventh goal: Make cities and human settlements inclusive, safe, resilient and sustainable.</p>
Partnership	Revitalizing global partnership and promoting a spirit of global solidarity for sustainable development	Seventeenth Goal: Strengthening means of implementation and revitalizing the global partnership for sustainable development

(United Nations, 2016)

The United Nations Organization (ESCWA, 2019) recommends Arab countries to integrate science, technology and innovation into national programs and plans to achieve the Sustainable Development Goals (2030), which are considered important tools to achieve them in line with their capabilities, and to support and finance plans and programs that seek to advance science, and from the forums that talked about The relevance of science, technology and innovation to the Agenda for Sustainable Development (2030), the Arab Forum for Scientific Research and Sustainable Development.

Education seeks to develop members of society in all respects to be effective and beneficial to their societies, so they preserve its resources and seek to develop its economy, and therefore education is a demand for development, which results in interest in improving education and its curricula in line with the goals of sustainable development (Al-Rasheed, 2020).

The United Nations Educational, Scientific and Cultural Organization, UNESCO (UNESCO, 2013) calls for the need to educational bodies to define the concepts, questions, values and ideas that are seen as a cornerstone for achieving sustainable development in all its fields, and the necessity for decision-makers in the educational environment to include sustainable development goals with the goals of the education process. And their inclusion in the curriculum,It called for the use of teachers in all disciplines that contribute to achieving the 2030 Sustainable Development Goals, including science, for educational methods to teach sustainable development that encourage analysis and solving real life problems, asking questions, discussion, applying values and imagining future alternatives through play, music, arts, story, simulation, etc. to investigate the degree of awareness of science teachers of methods to achieve sustainable development goals.

The study problem and its questions

The topic of sustainable development is one of the global topics that seek to improve and develop social, environmental and economic conditions, and interest in it is evident through the large number of conferences, research and media programs related to sustainable development (2030),In many international conferences, the United Nations has called for the necessity to strive to achieve the goals of sustainable development 2030 in addition to the need to raise awareness about them, and since the 2030 Sustainable Development Goals are linked to all groups of society, including teachers and learners, this requires more focus on educating teachers about the 2030 Sustainable Development Goals in general. And the methods of achieving them in particular, in a way that reflects positively on their students in achieving these goals, especially with the presence of many studies that indicated the lack of awareness of teachers about the sustainable development goals, such as:

Omisore et al. (2017), and Nwangwa and Inatimi (2019) study, hence the study problem in the following main question: What is the degree of

science teachers 'awareness of methods to achieve the 2030 Sustainable Development Goals?

Study questions

- **The first question: What is the degree of difference in science teachers 'awareness of the methods of achieving the 2030 Sustainable Development Goals in their three fields: people, planet, prosperity?**

- **The second question: What is the degree of difference in science teachers 'awareness of the methods of achieving the 2030 Sustainable Development Goals with different gender, experience, academic qualification and specialization?**

The importance of studying

This study keeps pace with global trends in achieving the goals of sustainable development (2030), The importance of the study was divided into two main areas:

First: The theoretical importance represented as the following:

This study is one of the limited studies that dealt with the degree of awareness of science teachers of methods for achieving the Sustainable Development Goals (2030). Concepts related to the Sustainable Development Goals have been framed, which provides a reference for researchers in this topic.

Second: Application importance represented as the following:

By providing research tools for methods of achieving the Sustainable Development Goals (2030) that have psychometric characteristics that can be used in subsequent studies, and revealing the degree of science teachers 'awareness of the methods of achieving the 2030 Sustainable Development Goals, which makes it provide guidance and draws the attention of the developers of science teacher training programs for that,

in light of the pursuit The current development of the educational process in all its aspects.

The limits and the Determinants of the study:

The results of the study are generalizable in light of the following limitations:

- The study was limited to science teachers (physics, chemistry, biology, earth sciences and environment) in the Directorate of Education for the University District.
- The results of the study are determined and the possibility of generalization on the accuracy of science teachers, and their seriousness in answering the paragraphs of the questionnaire that are used in this study, which was developed in accordance with the Sustainable Development Goals (2030).
- Temporal and spatial boundaries: The study was limited to the schools affiliated with the Directorate of Education for the University District in the capital Amman for the academic year (2020/2021).
- Objective boundaries: The study was limited to three areas of the 2030 Sustainable Development Goals, namely: people, planet, and prosperity.

Study terminology and procedural definitions

Awareness degree: It is the degree of knowledge that science teachers possess in the university district with methods for achieving the Sustainable Development Goals (2030), and it was measured by calculating the average performance of teachers on the scale prepared for the purposes of this study.

Science teachers: They are the teachers who teach the following subjects: (physics, chemistry, life sciences, earth and environmental sciences), who study in the schools affiliated with the education of the university's District.

