THE DEGREE OF RATIONALIZATION OF ENERGY CONSUMPTION CONCEPTS INCLUDED IN THE SCIENCE TEXTBOOKS OF THE BASIC STAGE IN JORDAN AND THE STUDENTS' ATTITUDES TOWARDS THEM

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Abstract

Research aimed at identifying the degree of the rationalization of energy consumption concepts included in the sciences textbooks of the basic grades (5-8) and their attitudes towards them. To achieve the objective of the research, the researchers developed the instruments included the instrument for the analysis of the sciences textbooks, and the instrument for measuring the students` attitudes towards energy saving. Validity and reliability of the two instruments were ensured, the instrument for measuring the attitudes was applied to the sample of the study of (272) male and female students in the eighth basic grade in Tafila education directorate, T-test frequencies, and percentages were used for analyzing the independent samples. The findings indicated that the analyzed sciences textbooks included most of the concepts of the analysis instrument, but the distribution of the concepts in the content of the textbooks were at different rates, The findings of the study showed there was a shortage of the concepts include in the sciences textbooks. The results of the study also indicated that the students` attitudes towards energy saving were positive with a high degree, The findings also indicated that there were no statistical differences at level of ($\alpha = 0.05$) students' attitudes towards energy saving attributed to gender, The researches recommended that the sciences textbooks should include all energy rationalization concepts and should be regular and balanced.

Keywords: Rationalization of Energy, sciences textbooks, Energy Consumption, attitudes

Introduction

Recent trends in the field of scientific education confirm the need to provide the individual with a scientific culture that help him keep up with the progress and enable him to live in the twenty-first century, The world today has become a large village; which caused the emergence of many scientific, social, and economic issues that have a direct impact on the future.

One of the most important issues facing the world in general and Jordan in particular is the energy issue, which is one of the main elements of modern societies, the basic engine to the wheel of everyday life in the various sectors, and the cornerstone of the scientific development and industrial renaissance.

Energy, defined as the ability of the matter to give forces able to accomplish a particular job. Jokhi (2006) defines it as the ability to accomplish a particular job, and takes the form of heat, or light.

Scientists have classified the sources of energy in different ways, the most famous classification was set by Cassidy and Grossman (2011), who were classified energy sources into three groups, namely:

1. Non-renewable resources: That exist under the ground, the extraction of such resources requires some geological and physical studies, and these sources are: oil, coal, natural gas and oil shale, and these sources are the most commonly used in the world for the production of energy, but they pollute the environment and they are depleted, the world depends on them by 80% for energy production.

2. Renewed resources: Renewable resources such as solar energy, hydropower, wind power and tidal energy. Such sources are eco-friendly, affordable, less costly in energy production, and may not be monopolized.

3. Renewable resources: the sources that are obtained from the bio-waste, or through recycling of certain materials or separation of some of the elements in nature such as: nuclear energy, bio-energy, and soil.

The scientific and technological progress, the increased use of machinery and equipment, and the increase in population have led to further depletion of energy resources, especially non-renewable sources, the International Energy Agency (IEA, 2000) indicates that energy consumption worldwide will grow at a rate of more than 2% annually and that demand for energy will increase by 54% until 2020.

Geller (2009) says that the world depends on fossil fuels by 80% to supply energy needs; and this has led to the emergence of problems and environmental issues, including: the depletion of non-renewable energy sources, air, water and soil pollution, the spread of health ailments as a result of gas emissions from the burning of fossil fuels.

The World Health Organization (WHO) (2014) indicates that air pollution resulting from the burning of fossil fuels causes the death of 3.8 million people per year worldwide as a result of illness.

The misuse of energy sources led to an increase in the environmental, political, and economic problems; which prompted the concerned parties to call for rationalization of energy consumption and the search for alternatives.

Frederiks, Stenner, and Hobman (2015) indicate that energy efficiency and use of renewable and sustainable energy sources will help preserve the environment, and increase energy efficiency. Further, the success of solving problems related to energy requires not only technological advances, but also needs a change in consumer behavior towards the desired direction.

Accordingly, communities have worked to solve energy associated problems, for example, Germany's parliament recommended to increase people's awareness on energy efficiency, to force power companies to produce greatest possible energy by exploiting renewable sources.

Britain shut down coal mines, turned towards the development of renewable energy, and the development of guidelines to reduce the amount of consumption (Prince, 2005).

At the Arab level, the Organization of Arab Petroleum Exporting Countries OAPEC (2014 Oapec,) held "Energy and Arab Cooperation" conference, the most important recommendations were: To encourage the trend towards renewable energies, and to include the rationalization of energy consumption in the Arab countries in school textbooks.

In Jordan, the energy is facing many current and future challenges, summarized by Muasher et al. (2005) as follows:: Lack of domestic sources of energy, as Jordan imports 95% of total energy needs, high demand for oil products, with average annual growth in oil products consumption by 3%, and an increase in electric power consumption rate by 5.3% per annum, in addition to the fact that producing energy from renewable sources will be very expensive, and the need to improve energy efficiency in all sectors.

Jordan has sought to solve the energy problems, where the Jordanian government has prepared a national plan, and encouraged the use of solar energy, wind power, and encouraged the use of energy-saving lamps, and media encouraged and educated people on the importance of energy rationalization (Ministry of Energy and Mineral Resources 2014) .

The rationalization of energy consumption refers to some actions taken in order to reduce the quantities of used energy to a lesser extent possible without reduction of production or level of service provided (Sam'an, 1994). Harbi (2009) identifies it as the moderate and rational dealing with energy in all aspects of life, without affecting human well-

being, and through the use of energy-saving devices and the optimal design of the buildings.

The best way to conserve energy and reduce problems is to work on reducing consumption, and this is done by increasing awareness and understanding of energy affairs, instilling correct behaviors and trends of individuals, providing them with technologies and knowledge that will enable them to solve the associated problems, and upbringing individual according to educational plan.

Educational and social institutions can do so considering that the education is a process to modify the behavior of individuals, and a means to develop the use of the learners of information in various aspects of their lives, and help them to positively adapt to the most important changes around them and interact with their community issues in order to participate in solving it. Rashdan and Ja'nini (2002) show that the objective of Education is the preparation of individuals that can acquire the skills, values and attitudes that enable them to deal with the environment.

This is done by providing individuals with the planned knowledge and expertise planned; and this requires reconsideration of educational process elements that can contribute to shed light on the energy and rationalization issues consumption, and the development of awareness among members of the community, and alert them to problems resulting from the wasteful use of energy and the need to make optimum use of it.

Curriculum, as one of the educational process key elements and a mean to achieve the educational goals, can be used to educate the individual to adapt to and interact with the community and seek to resolve its problems.

Yassin (2009) indicates that the curriculum is the main axis in the educational process; it is the message that should be conveyed to the learner to understand it and reflect that understanding in his thought and behavior. The research study of Zografakis, Menegaki, and Tsagrakis (2008) emphasizes on the effectiveness of the curriculum in changing behavioral skills and unacceptable attitudes to positive and acceptable skills and trends, and in raising students and parents' awareness about energy rationalization.