Achievement methods: These are the practices that science teachers follow, and are considered an indication of the implementation of the sustainable development goals, and are represented in the following areas: (people, planet, and prosperity).

Sustainable Development Goals: It is the group of seventeen development goals contained in the United Nations document on sustainable development, which began to be implemented in 2016 for a period of fifteen years, to end by 2030 and completed in Table (2).

Previous studies

Numerous Arab and foreign studies have been viewed that dealt with the topic of sustainable development from several aspects, through referring to the website and databases at Yarmouk University, doctoral and master's theses, periodicals and peer-reviewed journals, and the studies related to this study were classified chronologically from newest to oldest and on As follows:

A study by Buzlijac, Torkar, & Scheuch et al. (2019) emerged. Which aimed to know the understanding of biology teachers in sustainable development and education for sustainable development, which was applied to (60) Slovenian teachers and (60) Austrian teachers before service from the Faculty of Education at the University of Ljubljana, and from the Teacher Training Center at the University of Vienna, and they answered a group of Likert closed and open questions, The results indicated that they had an understanding, but they lacked an understanding of the interconnectedness between the environmental, economic and social dimensions related to sustainable development, and the study recommended the authorities responsible for higher education

and responsible for planning and developing curricula to devote more focus to the dimensions of sustainable development.

As for Nwangwa and Inatimi (2019), they conducted a study to ascertain the awareness and challenges of teachers towards achieving the sustainable development goals in Bayelsa State. A questionnaire consisting of (20) items was distributed to a sample of (240) teachers, and the results showed that the level of awareness and perception It was low and that there are great challenges that limit the achievement of the sustainable development goals. The study recommended the necessity of providing workshops for teachers to help improve their knowledge and awareness of the sustainable development goals.

Aye, Win, & Maw (2019) conducted a study aimed at identifying in-service teachers' perceptions towards education for sustainable development and their attitudes towards education for sustainable development. A questionnaire was developed and distributed to (248) middle school teachers from (30) schools in Myanmar, The results showed that the level of awareness of the concepts of education for sustainable development is rather low, and that they are not aware of the concept of education for sustainable development, and they showed that they have a positive attitude towards education for sustainable development, and the study recommended training science teachers during service in an integrated manner with education from For sustainable development.

Murphy (2019) aimed to conduct a survey of the awareness and attitudes of pre-service Thai education teachers on the sustainable development goals with their economic, social and environmental dimensions, and this was done on (390) of them, based on the type of program and the academic year, and the results showed that the level of awareness of pre-service teachers in The second year of their program is much higher than the awareness levels of teachers in the first, third, fourth and fifth years, and that there were no statistically significant differences for the type of

program, Higher education institutions recommended addressing sustainability aspects through various initiatives.

As for the study of Al-Waeli and Al-Qaraan (2019), it aimed to identify the level of knowledge of primary school teachers with the standards of sustainable development and its relationship to their students' motivation towards environmental sustainability. It followed the descriptive and analytical approach and used two tools, The sample consisted of (120) teachers who study the tenth grade of basic education and (480) students in Zarqa, and the results showed that the level of knowledge of primary tenth grade teachers of sustainable development standards in the three areas of sustainable development was average, and the study recommended the rehabilitation and preparation of teachers. The decision-makers in the Ministry of Education reconsidered the development plans on education for sustainable development.

As for the Omisore, Babarinde, Bakare, & Asekun (2017) study that was conducted in Nigeria, which aims to assess the level of awareness, knowledge and attitudes towards sustainable development goals among members of the university community, as it was conducted on (450) individuals from Osun State University students and employees. In southwestern Nigeria, data were collected through a questionnaire and then analyzed data using SPSS, and the results of the study indicated that only (43%) of the respondents were aware of the SDGs and only (4.2%) had good knowledge of the SDGs, however. (56.3%) had a positive attitude towards it, and the study concluded that awareness and attitudes towards the sustainable development goals was fair, nevertheless, the level of knowledge was very low, and this has serious negative repercussions on achieving the sustainable development goals. It also recommended adopting new methods related to enlightening employees and students of the sustainable development goals at the university, and recommended the necessity of changing curricula and adopting new methods of teaching it to achieve appropriate awareness.

The study of Karaarslan and Teksoz (2016) aimed to find out the competence of science teachers for sustainable development in Turkey, and it identified the competencies required of science teachers to become teachers for education for sustainable development. Interviews were conducted with science teachers and education researchers for sustainable development and reviewing the literature, and the study showed that the competence of science teachers does not cover thinking skills along with emotional aspects. Therefore, the study recommends the need to improve and develop the competence of science teachers.