Curricula in general and science curriculum in particular have seen a lot of progress and reform; in order to keep pace with the development and meet the emerging needs of society. Science curriculum focuses on global issues including energy issues, and this is confirmed by Kyle's study (1996). Kyle (1996) indicates that teaching of science in the early twenty-first century should focuses on environmental problems, which are the major problems facing the world in this century, i.e. the energy problems, pollution and scarcity of natural resources, increasing population, climate change, poverty, and food shortages.

According to Atallah (2002) there are seven key concepts which form the basis of curricula and science courses of the basic education stage, including the concept of matter and energy. Ali (2003) noted that the reform of the science curriculum movements aimed at re-formulating a developing the curriculum to keep pace with the scientific and technological development, and to achieve the scientific culture as a major goal of the scientific education.

The movements related to the environment and its issues are: the movement of the reform of the science curriculum in the light of the interaction between Science, Technology and Society (STS), which emerged as a result of criticism of the science curriculum about the lack of focus on some aspects, absence of the issues needed by the student in his daily life, not showing the social aspect in science.

The above was followed by reform of science curriculum movement which came in the light of the interaction between science, technology, society, and the environment, (STSE) to link environment with education by addressing several issues such as: pollution, global warming, desertification, degradation of environmental resources, and climate change; to increase students' scientific awareness about sustainable development , to reduce the environmental and social problems (Zaitoon 2010).

Neuendorf (2002) stressed that the modern trends of science curriculum show interest in the personal aspects of the learner (knowledge, skills, and affection), focus on the employment of knowledge in everyday life, and focus on aspects of importance to the individual and society.

Thus, science curriculum should provide students with energy consumption rationalization skills through the inclusion of the concepts related to energy and rationalization.

Harbi (2009) confirms that science curriculum should contain concepts about energy sources and their impact on the environment and ways to rationalize consumption. In his opinion, this will prepare a generation capable of facing energy problems, and contribute to finding clean, sustainable and least expensive sources instead of fossil fuels.

With regard to environmental issues and the community, the general framework of the curricula of science in basic education in Jordan stressed the need to recognize the correlation between organisms and environment, and awareness of environmental issues, and the ability to sustainable use of the sources of the environment, and show positive attitudes towards science and technology, and providing students with skills to help them preserve the environment and its elements, and enable the individual to make decisions that take into account the moral side through the influence of science and its impact to the environment and the community (Jordan Ministry of Education. 2013)

Given the importance of the textbook in the translation of the functions of the curriculum in the field, and as it is the best mean upon which the state depends in the delivery of expertise and information it deems appropriate in the upbringing of individuals

Noor (2013) adds that the textbook has an active role in the field of education, it is a principal mean to provide the student with information, knowledge, values, and skills that he needs to develop his attitude in a positive way in his daily life.

As the scientific attitudes development has been one of the most important educational outcomes, educational institutions has pinned hopes on it , the general framework of the science curriculum in basic education in Jordan stressed the need to develop scientific and attitudes among students about environmental resources and how to maintain them (Jordan Ministry of Education of Jordan, 2013).

Attitudes are a set of cognitive, emotional, and behavioral components that relate to the response of the individual toward a certain position of support or rejection (Zaitoon, 2005).

Trow (2000) refers to attitude as one of the internal variables that affect the various responses formed by the students about what they are learning, and also it affects the different responses formed by the teacher about his students. If the attitudes are positive, then the emotional atmosphere that prevails in the educational process will be positive, and desirable.

Attitudes are closely linked to One's reaction to various situations around him, especially social issues.

Mukhaimar and Absi (2014) say that the attitude has three components: cognitive, emotional, and behavioral. The cognitive component includes knowledge, information, and ideas that the individual acquires and learns and has an impact on the construction of the attitude. The emotional component expresses the individual's emotions and feelings towards a particular topic. The behavioral component includes skills, dispositions, and a set of behavioral patterns that urge the individual to practice a negative or positive behavior, depending on the motive behind the behavior the individual earned.

Knowledge is a key factor in the formation of positive attitudes about energy use; students are learning behavior through experiences provided to them. This will affect their families and their environments. Wakeel and Moghni (2007) confirm that the experience and information acquired by individuals through the textbook help them identify environment and society related issues in order to find solutions to these problems through comprehensive planning and implementation. So we should pay attention to the quality of the concepts provided through textbooks especially the

concepts of energy rationalization, as the inclusion of energy concepts in the science books helps to raise awareness among students about its importance in our lives, and how to cope with current and future problems caused by them, especially in this age, when values and correct behavior and attitudes towards the importance of energy rationalization are instilled in the individual.

Therefore, it has become necessary to study the degree of inclusion of energy consumption rationalization concepts in science textbooks. The study also investigated the students' attitudes towards the rationalization of consumption.

Research Problem

Lack of energy sources is the main problem in Jordan, it has doubled in recent years due to high demand; as a result of the increase in population and improvement in the economic level of the individual on the one hand and misuse on the other hand.

The two researchers noted that members of Jordanian society in general and students in particular do not have good attitudes towards energy rationalization, which is demonstrated in: leaving the light bulbs illuminated without need, whether on the streets or houses or in classrooms and school corridors, not shutting down the electrical appliances after using them, using private cars more than means of public transport to arrive to school or while doing daily chores, and not walking on foot even to cover short distances.

The study came to reveal the concepts of the rationalization of energy consumption included in science textbooks and students attitudes towards them, and more precisely, this research seeks to identify the degree of inclusion of concepts of energy consumption rationalization in science textbooks for basic grades (5,6,7,8) in Jordan and students attitudes towards them.

Research Questions

The first question: What are the concepts of energy rationalization included in science textbooks for basic grades (5-8) in Jordan?

The second question: To what degree the concepts of rationalization of energy consumption are included in science textbooks for basic grades (5-8) in Jordan?

The third question: What are the attitudes of students in Tafila Education Directorate schools towards the rationalization of energy consumption?

Research Importance

Research importance comes from its ability to give the desired results, which are expected to be reflected positively on the students, family, and the community at large. This is done by providing the list of the concepts of energy rationalization to be included in the curriculum. Such concepts may be useful to curricula experts in the development of science curriculum to reduce the energy crisis.

In addition to providing an instrument to analyze the content and see the concepts that are included in the science textbooks, study the points of view of experts and specialists to see if such concepts are adequate to achieve the desired goal.

Thus briefing the experts in charge of the development of curriculum on points of strength and weaknesses in science textbooks for grades (5-8) regarding the aspects of energy rationalization in all sectors (industrial, household, commercial, agricultural, and transportation), and by providing an instrument for measuring eighth-grade students attitudes about energy rationalization after they finish studying all the concepts that have been acquired in the science books of the previous classes. Each scientific information and experience gained by the student in each past stage will be considered past experience for the subsequent stage.