The study of Al-Adwan and Daoud (2016) aimed to find out the degree of awareness of geography teachers to the standards of sustainable development in Jordan that were conducted on (52) teachers from the Directorate of Education and Teaching of the Qweismeh District, which showed that the awareness of geography teachers was at an average level, where it came in the rank. The first is the economic field, followed by the environmental, then the social, and because there are no statistically significant differences due to the scientific qualification variable, and there are statistically significant differences due to the experience variable and for the benefit of geography teachers with recent experience, and the study recommended the conduct of qualification programs for teachers.

Vasconcelos, Sousa, & Pereira (2015) demonstrated the awareness of science teachers in education for sustainable development, where a questionnaire consisting of two questions and judged by (5) experts in education for sustainable development was distributed to (86) teachers in Portugal, and the results showed that few science teachers are aware of the new goals and objectives of sustainable development, and the study recommended an increase Interest in the knowledge of science teachers in relation to the sustainable development goals.

Dencekara and tuna (2011) conducted a study to measure the levels of knowledge of high school students towards environmental issues and

their awareness of sustainable development in Turkey. To achieve this, the study used survey research, and the results indicated that the students were relatively familiar with environmental issues, but , their knowledge of sustainable development was not satisfactory, and that there are large knowledge gaps regarding some issues of the environment and sustainability, especially in students' knowledge of salinity, acid rain, biological diversity, solid waste and the ecosystem, and that students showed their willingness to participate in any activity that promotes sustainable development, and the study recommended encouraging schools. And educators to create their own teaching schedules to apply solutions to problems associated with promoting sustainable development in Turkey.

By reviewing previous studies, it is noted that most of the studies recommended the necessity of qualifying teachers and holding awareness sessions and programs for sustainable development. Most of them indicated a weak awareness of sustainable development in general among teachers and students, with the difference in the rate of weakness from one study to another, Such as the Nwangwa and Inatimi study (2019, Aye et al., 2019, and Vasconcelos et al., (2015), as well as the Dencekara and tuna study, 2011).

While some studies, such as the study of Al-Waili and Al-Quraan (2019), and the study of Al-Adwan and Daoud (2016), have shared an average awareness of sustainable development in general, this is what these studies agree with the current study.

The current study benefited from previous studies in emphasizing its problem, in addition to using it in interpreting and discussing the results, seeing the statistical methods used, and building and framing the study tool.

This study is distinguished by the fact that it will be one of the first studies on the degree of awareness of science teachers of methods of achieving

sustainable development goals (SDGs), within the limits of the researcher's knowledge.

Study procedures and tools

This chapter deals with a description of the study curriculum, the study community, its sample, and the method of selection, and a presentation of the tool used, the method of preparing it, and how to verify its validity and reliability, the chapter provides a description of the research steps and procedures, and the statistical treatment used to draw conclusions and answer the study questions.

Curriculum of study

The survey descriptive curriculum was used to suit the course of study based on the degree of awareness of science teachers on ways to achieve sustainable development goals (2030).

Study population

The study population consists of all science teachers (physics, chemistry, life sciences, earth sciences and environment) in the public schools of the Directorate of Education for the University District in the capital Amman, whose number is (203) science teachers, according to the statistics issued by the planning department in the directorate during the second semester of The year 2021/2020.

The study sample

The study sample consisted of (180) science teachers (physics, chemistry, life sciences, earth sciences and environment) in the Directorate of Education for the University District in the capital Amman, and they constitute (88.7%) and Table No. (3) Shows the distribution of the

frequencies and percentages of the sample members according to the variables studying.

Table (3)

Frequencies and percentages according to study variables

Type	Categories	frequencies	percentages
Gender	Male	56	31.1
	Female	124	68.9
Teaching experience	Less than 5 years	37	20.6
	From 5-10 years	59	32.8
	More than 10 years	84	46.7
Qualification	Bachelor	140	77.8
	Postgraduate	40	22.2
Specialization	Physics	54	30.0
	Chemistry	40	22.2
	Biology	50	27.8
	Earth and Environmental Sciences	36	20.0
Total		180	100.0

Study tool

Since the current study requires determining the degree of awareness of science teachers of methods for achieving the Sustainable Development Goals (2030), it was necessary to develop a tool to measure the required purpose. The tool included three areas:

First: people

Second: the planet

Third: Prosperity

It was referred to the United Nations website to develop the tool, and accordingly the tool was in its initial form (51) paragraphs distributed into (3) areas, the first area: people and includes (18) paragraphs, and the second area: the planet and includes (15) paragraphs, and the third area prosperity It includes (18) paragraphs.

Validate the tool

The scale was distributed to a group of specialists in the sciences and those interested in the field of teaching science curricula and methods of teaching it to arbitrate and take their opinions, and the number of arbitrators reached (10) arbitrators, for the purpose of arbitration in terms of : The soundness of the linguistic wording, the clarity and relevance of the paragraphs in determining the degree of awareness of science teachers of the methods of achieving the sustainable development goals, and adding any suggestions or amendment .