Research Objectives

The study aims at revealing to what degree the concepts of rationalization of energy consumption are included in science textbooks of (5-8) grades in light of the research instrument, and identifying the attitudes of the eighth grade students towards energy rationalization.

Procedural Definitions

Energy: a physical amount in the form of heat, mechanical movement, or electrical discharges resulting from electricity or fossil fuels, which includes (natural gas and oil derivatives of diesel, gasoline and kerosene), which man uses to run machinery devices used in daily life.

Rationalization of Energy Consumption: a set of procedures to reduce the amount of energy used to a minimum quantity without compromising the well-being, or to influence the level of performance.

Attitude: Individual's position about a subject, positively or negatively.

Attitudes towards Rationalization of Energy Consumption: Students attitude towards energy rationalization through their application on the scale prepared for that purpose, and is measured by the degree the student obtained according to the instrument used in the study.

Science Textbooks: the textbooks issued by the Ministry of Education of Jordan under version number (11/2007), starting from the academic year 2007/2008, and include science textbooks for basic grades (fifth, sixth, seventh and eighth).

Basic Stage: the Education stage which begins from the first basic grade and ends at the tenth basic grade according to Jordan Ministry of Education.

Content Analysis: the quantitative analysis of the concepts included in science textbooks for basic grades (fifth, sixth, seventh, and eighth) that highlight the concepts of rationalization of energy consumption in Jordan, it includes the textual content (introductions, headings, items, words and questions and activities), and visual content (images, graphics, forms, maps and tables).

Basic Eighth Grade: eighth academic year of basic stage according to the education system in Jordan.

Research Limitations

This study was confined to science textbooks for basic grades (5-8) issued under the Jordanian Ministry of Education, the version number (11/2007), starting from the academic year 2007/2008

And attitudes of eighth grade students towards energy rationalization concepts in Tafila Education Directorate during the second semester of the academic year 2014/2015 using an attitude scale prepared for that purpose.

Previous Literature

After reviewing the educational literature and studies related to the energy issues contained in science textbooks and students' attitudes towards them, the two researchers reviewed several research studies such as the study of Hiari and Rawashda (2013) which aimed to determine rates of scientific, social and technological issues in science textbooks for the ninth grade in Jordan. The researcher applied content analysis method, the used analysis instrument included ten main issues, divided into 86 sub-issue, including energy issues, and the researcher suggested that science textbooks focused on health issues by (% 28.37), followed by water scarcity issues by (% 20.52) and energy issues by (7.45%). The researchers found that there are some issues not included in the science books, such as nuclear energy issues.

Harbi (2009) conducted a study that aimed at identifying the energy issues, alternatives, and rationalization measures that suit primary school students in Saudi Arabia, and how science textbooks dealt with such topics. The researcher adopted the content analysis method, and the process of analysis depended on the idea and the subject.The researcher found out that the science textbooks in the primary stage included one or more of energy

consumption and rationalization subjects, but the inclusion lacked balance. The researcher also found out science textbooks lack subjects on energy alternatives and rationalization measures.

Faqih (2006) conducted a study aimed at identifying the nature of environmental concepts included in the science textbook for the ninth grade in Yemen and to achieve the goal, the researcher analyzed the science textbook for the ninth grade using analysis instrument consisted of (75) environmental items distributed on five aspects, the researcher used the content analysis style, and adopted the explicit word in the analysis. The results of his study showed that the field of environmental problems consisted of five problems, including the problem of energy which contains (6) sub-items received the highest rank with (129) repetition and a rate of (47.77). The results also showed that the degree of inclusion of sub-items related to the problem of energy including energy shortages, increased consumption of energy, and lack of awareness of the importance of energy, in the science textbook is high.

Rashed's study (2004) sought to find out how science textbooks in the various stages of public education in Saudi Arabia have dealt with oil and derivatives topics from the perspective of a group of experts. The researcher used an instrument for measuring the point of view of experts about the extent to which science textbooks have dealt with oil topics. The researcher concluded that the content of science textbooks in the stages of public education does not achieve the educational goals of science topics related to oil, such as the importance of oil and the fields of use and its negative impact on the environment.

Okour's study (2002) aimed at identifying the environmental values that included some energy concepts in science textbooks for basic stage (the fourth, fifth and sixth) in Jordan, and the extent of acquisition of such values by seventh graders in Irbid 2 schools. The study sample consisted of (337) students from the seventh grade, it also consisted of science textbooks for fourth, fifth and sixth basic grades. The results of the study indicated that the environmental values in science textbooks are marginalized and disorganized, including the concepts of rationalization of energy and water consumption, and lack of attention to some of the environmental values such as rationalization of energy consumption, water and the fight against desertification and pollution.

Abdelraheem's study (2012) focused on students attitudes towards energy and rationalization measures. The study sought to identify the attitudes of female students at King Saud University towards the culture of energy rationalization in all aspects of life, including the use of electricity and fuel, the sources of this knowledge, and the extent of its contribution to the promotion and dissemination of this culture.

The study was applied on a sample consisting of (550) female students, and the results indicated a relationship between the social background of the student and the knowledge of consumption rationalization culture and the practice of this culture. The results showed that extravagance and waste in food, drink, clothing, electricity, and fuel could be attributed to the lack of awareness on the importance of rationalization, and results of the study also showed that there is a decline in civil societies interest in the culture of rationalization of consumption.

Zografakis, Menegaki, and Tsagrakis (2008) conducted a study aimed to investigate the effectiveness of the curriculum in behavior change and in educating students and parents about energy issues.

The researchers used the descriptive method survey in the study, and prepared a questionnaire to measure the impact of the curriculum in educating students and parents about energy rationalization issues, and in changing their behavior. The questionnaire was used as an instrument for gathering data, it has been applied to (320) students, and the results of the study confirmed the effectiveness of the curriculum in behavior change and in education students and parents about energy matters, and the importance of the role played by school in educating students about most important energy-related issues.

Tekbiyik (2008) presented a work paper aimed to examine the attitudes of primary stage teachers towards energy conservation before the service at the Faculty of Education of the University of Rise. His study came to answer the pre-service primary stage teachers' attitudes towards energy conservation. The attitudes varied according to sex and rank, the researcher used Energy Conservation Attitude Scale (ECAS), which is composed of nine sub-levels, applied to the study sample of (223) teachers of primary stage before the service. The results indicated that primary stage female teachers, before the service, have more positive attitudes than male teachers in some sub-levels (such as maintain the cars, preserving the environment from pollution, and how to get energy), on the other hand the attitudes of primary stage male teachers, before the service, were more positive than female teachers in some sub-levels: such as indifference to energy conservation, irresponsibility, and support for nuclear energy.