The arbitration process resulted in some amendments that were represented in rewriting some paragraphs, changing some of them because they were not appropriate, and deleting some paragraphs, so that the number of paragraphs after arbitration reached (47) paragraphs distributed as follows: The first area: people and includes (17) paragraphs, and the second area: the planet It included (14) paragraphs, and the third area: prosperity and included (16) paragraphs.

In order to extract the indications of the validity of the construction of the scale, the correlation coefficients of each paragraph and the total score, and between each paragraph and its correlation with the field to which it belongs, and between the fields and the total score, in an exploratory sample from outside the study sample consisted of (30) science teachers, and the correlation coefficients ranged The paragraphs with the tool as a

whole are between (0.04-0.91), and with the field (0.1-0.94), and the following table shows that.

Table (4)

Correlation coefficients between the paragraph, the total degree and the area to which it belongs

Paragraph NO.	Correlation coefficient with domain	Correlation coefficient with the tool	Paragraph NO.	Correlation coefficient with domain	Correlation coefficient with the tool	Paragraph NO.	Correlation coefficient with domain	Correlation coefficient with the tool
1	.65**	.60**	17	.84**	.81**	33	.86**	.83**
2	.66**	.52**	18	.84**	.85**	34	.87**	.85**
3	.01	.18	19	.89**	.91**	35	.89**	.85**
4	.80**	.79**	20	.94**	.91**	36	.93**	.91**
5	.18	.04	21	.79**	.85**	37	.19	.23
6	.83**	.84**	22	.86**	.85**	38	.08	.31(*)
7	.64**	.58**	23	.83**	.74**	39	.86**	.83**
8	.84**	.86**	24	.85**	.85**	40	.89**	.91**
9	.75**	.65**	25	.85**	.81**	41	.81**	.81**
10	.84**	.81**	26	.84**	.79**	42	.90**	.89**
11	.09	.27	27	.90**	.86**	43	.88**	.88**
12	.17	.12	28	.93**	.89**	44	.86**	.82**
13	.78**	.80**	29	.16	.26	45	.86**	.86**
14	.86**	.86**	30	.89**	.81**	46	.84**	.84**
15	.15	.31	31	.91**	.86**	47	.88**	.87**
16	.57**	.52**	32	.86**	.84**			

* Statistical significant at the significance level (0.05).

** Statistical significant at the level of significance (0.01).

It should be noted that all the correlation coefficients were of acceptable scores and statistically significant, and therefore none of these paragraphs were deleted except for (3, 5, 11, 12, 15, 29, 37, and 38), thus the total number of paragraphs became the final form of the tool (39 A paragraph, so that the number of paragraphs in the first area

becomes (12) paragraphs, the second field (13) paragraphs, and the third field (14) paragraphs.

The field correlation coefficient with the total degree was extracted, and the correlation coefficients between the domains with each other. The following table shows that

Table (5)

Correlation coefficients between domains and the total degree

the field	People	planet	prosperity	Total degree
People	1			
Planet	.881**	1		
Prosperity	.766**	.737**	1	
Total Degree	.859**	.868**	.883**	1

* Statistical significant at the significance level (0.05).

** Statistical significant at the level of significance (0.01).

Tables (5) show that all correlation coefficients were of acceptable scores and statistically significant, indicating an appropriate degree of constructs validity.

Tables (5) show that all correlation coefficients were of acceptable scores and statistically, indicating an appropriate degree of constructs validity.

Stability of the search tool

In order to verify the stability of the tool, the stability coefficient was calculated by the internal consistency method according to the Cronbach Alpha equation, and Table No. (6) Shows the internal consistency coefficient according to the Cronbach alpha equation for fields and the total degree, and these values were considered appropriate for the purposes of this study.

Table (6)

Cronbach's alpha for internal consistency coefficient and overall score

The field	Internal consistency	Number of paragraphs
People	0.87	12
Planet	0.85	13
Prosperity	0.88	14
Total Degree	0.92	

Correction of the study tool

Some statistical methods available in the (SPSS) program were used to process the research data, and the five-point Likert scale was adopted to correct the study tools, by giving each of its paragraphs one score out of its five degrees (very large, large, medium, few, very few), which represent Numerically (5, 4, 3, 2, 1) respectively, and the following statistical ranking was adopted to distribute the arithmetic means:

From 1- 1.8 -very few

From 1.81 - 2.6 -few

From 2.61 - 3.4 medium

From 3.41- 4.2 large

4.21-5 - very large

The scale was calculated by using the following equation:

Upper limit of scale (5) - lower limit of scale (1)

Number of required classes (5)

$$0.80 = 1 \frac{-5}{5}$$

And then add the answer (0.80) to the end of each category.

Study application procedures

The researcher carried out the following procedures to implement the study, namely:

- Determining the population of the study and its sample in the schools affiliated to the Directorate of Education and Teaching of the University District.
- Obtaining an official letter from the Education Directorate of the University District, approving the application of the search tool in its affiliated schools.
- Preparing the research tool and conducting validity for them.
- Application of the research tool and data collection for the purposes of statistical analysis.
- Dumping and manipulating data statistically.
- Access to research results and write recommendations and proposals.

Variables of the Study

This study included the following variables:

First: the independent variables:

- 1- Gender: it has two groups (males and females).
- 2- Teaching experience: It has three levels (less than 5 years, 5-10 years, more than 10 years).
- 3- Academic qualification: It has two levels (Bachelor's, postgraduate studies).
- 4- Specialization: it has four categories (physics, chemistry, biology, earth sciences and environment) .

Second: Dependent Variables:

The degree of awareness of science teachers of the sustainable development goals.

Statistical treatment

To answer the study questions, the following statistical analyze were used:

- To answer the first question, the arithmetic means and standard deviations about the estimates of the study sample were used for all the paragraphs of the fields of study.
- To answer the second question, arithmetic means and standard deviations were used for estimates of sample individuals, and Analysis of variance (ANOVA) for the effect of variables (gender, teaching experience, academic qualification and specialization) on the areas of the sustainable development goals (2030).

Results

This chapter includes a presentation of the results that were reached, after data were collected through the study tool that aimed to know the degree of awareness of science teachers of methods to achieve the Sustainable Development Goals (2030), and below is a presentation of the results of the study according to its questions.

First: the results related to the first question

The first question stated: “What is the degree of difference in science teachers’ awareness of methods for achieving the Sustainable Development Goals (2030)?” To answer this question, the arithmetic averages and standard deviations of teachers’ ratings were extracted on the fields of science teachers’ awareness of methods of achieving the Sustainable Development Goals (2030), and the table below illustrates this.

Table (7)

Arithmetic Averages and the standard deviations of science teachers' awareness of methods for achieving the 2030 Sustainable Development Goals arranged in descending order of averages

Rank	NO	The field	Arithmetic Averages	standard deviations	Level
1	1	People	2.97	.706	medium
2	2	Planet	2.93	.789	medium
3	3	Prosperity	2.89	.837	medium
		Total Degree	2.92	.733	medium

Table (7) shows that the arithmetic averages ranged between (2.89-2.97), where the field of people came in the first place with the highest arithmetic average of (2.97), while the field of prosperity came in the last place with a mean of (2.89). As a whole (2.92).

The arithmetic averages and standard deviations of the estimates of the study sample individuals were calculated on the paragraphs of each domain separately, as they were as follows:

The first area: people

Table (8)

Arithmetic averages and standard deviations of the paragraphs related to the field of people arranged in descending order of the arithmetic averages

Rank	NO	Paragraphs	Arithmetic Averages	standard deviations	Level
1	8	Methods of applying health protocols in facing various epidemics	3.56	.922	High
2	6	Educating society on ways to prevent drug and alcohol abuse and their implications for health	3.28	.976	medium
3	11	Use of information and communication technology to promote women's empowerment	3.27	.972	Medium
4	12	Educating and clarifying the laws prohibiting Child marriage and early and forced marriages and their implications	3.13	1.022	medium
5	9	Elimination of all forms of discrimination to achieve gender equality	3.10	.969	medium
6	10	Eliminate all forms of violence	2.98	1.093	medium

Rank	NO	Paragraphs	Arithmetic Averages	standard deviations	Level
7	5	Reducing traffic accidents to reduce mortality	2.97	1.049	medium
8	7	Methods of handling chemicals	2.93	1.073	medium
9	3	The role of initiatives to assist the poor in reducing poverty permanently	2.68	.972	medium
10	4	The role of initiatives calling for the preservation and sustainability of agricultural lands in reducing hunger rates	2.66	1.027	medium
11	1	Technological methods used to reduce poverty	2.56	1.004	medium
12	2	Economic methods used to reduce poverty	2.52	.983	medium
		People	2.97	.706	medium

Table (8) shows that the arithmetic averages ranged between (2.52-3.56), where Paragraph No. (8) Which states “Methods of applying health protocols in the face of various epidemics” came first, with a arithmetic averages of (3.56), Paragraph No. (6), which stipulate “educating the community on methods of preventing drug use and alcohol consumption and their implications for health,” came in second place, with an average of (3.28), while Paragraph No. (2) reads “Economic methods used in poverty reduction.” In the last place, with a arithmetic averages of (2.52). The average for the field of people as a whole was (2.97).