The previous literature addressed the energy matters and consumption rationalization from different perspectives. The first part of the previous literature focused on the degree of inclusion of concepts of energy in science textbooks, and that there are shortcomings and lack of balance in the presentation of concepts of energy, and conservation measures in science textbooks, some studies also focused on students' attitudes and behaviors toward the rationalization of consumption, the results of such

studies showed that Saudi female students ' attitude towards energy rationalization culture was law in it level.

Like many previous studies, this study is also concerned with the concepts of energy conservation included in science textbooks, the two researchers benefited from previous studies and instruments in designing a new instrument for the analysis of science books to know the degree of inclusion of energy conservation concepts, and another instrument to measure students' attitudes toward energy rationalization.

According to researchers, no study was conducted in identifying the degree of inclusion of energy rationalization concepts in science textbooks for grades (5-8) in Jordan, or to identify students' attitudes towards themselves, which confirms the importance of this study.

Research Population

The study population consisted of science textbooks assigned for the fifth, sixth, seventh, and eighth grades, issued under the Jordan Ministry of Education decision , version number (11/2007) from the academic year 2007/2008, the number of textbooks was (4) books. The study population also consisted of all eighth graders in the public schools affiliated with Tafila Education Directorate, and enrolled for the second semester of the academic year 2014/2015, about (1290) students.

Research Sample

Research sample included science textbooks for (fifth, sixth, seventh, and eighth) grades of the basic stage. It also included (272) eighth grade students from Tafila Education Directorate distributed on (16) schools, as the number of male students was (142) and the number of female students was (130), this accounts for 20% of the study population, the study sample was chosen using the stratified random method.

Research Instrument

To achieve the research purposes, the researchers designed two instruments.

The first one to analyze the content of science textbooks assigned for (fifth, sixth, seventh, and eighth) grades of the basic stage in Jordan. The second one is a list consisted of energy consumption rationalization concepts that included in science textbooks, to be used in the analysis of the textbooks, after a review of the scientific literature, studies and researches. In light of this, the researchers prepared a preliminary list of the concepts of energy rationalization consisted of (44) concepts distributed over five aspects (housing sector, transportation sector, agricultural sector, industrial sector, and commercial sector).

To ensure the validity of the instrument it was presented to a committee of arbitrators of (10) members, specialists in curricula and teaching methods, methods of teaching science in faculties of education, teachers from the faculty of science, supervisors, and teachers of science at the Department of Education, who were asked to give their comments on the utility of the instrument , in terms of comprehensibility of aspects and concepts contained , their importance and relevance, language and drafting, and any amendments they deem appropriate. After reviewing the instrument, and conducting the proposed amendments suggested by the arbitrators: such as formulation, deletion, and addition of some concepts, the instrument in its final form consisted of (43) concepts distributed on five aspects. See appendix (A).

Reliability of Analysis: it was ascertained in two ways: the first through the people; where the two researchers analyzed two parts of the science textbooks selected randomly, and constitute about 20% of the study sample. The percentage of agreement between them reached 95%, and this percentage is sufficient to ensure the reliability of analysis.

The second through time, where the researchers re-analyzed all study samples after three weeks, the percentage of agreement between the results of the analysis was calculated using Holsti Formula (Holsti, 1969) which takes the following form: CR = 2M / (N1 + N2), where: CR = coefficient of reliability, 2M = total items agreed upon during the two times of analysis, (N1 + N2) = times of agreements + times of disagreements.

The ratio of average reliability coefficient has reached 98%, which is an acceptable value.

Analysis Rules

-Search for any implication in the content that might promote energy rationalization.

- When a item, image or form reflects more than one idea or explicit word, then the word" frequency " will be given to each of them.

- Identify the unit of analysis, the adoption of the idea that form the basic rule in the concepts analysis, as reflected in concept, item, text, symbols, shapes, images and tables.

Second: Attitudes Measuring Instrument:

The study researchers prepared an instrument to measure students' attitudes towards energy rationalization, after reviewing the theoretical literature and previous studies related to the subject of study.

In light of that instrument for measuring attitudes of the eighth grade students about the concepts of energy rationalization was prepared. It included (30) items in its initial form.

To ensure the validity of the instrument, it was presented to a committee of arbitrators and specialists in curricula, teaching methods, methods of teaching science, measuring and evaluation in faculties of education , teachers from the faculty of science, and a number supervisors and teachers of science at the Department of Education, who were asked to give their comments on the utility of the instrument , in terms of comprehensibility of aspects and concepts contained, language and drafting, appropriateness to eighth grade students, and to make any amendments they deem appropriate. Some items have been reformulated; others have been deleted, or added as suggested by the arbitrators. The instrument in its final form consisted of (26) items as shown in appendix (B).

To calculate the reliability of the instrument, it was applied on a prospective sample from outside the study sample, about (25) students. Two weeks later, it was re-applied to the same sample. The correlation coefficient between the scores of students in the two applications was measured, the value found to be (85%). Then the internal consistency of their scores in the first application was calculated using (Cronbach's alpha), which found to be (86%). These values are acceptable for purposes of this study.

The data were processed using the following statistical methods: Cronbach Alpha equation to calculate the reliability of the measurement instrument, and Holisti Formula to calculate reliability of the two analysis, averages, percentage, and t-test for independent samples.

Research Results

This part shows the findings of the study

First: results related to the answer of first question: What are the concepts of energy rationalization included in science textbooks of (5-8) grades in Jordan?

To answer this question, an instrument contained a list of the concepts of energy rationalization that should be included in the science textbooks has been developed. It was developed after reviewing the educational literature and previous studies, and after consultations with experts and specialists in this filed. Such concepts were distributed on five aspects, and table (1) illustrates this:

Table (1) Aspects of energy rationalization, concepts, and indicators

Aspect	Concept No	Concept	Indicator
Household Sector	1	House design	Encourage the design that serve rationalization of consumption
	2	Wall color	Paint walls with light colors
	3	Solar geyser	Use solar energy to heat water
	4	Solar cells	Use solar cells producing electricity in certain aspects
	5	Drying clothes	Utilize solar energy to dry clothes
	6	Shutting down devices	Turn off bulbs and unused appliances
	7	Energy-saving appliances	Use energy-saving lamps
	8	Appropriate Flame	Use the appropriate flame during cooking
	9	Cleaning devices	the importance of cleaning appliances and light bulbs periodically
	10	Importance of energy to	Increase awareness about the importance of energy and some of their uses in our daily lives
	11	Sunlight	Take advantage of sunlight in lighting the house in the daytime
	12	Washing &ironing	Regulate washing and ironing process.
	13	Heating & Cooling	Close windows and doors when you turn on the air conditioner reduces the amount of energy consumed
Transport Sector	14	Hybrid Cars	Replace the old vehicle with hybrid
	15	Vehicle use	Use the vehicle in case of bad need
	16	Pubic Transport	Encourage the use of public transport
	17	Importance of walking on foot	Walk on foot, particularly for short distances.
	18	Transport System	Improve transport systems and network on ongoing basis
	19	Traffic	Regulate traffic lanes and intersection to ease traffic
	20	Fossil fuel	The importance of fossil fuels in transport and vehicles
	21	Maintenance	Encourage the maintenance of vehicles on a regular basis
Agriculture Sector	22	Gravity Irrigation	To rely on gravity irrigation instead of pumps
	23	Greenhouses	Use greenhouses in agriculture to save energy
	24	Devices and machines	Encourage the use of devices and machines when needed
	25	Maintenance	Encourage periodic maintenance of devices and machines
	26	Products transfer	The importance of regulating the process of transferring animal & agricultural products in reducing the amount of fuel consumption
	27	The importance of sun for agriculture	Take advantage of the sun rays in agriculture