The second area: the planet

Table (9)

The arithmetic averages and standard deviations of the paragraphs related to the planet domain arranged in descending order of the arithmetic averages

Rank	NO	Paragraph	Arithmetic averages	Standard deviations	Level
1	13	Providing safe drinking water at low cost	3.32	.961	medium
2	24	Supporting the establishment of natural reserves	3.08	1.062	medium
3	25	Halting deforestation and increasing afforestation rates	3.03	1.080	medium

Rank	NO	Paragraph	Arithmetic averages	Standard deviations	Level
4	15	Creating methods to activate the role of local communities in improving water and wastewater management	2.97	.948	medium
5	20	Treating the sources of water pollution	2.95	1.021	medium
6	19	Raising awareness of the impact of climate change on human beings and nature	2.94	1.007	medium
7	14	Restoration and protection of water-related ecosystems	2.92	.884	medium
8	17	Confronting risks associated with climate and natural disasters	2.89	.927	medium
9	16	Activating ways to live in harmony with nature	2.87	.986	medium
10	18	Integrate climate change measures into national policies, strategies and plans	2.77	.968	medium
11	21	To develop scientific and technological knowledge about the seas and oceans	2.77	1.036	medium
12	23	Combat Desertification	2.77	1.020	medium
13	22	Restoration and protection of terrestrial ecosystems	2.76	.949	medium
		Planet	2.93	.789	medium

Table (9) shows that the arithmetic averages ranged between (2.76-3.32). Paragraph No. (13) which states “providing safe and affordable drinking water” came in first place with a averages of (3.32), and Paragraph No. 24 came) Which provides for “support for the establishment of protected areas” in second place, with a averages of (3.08), while Paragraph No. (22) which reads “Restoration and protection of terrestrial ecosystems” came last, with a averages of (2.76). The averages of the field for the planet as a whole are (2.93).

The third area: prosperity

Table (10)

The Arithmetic averages and standard deviations of the paragraphs related to the Prosperity domain arranged in descending order of the arithmetic averages

Rank	NO	Paragraph	Arithmetic averages	Standard deviations	Level
1	27	Taking specific measures to save energy	3.16	.935	medium
2	26	The use all kinds of renewable energy	3.07	.975	medium
3	28	Improve energy efficiency	3.07	.955	medium
4	29	Improving technology for providing alternative and sustainable energy	2.99	.974	medium
5	36	Enhancing access to information and communication technology	2.96	.968	medium
6	34	Employment of industries in life to achieve well-being	2.94	1.122	medium
7	33	Improving technological capabilities in industrial sectors	2.92	1.051	medium
8	37	Reducing the negative individual environmental impact of cities, especially with regard to air pollution and the amount of waste	2.89	.994	medium
9	38	Provide safe, affordable and accessible transportation systems	2.84	.987	medium
10	30	Employing alternative energy research and technology results	2.78	1.021	medium
11	32	Enhancing the role of scientific research in the industry	2.78	1.111	medium
12	35	Promote inclusive and sustainable industrialization	2.72	.982	medium
13	31	Combating child labor in all its forms	2.65	1.101	medium
14	39	Provide adequate, safe and affordable housing and basic services	2.63	1.036	medium
		Prosperity	2.89	.837	medium

Table (10) shows that the arithmetic averages ranged between (2.63-3.16), where Paragraph No. (27) Which states “Taking specific measures to save energy” came in first place with an arithmetic average of (3.16). 26, and 28) which stipulate “the use all kinds of renewable energy” and “improving energy efficiency” in second place, with a averages of (3.07),

while Paragraph No. (39) Which reads “Providing adequate, safe and affordable housing and basic services” ranked the last, with a averages of (2.63). The average for the prosperity domain as a whole is (2.89).

Second: The results related to the second question

The second question stated: “What is the degree of science teachers’ awareness of the methods of achieving the Sustainable Development Goals (2030) according to gender, experience, academic qualification, and specialization?”

Table (11)

Arithmetic averages and standard deviations of the degree of awareness of science teachers of methods to achieve the goals of sustainable development 2030 according to gender variables, teaching experience, academic qualification, and specialization

			People	Planet	prosperity	Degree
gender	Male	\bar{X}	3.04	3.05	2.91	3.00
		σ	.720	.858	.934	.802
	Female	\bar{X}	2.94	2.87	2.87	2.89
		σ	.700	.753	.793	.701
teaching experience	Less than 5 years	\bar{X}	3.16	2.98	2.93	3.02
		σ	.601	.728	.795	.637
	From 5-10 years	\bar{X}	2.89	2.84	2.75	2.82
		σ	.735	.873	.865	.779
		\bar{X}	2.94	2.96	2.97	2.96