Industrial Sector	28	Maintenance	The importance of periodic maintenance for devices
	29	Gas danger	To state the danger of gases emitted from factories
	30	Emitted heat	To benefit from heat released from factories
	31	Energy saving	Possess the most efficient power-saving devices
	32	Adjust heating and air conditioning	Importance of adjusting heating and air conditioning systems to the required degree.
	33	Waste of energy	Encourage addressing the faults that lead to energy waste
	34	Raise awareness among workers	Raise awareness among workers about energy rationalization
	35	Renewable energy sources	Encourage the use of renewable energy sources
	36	Control of devices	Turn off unused devices and lamps
	37	Energy-saving devices	Manufacture the energy-saving, performance –efficient devices and encourage their use.
	38	Solar cells	Manufacture the power-generating solar cells and encourage using them
Commercial Sector	39	Adjust refrigerators heat	To adjust refrigerator heat at the appropriate temperature
	40	Site	Choose the stores that are mostly exposed to sun light
	41	Energy –saving devices	Encourage the purchase of energy – saving devices
	42	Maintenance	The importance of periodic maintenance for devices
	43	Shutting down the devices	Turn off unused devices

From Table (1) researchers note that the analysis instrument consisted of (43) concept of the rationalization of energy consumption, distributed on five key aspects, where the household sector included (13) concept, transport sector included (8) concepts, the agricultural sector included (6) concepts, the industrial sector included (11) concept, the commercial sector included (5) concepts, and in front of each concept there is an indicator related to it.

Second: The Results Relating to the Second Question:

To what degree the concepts of energy consumption rationalization are included in science textbooks for grades (5-8) in Jordan?

To answer this question, science textbooks of (5-8) grades in Jordan were analyzed, using the analysis instrument that has been prepared for this purpose.

Frequencies and percentages of concepts of energy consumption rationalization in each textbook of the study sample have been counted and found to be (43) concepts distributed on five aspects. Find below their distribution by each aspect:

The First aspect: the Housing Sector:

To find frequencies and percentages of the concepts of rationalization of energy consumption in this sector, all science textbooks identified in the sample have been analyzed. Frequencies representing the households were counted, then their percentage was calculated, and Table 2 illustrates this.

Table (2) Frequencies and percentages of energy rationalization concepts in the area of the households sector contained in science books in descending order

No	Concept	Frequencies				Total Frequencies	Percentage	Rank
		Grade 5^{th}	Grade 6^{th}	Grade 7^{th}	Grade 8^{th}			
10	Importance of energy	17	29	0	22	68	43.59	1
1	House design	6	4	5	2	17	10.90	2
4	Solar cells	2	7	0	5	14	8.97	3
11	Sunlight	3	7	0	4	14	8.97	4
7	Energy-saving devices	5	4	3	1	13	8.34	5
3	Solar geyser	1	4	2	2	9	5.77	6
6	Closing devices	5	0	0	2	7	4.49	7
5	Clothes drying	3	0	2	1	6	3.85	8
8	Appropriate flame	2	0	2	0	4	2.56	9
9	Cleaning devices	1	0	1	0	2	1.28	10
13	Heating & Cooling	1	0	0	0	1	0.64	11
2	Walls paint	0	0	0	1	1	064	12
12	Regulating washing & ironing	0	0	0	0	0	0.00	13
Total		**46**	**55**	**15**	**40**	**156**	**100%**	

Researchers of this study note from table (2) that the total frequencies that reflect the area of the household sector are (156) distributed on (13) concepts, where "the importance of energy" concept ranked the first with (68) frequencies, with a percentage of (43.59%) of the total concepts. The

second rank was occupied by “house design” concept with (17) frequencies and a percentage of (10.90%).

"Heating and cooling” concept ranked the lowest, and “walls paint” got (1) frequency with a percentage of (0.64%) for each, however the concept of "regulating washing and ironing, "did not receive any frequency.

It is also noted from the above table that science textbook of sixth-grade received the highest frequencies of the total frequencies that reflect the household sector with (55) frequencies, followed by science textbook of the fifth grade with (46) frequencies. Science textbook of the eighth grade came in the third place with (40) frequencies, while science textbook of the seventh grade came in the last place with (15) frequencies.

The Second aspects: Transport Sector:

The frequencies of concepts relating to transport sector were counted, then their percentage was calculated, and Table 3 illustrates this.

Table (3) Frequencies and percentages of energy rationalization concepts in the area of the transport sector contained in science books in descending order

No	Concept	Frequencies				Total frequencies	Percentage	Rank
		Grade 5^{th}	Grade 6^{th}	Grade 7^{th}	Grade 8^{th}			
20	Fossil fuel	6	18	0	18	42	43.30	1
21	Maintenance	6	3	3	3	15	15.46	2
15	Use of vehicle	6	1	0	4	11	11.34	3
16	Public transport	5	2	1	3	11	11.34	4
17	Importance of walking on foot	6	2	1	0	9	9.28	5
14	Hybrid cars	3	0	0	1	4	4.12	6
18	Transport systems	2	0	0	1	3	3.10	7
19	Traffic movement	1	0	0	1	2	2.06	8
Total		**35**	**26**	**5**	**31**	**97**	**100%**	

We, as researchers, note from table (3) that the total frequencies that reflect the area of the transport sector are (97) distributed on (8) concepts, where "fossil fuel" concept ranked the first with (42) frequencies, with a percentage of (43.30%) of the total concepts. The second rank was occupied by “maintenance” concept with (15) frequencies and a percentage of (15.46%),"traffic movement” concept ranked the lowest with (2) frequencies and a percentage of (2.06%).

It is also noted from the above table that science textbook for fifth-grade received the highest frequencies of the total frequencies that reflect the transport sector with (35) frequencies, followed by science textbook for the eighth grade with (31) frequencies. Science textbook for the sixth grade came in the third rank with (26) frequencies, while science textbook for the seventh grade came in the last rank with (5) frequencies.

The Third aspect: Agriculture Sector:

The frequencies of concepts relating to agriculture sector were counted, then their percentage was calculated, and Table 4 illustrates this.