			People	Planet	prosperity	Degree
	More than 10 years	σ	.720	.757	.832	.740
academic qualification	Bachelor	\bar{X}	2.92	2.85	2.81	2.86
		σ	.654	.715	.772	.664
	Postgraduate	\bar{X}	3.15	3.20	3.14	3.17
		σ	.848	.968	1.002	.906
specialization	Physics	\bar{X}	3.00	3.02	2.97	3.00
		σ	.744	.751	.875	.755
	Chemistry	\bar{X}	2.94	2.90	2.96	2.93
		σ	.762	.748	.844	.741
	Biology	\bar{X}	2.99	2.83	2.77	2.85
		σ	.717	.842	.816	.739
	Earth and Environmental Sciences	\bar{X}	2.93	2.95	2.84	2.91
		σ	.580	.828	.810	.705

Arithmetic averages = \bar{X}

Standard deviation = σ

Table (11) shows an apparent variation in the arithmetic **averages** and standard deviations of the degree of awareness of science teachers of the methods of achieving the 2030 Sustainable Development Goals due to the different categories of gender variables, teaching experience, academic qualification, and specialization.

To demonstrate the significance of the statistical differences between the arithmetic means, a **Quadruple Analysis of variance (ANOVA)** was used on the fields of Table (12) and the quadruple analysis of variance the instrument as a whole Table (13).

Table (12)

Quadruple Analysis of variance (ANOVA) of the impact of gender, teaching experience, academic qualification, and specialization on the areas of the sustainable development goals

Source of Variance	Field	Sum of squares (ss)	Df	Mean squares (MS)	F value	Statistical significant
Gender T2 = 0.028 ME= 0.196	People	.236	1	.236	.482	.489
	Planet	.446	1	.446	.731	.394
	Prosperity	.025	1	.025	.036	.850
Teaching experience Wilks=0.935 ME= 0.075	People	2.760	2	1.380	2.815	.063
	Planet	1.286	2	.643	1.053	.351
	Prosperity	2.256	2	1.128	1.641	.197
Qualification T2 = 0.038 ME=0.097	People	2.453	1	2.453	5.003	.027
	Planet	3.836	1	3.836	6.282	.013
	Prosperity	3.834	1	3.834	5.577	.019
Specialization Wilks =0.957 ME= 0.851	People	.071	3	.024	.048	.986
	Planet	.615	3	.205	.336	.799
	Prosperity	1.584	3	.528	.768	.513
Error	People	84.343	172	.490		
	Planet	105.032	172	.611		
	Prosperity	118.248	172	.687		
Total	People	89.165	179			
	Planet	111.472	179			
	Prosperity	125.352	179			

It can be seen from Table (12) the following:

- There were no statistically significant differences ($\alpha= 0.05$) due to the effect of gender in all fields.

- There were no statistically significant differences ($\alpha= 0.05$) due to the impact of teaching experience in all fields.

- There were statistically significant differences ($\alpha= 0.05$) due to the effect of scientific qualification in all fields, and the differences came in favor of postgraduate studies.

There were no statistically significant differences ($\alpha= 0.05$) due to the effect of specialization in all fields.

Table (13)

Quadruple Analysis of variance (ANOVA) of the impact of gender, teaching experience, academic qualification, and specialization on the degree of awareness of science teachers of methods to achieve the goals of sustainable development 2030

Source of Variance	Sum of squares (ss)	Df	Mean squares (MS)	F value	statistically significant
Gender	.100	1	.100	.189	.664
Teaching experience	1.784	2	.892	1.688	.188
Qualification	3.377	1	3.377	6.391	.012
Specialization	.497	3	.166	.314	.815
Error	90.894	172	.528		
Total	96.232	179			

Table 13 shows the following:

- There were no statistically significant differences ($\alpha= 0.05$) due to the effect of gender, as the F-value was 0.189, with a statistical significance of 0.664.

- There were no statistically significant differences ($\alpha= 0.05$) due to the impact of the teaching experience, where the F- value was 1.688, and in statistical significance was 0.188.
- There were statistically significant differences ($\alpha= 0.05$) due to the effect of scientific qualification, as the F - value was 6.391, with a statistical significance of 0.012, and the differences came in favor of postgraduate studies.
- There were no statistically significant differences ($\alpha= 0.05$) due to the effect of specialization, as the F- value was 0.314, with a statistical significance of 0.815.

Discuss results

This chapter deals with a presentation to discuss the results of the study, and its recommendations in light of the results, where the discussion was presented according to the sequence of study questions as follows.

Discuss the results related to the first question

"How different is science teachers' awareness of the methods of achieving the Sustainable Development Goals (2030) in their three areas: people, planet, prosperity?" The results related to this question showed that the degree of science teachers 'awareness of the methods of

achieving the Sustainable Development Goals (SDGs) from their point of view was moderate.