Table (4) Frequencies and percentages of energy rationalization concepts in the area of the agriculture sector contained in science textbooks in descending order

No	Concept	Frequencies				Total frequencies	Percentage	Rank
		Grade 5^{th}	Grade 6^{th}	Grade 7^{th}	Grade 8^{th}			
27	Importance of sun for agriculture	3	1	4	4	12	63.15	1
24	Use of devices and machines	2	1	0	0	3	15.79	2
22	Gravity irrigation	1	0	0	1	2	10.53	3
23	Greenhouses	1	1	0	0	2	10.53	4
25	Maintenance	0	0	0	0	0	0.00	5
26	Transfer of products	0	0	0	0	0	0.00	6
Total		**7**	**3**	**4**	**5**	**19**	**100%**	

We note from table (4) that the total frequencies that reflect the area of the agriculture sector are (19) distributed on (6) concepts, where "importance of sun for agriculture" concept ranked the first with (12) frequencies, with a percentage of (63.15%) of the total concepts. However, "use of devices and machines, gravity irrigation, and greenhouses" concepts were included in science textbooks with almost similar frequencies and percentages. On the other hand, "products transfer, and maintenance "were not mentioned in the analyzed sample.

The above table also showed that science textbook for the fifth-grade received the highest frequencies of the total frequencies that reflect the agriculture sector with (7) frequencies, followed by science textbook for the eighth grade with (5) frequencies. The third and fourth ranks occupied by science textbooks for the seventh and sixth grades, with almost similar frequencies and percentages, with (3,4) frequencies for each of them, respectively.

The Fourth Area: Industrial Sector:

The frequencies of concepts relating to industrial sector were counted, then their percentage was calculated, and Table 5 illustrates this.

Table (5) Frequencies and percentages of energy rationalization concepts in the area of the industrial sector contained in science books in descending order

No	Concept	Frequencies				Total frequencies	Percentage	Rank
		Grade 5^{th}	Grade 6^{th}	Grade 7^{th}	Grade 8^{th}			
35	Renewable energy sources	11	14	1	13	39	39.00	1
29	Gases danger	9	10	2	16	37	37.00	2
34	Raise awareness of workers	5	2	0	1	8	8.00	3
38	Solar cells	3	1	0	1	5	5.00	4
37	Energy-saving devices	2	0	1	1	4	4.00	5
33	Waste of energy	1	1	0	0	2	2.00	6
36	Adjust the devices	2	0	0	0	2	2.00	7
30	Released heat	0	1	0	0	1	2.00	8
31	Saving energy	1	0	0	0	1	1.00	9
32	Adjust heating and air conditioning devices	1	0	0	0	1	1.00	10
28	Maintenance	0	0	0	0	0	0.00	11
Total		**35**	**29**	**4**	**32**	**100**	**100%**	

Table (5) indicates that the total frequencies that reflect the area of the industrial sector are (100) distributed on (11) concepts, where "renewable energy sources" concept ranked the first with (39) frequencies, with a percentage of (39%) of the total concepts. The second rank was occupied by “gases danger” concept with (37) frequencies and a percentage of (37%), "released heat, saving energy, adjust heating and air conditioning devices” concept ranked the lowest with (1) frequency and a percentage of (1%) for each concept. However, “maintenance” concept was not mentioned in any of the analyzed science books..

The above table also showed that science textbook for fifth-grade received the highest frequencies of the total frequencies that reflect the industrial sector with (35) frequencies, followed by science textbook for eighth grade with (32) frequencies. The third rank was occupied by science textbook for the sixth grade with (29). Science textbook for the seventh grade came in the last rank with (4) frequencies.

The Fifth Area: Commercial Sector:

The frequencies of concepts relating to commercial sector were counted, then their percentage was calculated, and Table 6 illustrates this.

Table (6) Frequencies and percentages of energy rationalization concepts in the area of the commercial sector contained in science books in descending order

No	Concept	Frequencies				Total frequencies	Percentage	Rank
		Grade 5^{th}	Grade 6^{th}	Grade 7^{th}	Grade 8^{th}			
41	Energy –saving devices	1	1	0	3	5	50.00	1
43	Closing devices	2	1	0	0	3	30.00	2
42	Maintenance	1	0	0	1	2	20.00	3
39	Adjust the temperature of refrigerators	0	0	0	0	0	0.00	4
40	Site	0	0	0	0	0	0.00	5
Total		**4**	**2**	**0**	**4**	**10**	**100%**	

Table (6) indicates that the total frequencies that reflect the area of the commercial sector are (10) distributed on (5) concepts, where "energy – saving devices "concept ranked the first with (5) frequencies, with a percentage of (50%) of the total concepts. "Closing devices, and maintenance" concept came in the second and third ranks, respectively. They were included with similar frequencies, with (3, 2) frequencies for each of them, respectively. However, the two concepts "site, and adjust the temperature of refrigerators were not mentioned in any of the analyzed science books.

The above table also showed that total frequencies for commercial sector concepts distributed on three textbooks, science textbook for the fifth and eighth grades received the highest frequencies with (4) frequencies for each of them, followed by science textbook for the sixth grade with (2) frequencies. The science textbook for the seventh grade did not score any frequency.

The aspects of Energy Consumption Rationalization

The frequencies and percentages of each area of energy consumption rationalization included in science textbooks were counted, and Table 7 illustrates this.

Table (7) Frequencies and percentages of energy consumption rationalization aspects included in science books For (5-8) grades

Sector	5th Grade		6th Grade		7th Grade		8th Grade		Total Freq.	Instrument percentage
	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Households	46	36.22	55	47.83	15	53.57	40	35.71	156	41%
Transport	35	27.56	26	22.61	5	17.85	31	27.68	97	25%
Agriculture	7	5.51	3	2.60	4	14.29	5	4.47	19	5%
Industrial	35	27.56	29	25.22	4	14.29	32	28.57	100	26%
Commercial	4	3.15	2	1.74	0	0.00	4	3.57	10	3%
Total	127	100	115	100	28	100	112	100	382	100%
Grade Percentage		33.25		30.10		7.33		29.32		100%

Results in Table (7) indicate that the total frequencies of energy consumption rationalization concepts included in all books of the sample are (382), science textbook for the fifth grade received the highest number of frequencies , about (127) with a percentage of (33.25%), followed by science textbook for the sixth grade which received (115) frequencies with a percentage of (30.10). Science textbook for the eighth grade came in the third rank with (112) frequencies and a percentage of (29.32%). Science textbook for the seventh grade occupied the lowest rank with (28) frequencies, and a percentage of (7.33%).

Regarding the aspects, households sector received the highest number of frequencies, about (156) with a percentage of (41%), followed by industrial sector with (100) frequencies and a percentage of (26%). Transport sector came in the third rank with (97) frequencies and a percentage of (25%). Agriculture sector came in the fourth rank with (19) frequencies and a percentage of (5%).Commercial sectors came in the lowest rank with (10) frequencies, and a percentage of (3%).

The distribution of aspects according to frequencies and percentages in each book came as follows: households sector received the highest number of frequencies in science textbook for the fifth grade, about (46) with a percentage of (36.22%), followed by transport & industrial sectors with (35) frequencies for each and a percentage of (27.56%). Commercial sector ranked the lowest with (4) frequencies and a percentage of (3.15%). With regard to science textbook for the sixth grade, households sector came in the first rank with (55) frequencies and a percentage of (47.83%), followed by industrial sector with (29) frequencies, and a percentage of (25.22%), commercial sector came in the lowest rank with (2) frequencies, and a percentage of (1.74 %).

In science textbooks for the seventh grade, households sector received the highest number of frequencies, about (15) with a percentage of

(53.57.22%), followed by transport sector with (5) frequencies and a percentage of (17.85%), commercial sector ranked the lowest with (0) frequencies. Finally, in science textbook for the eighth grade, households sector came in the first rank with (40) frequencies and a percentage of (35.71%), followed by industrial sector with (32) frequencies, and a percentage of (28.57%), commercial sector came in the lowest rank with (4) frequencies, and a percentage of (3.57 %).

Third: Results Relating to Responses to Study's Third Question

What are the students' attitudes towards energy consumption rationalization in the schools affiliated with Tafila Education Directorate?

To answer this question, the items of the questionnaire applied to the study sample were analyzed to calculate the averages, standard deviations, rank of items, and the grades obtained by each item, and Table (8) shows that.

Table (8) Averages, standard deviations, and students' attitudes towards energy consumption rationalization

item's No	item	Average	Standard Deviation	item's Rank	Grade
3	I prefer drying clothes under the sun in warm days.	4.42	0.97	1	High
4	I remove the curtains from windows during the day to take advantage of sunlight in lighting the house	4.32	0.92	2	High
2	I shut down unused electrical appliances	4.30	1.02	3	High
1	I turn off lamps in the unused places	4.28	1.00	4	High
7	I close doors and windows when turning on the air conditioner or heating devices	4.11	1.26	5	High
10	I walk on foot for short distances	4.08	1.30	6	High
19	I open the refrigerator door in case of need only.	4.08	1.27	7	High
20	I use the small gas flame to heat small utensils	3.93	1.29	8	High
8	I encourage purchasing energy –efficient, energy-saving devices	3.92	1.26	9	High
26	I do my best to keep the value of the electricity bill low	3.91	1.35	10	High
25	I encourage the use of renewable energy sources	3.83	1.33	11	High

24	I encourage regulating washing & ironing process	3.80	1.27	12	High
21	I prefer using energy – efficient and energy –saving devices	3.79	1.30	13	High
18	I encourage paginating the interior walls with light colors	3.70	1.41	14	High
23	I prefer using energy –saving cooking utensils such as pressure cooker	3.68	1.34	15	High
9	I open windows instead of turning on the AC	3.68	1.22	16	High
15	I adjust the temperature of the AC at a certain degree.	3.64	1.38	17	Medium
16	I encourage fixing malfunctions in devices that lead to energy waste	3.63	1.38	18	Medium
5	I clean devices and lamps on regular basis	3.58	1.03	19	Medium
22	I try to buy clothes that do not need ironing	3.50	1.33	20	Medium
14	I encourage my friends to rationalize energy consumption	3.48	1.39	21	Medium
6	I encourage the use of solar geyser to heat water	3.39	1.42	22	Medium
12	I call for using vehicle in case of need only	3.38	1.38	23	Medium
17	I encourage farmers to use gravity irrigation instead of pumps	3.22	1.37	24	Medium
11	I prefer to use public transport	3.14	1.30	25	Medium
13	I encourage the purchase of hybrid vehicles	3.05	1.39	26	Medium
	Attitude in general	**3.76**	**0.47**	**-**	**High**

Table (8) shows that grades of eighth-grade students' attitudes towards energy rationalization were high. The average of respondents responses on the total degree of the instrument was (3.76), with a standard deviation of (0.47).

The Table also shows that the grades of all items ranged between medium and high, as for the order of items, the item "I *prefer drying clothes under the sun in warm days*" occupied the first rank, with an average of (4.42), standard deviation of (0.97), and a high grade. Item "I *remove the curtains from windows during the day to take advantage of sunlight in*

lighting the house", came in the second rank was with an average of (4.32), a standard deviation of (0.92), and a high grade.

Item " *I shut down unused electrical appliances"* came in the third rank was with an average of (4.30), a standard deviation of (1.02) , and a high grade The item with the lowest rank was "*I encourage the purchase of hybrid vehicles*" with an average of (3.05), a standard deviation of (1.39), and a medium grade.

Discussion

This part discusses the results that have been reached, and sets the recommendations

First, discussing the results relating to the first question:

What concepts of energy rationalization included in science textbooks for grades (5-8) in Jordan?

We note from Table (1) that the analysis instrument, in its final version, consisted from (43) concepts, distributed on five key aspects. The distribution of these concepts came as follows: Households sector included (13) concepts, transport sector included (8) concepts, agriculture sector included (6) concepts, industrial sector included (11) concepts, while the commercial sector included (5) concepts.

The Table (1) shows that a list included most of the concepts of energy consumption rationalization, which should be included in science textbooks, was prepared.

The researcher explains this result in the light of the significant role that could be played by science textbooks in educating students, modify their behavior and attitudes towards energy consumption; as concepts of energy consumption rationalization are very important in earning the students the positive attitude and behavior towards energy use, since the information and skills associated with energy and rationalization measures are not innate, but acquired. This is done by providing the content of science books with concepts associated with the rationalization of energy consumption, as the textbooks play an important role in instilling values and modifying behavior and attitudes in a positive manner.

Theoretically, the textbook occupies a privileged position in the process of education, as a basic reference for the student, the main means by which students are equipped with knowledge, skills and values to achieve the planned objectives Noor (2013).

This result agreed with Zografakis, Menegaki, and Tsagrakis (2008) study (2008), which confirmed the active role of science books in raising awareness and modifying behavior towards energy concepts, and Harbi's

(2009) study, which resulted in designing a list of topics on energy and consumption rationalization .

Second, discussing the results relating to the second question:

To what degree the concepts of energy rationalization are included in science textbooks for grades (5-8) in Jordan?

Results of Table (2) showed that households sector got (156) frequencies, distributed on (13) concepts, most of the frequencies focused on one concept, while the rest of the concepts have not received enough attention, despite the importance of providing them to students. Such concepts include: "house design, solar cells, saving devices, shut down appliances, wall paints", where "the importance of energy" concept came in the first rank with (43.59%) of the total frequencies of all concepts in this sector. The concept of "house design" came in the second rank with (10.90%), some of the concepts have not been mentioned in the sample textbooks, such as the concept of "regulating washing and ironing", this can be attributed to the lack of interest by authors of the curricula for those concepts despite their positive impact on the individual and the community. The lack of interest may be justified under the pretext that such concepts can be gained through the educational environment at home or through multi-media institutions, but this is not an excuse; as science textbooks are the most appropriate to include such concepts and provide them to the learner in a way that could affect his behavior and attitudes in a positive manner. This result agrees with Harbi's study (2009), which revealed that science textbooks have not given energy topics the required attention. This result also agrees with Rahid's study (2004), which concluded that the content of science books did not achieve the objectives relating to oil, its importance and its negative impact on the environment. The results of his study also showed that science textbooks lack regulation and balance in including these topics. It also agreed with the study of Faqih (2006), the results of which showed that science textbooks for the ninth grade lack the concepts of environment including the concept of energy consumption rationalization and energy shortages.