The results showed that the ranking of the fields of the sustainable development goals according to the arithmetic averages was as follows: (the field of people, followed by the field of the planet, then the area of prosperity), this may be due to the fact that the degree of science teachers' awareness of the methods of achieving the sustainable development goals has not reached the required level in particular and of the sustainable development goals and their dimensions in general, This may be due to the lack or absence of courses, workshops and qualifying programs for methods of achieving sustainable development goals (SDGs) for teachers, whether before or during service, which is agreed upon by many studies such as: Nwangwa Study and Nwangwa & Inatimi, (2019), and Aye et al and others .(2019), and Al-Wali and Al-Quraan (2018).

With regard to the people field, the results showed that the arithmetic averages of the research sample's answers for the paragraphs of the people field ranged between (3.16-2.63), whereas Paragraph No. (8) which states "Methods of applying health protocols in the face of various epidemics" came first. With an average of (3.56), This result may be attributed to the suffering the world is witnessing from the spread of the Corona virus (COVID-19), which has claimed the lives of many, and what the state has done in an attempt to raise the awareness of citizens in general and teachers in particular of the procedures that must be followed to prevent this epidemic by enacting a number of Decisions such as the health protocols enacted by the government and the Ministry of Education for schools, This may also be attributed to the role of various media outlets and channels and social media sites in educating society about the health and economic effects of this virus, and this was reflected in their awareness of the methods of applying health protocols in the face of the Corona epidemic in particular and various epidemics in general, While Paragraph No. (2), which reads "Economic methods used in reducing poverty", came last, with an average of (2.52), this may be attributed to the dependence of most workers on the basic job in obtaining income only and moving away from self-employment that may improve their economic situations and limit poverty.

With regard to the planet field, the results showed that the arithmetic averages of the research sample's answers to the paragraphs of the planet's field ranged between (2.76-3.32), where paragraph No. (13) which states "providing safe and affordable drinking water" came first, This may be attributed to the fact that Jordan is the second poorest water country in the world in terms of per capita share, as indicated by Al-Hamidi (2017), and that there is a great interest by individuals in water due to the many needs of it in drinking and daily life, as it is considered a basis for life as God said in His great book :

("وجعلنا من الماء كلشي حي" (القرآن الكريم، الأنبياء: 30

"We made from water every living thing" (The Noble Qur'an, Al-Anbiya's: 30) , With an average of (3.32), while Paragraph No. (22), which reads "Restoration and Protection of Wild Ecosystems," came last, with a mean of (2.76). This may be attributed to the application of the tool on science teachers in the capital, Amman, as it is an environment. Ecosystems are limited.

As for the prosperity field , the results showed that the arithmetic averages of the answers of the individuals of the research sample for the items of the prosperity domain ranged between (2.63-3.16), Paragraph No. (27) which states "the application of certain measures to reduce energy consumption" came first, with an arithmetic average of (3.16). The researcher attributes this to the fact that energy in all its forms is a global issue and the focus of competition for all countries of the world, and that its production and consumption is economically costly, and this may be attributed to the development of the industrial sector in providing tools and equipment to save energy consumption, such as: Energy saving lamps, while Paragraph No. (39) which reads "Providing adequate, safe and affordable housing and basic services" came last, with an arithmetic average of (2.63), and this may be attributed to the high cost of providing these housing and services.

It is noticeable from the above that there is a significant impact of the audio-visual media and social media on the degree of awareness of science teachers of methods for achieving the Sustainable Development Goals (SDGs), as indicated by the Bojaja study (2019), which aimed to define social media and its role in environmental awareness and

sustainable development And the study of Kwaider and Mubdooa (2017), which aimed to determine the role of social media in spreading sustainable environmental awareness among university students.

Discuss the results related to the second question

"What is the degree of science teachers' awareness of the methods of achieving the Sustainable Development Goals (2030) according to gender, experience, academic qualification, and specialization?"

The results related to this question showed that there are no statistically significant differences ($\alpha= 0.05$) due to the effect of gender, specialization and experience in all fields, while there are statistically significant differences ($\alpha= 0.05$) attributed to academic qualification, and this may be attributed to the fact that teachers who They have enrolled in graduate studies programs they usually have the most knowledge, and this result regarding academic qualification is consistent with the study of Aggression and Daoud (2016).

Recommendations

Based on the findings of this study, the following may be recommended:

- 1- Striving to raise the level of teachers 'knowledge of the concept of sustainable development and its seventeen goals and dimensions through holding discussion meetings and awareness publications on this topic.
- 2- Providing awareness courses and workshops for teachers on methods of achieving the Sustainable Development Goals (SDGs), this leads to a positive reflection on their students.
- 3- Include sustainable development goals in training and qualification programs for teachers before and during service by decision-makers in the Ministry of Education to improve and develop their competence.
- 4- Implementing more studies to determine the training needs of science teachers in the field of sustainable development, to benefit from their results.

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