Table (3) shows that concepts relating to transport sector obtained (97) frequencies in science textbooks distributed on (8) concepts, such concepts were distributed at various degrees in the contents of science textbooks. For example, the concept of "fossil fuels" obtained the first rank with (42) frequencies, and the percentage of (43.30%), followed by the concept of "maintenance" with (15) frequencies and a percentage of (15.46%). However, the percentage of inclusion of some concepts in science textbook was meager, for example, the concept of "transport systems" obtained (3) frequencies, and a percentage of (3.10%), and the concept of

"traffic movement" came in the last rank with (2) frequencies and a percentage of (2.06%).

The researchers attribute the highest frequencies obtained by "fossil fuels" concept to the fact that science textbook for the eighth grade allocated a chapter in the first part to "fossil fuel" for its importance in our daily lives.

The researchers could attribute the lack of transport concepts in science textbooks to curricula expert's negligence of the importance of such concepts.

In the theoretical framework, the transport sector is the most –energy consuming sector in Jordan, with a consumption average of (49%) of the total energy used. The researcher attribute the high energy consumption in the transport sector to lack of awareness among individual about rationalization, as a result of the limited concepts and experiences included in the science books regarding the transport sector.

This opinion has been confirmed by Zografakis, Menegaki, and Tsagrakis (2008) study (2008), which showed that the science curriculum plays a significant role in changing students' behavior and make them aware of energy issues.

The results in the table (4) showed that the agricultural sector got (19) frequencies, distributed on (6) concepts, and the distribution of such frequencies varied in science textbooks that have been analyzed, where the concept "the importance of sun for agriculture" obtained the most frequencies, about (12) frequencies , and percentage of (63.15%).

The concept of "the use of devices and machinery “came in the second rank with (3) frequencies and a percentage of (15.79%). Some concepts in this sector have not obtained any frequency, for example, “maintenance “concept and “products transfer” concept. The researchers attributed this result to the fact that such concepts could be elicited and gained through the concepts of other sectors included in science textbooks, which is called the interdependence and integration of the gained knowledge gained, and this result agreed with Harbi’s study (2009), which concluded that energy issues in science textbooks are marginalized and not given the required attention.

It is noted from the results of table (5) that the field of the industrial sector got (100) frequencies distributed on (11) concepts. The concept of "renewable energy sources" received the highest frequencies, about (39) with a percentage of (39%), the concept of "gases danger" came in the second rank with (37) frequencies and a percentage (37%), but the concept of "adjust heating & AC” came in the rank before the last with (1) frequency and a percentage of (1%), while the concept of "maintenance" has not obtained any frequency in the content of science textbooks.

The researchers could attribute the obtaining of the first rank by "renewable energy sources" concept to the allocation of unit entitled (energy sources) in the science in the first part of the science book for the sixth grade, and the obtaining of the second rank by " gases danger " concept to the fact that this concept is linked with several titles included in science textbooks such as the environment, the risk resulting from human activities, and air pollutants.

The researchers attribute failure of the authors of science curriculum to include some concepts related to the industrial sector in science books such as the concept of "maintenance" to the fact that such concepts were included in the content of science books within the framework of household and transport sectors. This result agrees with Okour's study (2002) which showed that the distribution of environmental values, including the value of energy rationalization in science textbooks was disorganized.

With regard to the commercial sector, Table (6) shows that the sector got (10) frequencies distributed on (5) concepts, where "energy-saving devices" concept got most frequencies which were about (5), and a percentage of (50%). The concept of "shut down appliances" came in the second rank with (3) frequencies and a percentage of (30%), while "Adjust refrigerator temperature, and site" concepts have not obtained any frequencies. However, the researchers attribute this to the fact that such concepts could be gained by student through the educational publications on how to use the appliances, particularly when buying refrigerators and the concept of "site" could be gained through household sector, as this concept is strongly linked to "house design" concept.

Although the commercial sector is widely spread in Jordan as indicated in the theoretical framework, however it did not get enough frequencies. This result agreed with the study of Harbi (2009), who pointed out to the negligence of the authors of science curriculum over not including some energy topics in science textbooks.

The results of Table (7) reflected a variation in the degree of inclusion of energy consumption rationalization in science books, which were distributed as follows (in descending order): households sector, industrial sector, transport sector, agriculture sector, and commercial sector. The following is a clarification of this:

The household sector got the first rank with (156) frequencies, and a percentage of (41%), industrial sector got the second rank with (100) frequencies, and a percentage of (26%), transport sector got the third rank with (97) frequencies and a percentage of (25%), agricultural sector got the fourth rank with (19) frequencies and a percentage of (5%), commercial sector got the lowest rank with (10) frequencies , and a percentage of (3%).

The researchers attribute the highest percentage of the concepts of energy consumption rationalization associated with household sector, to the fact that this is the largest sector in size and number, and directly associated with members of the community, The house is the place where the individual lives and grows, it gives the individual a sense of belonging to his community, then to his homeland, and gives a sense of privacy that gives individuals the opportunity for creativity.

Educators believe that the experience acquired by an individual in a particular place moves with him wherever he went and can be applied anywhere, and anytime if he is given the opportunity to do so, to achieve belonging to this country, especially that the country is suffering from many power problems. It has been stated in the theoretical framework that the Ministry of Energy and Mineral Resources in Jordan put a number of measures to rationalize energy consumption in the household sector, and that the household's energy consumption is estimated at (23%) of the total energy used, and this result agreed with a number of studies including: the study of Hiari and Rawashda (2013) which showed that social issues and energy issues are included at various degrees in science textbooks, and Harbi's study (2009), which showed that inclusion of energy issues in science books lacks balance.

When we look at the results of total frequencies for each science book, we find variation in the distribution, as distribution came as follows (in descending order): the science book for fifth grade, science book for sixth grade, science book for eighth grade, and finally science textbook for seventh grade . The following is an explanation for this:

Science textbook for fifth grade got (127) frequencies and a percentage of (33.25%), the highest among the selected books, science book for sixth-grade came in the second rank with (115) frequencies and a percentage of (30.10%), science book for eighth grade came in the third rank with (112) frequencies and a percentage of (29.32%), science book for seventh grade came in the last rank with (28) frequencies and a percentage of (7.33%), a low percentage compared with those obtained by the rest of the science books.

This can be attributed to the fact that scientific knowledge and expertise are acquired through practice, where the subsequent knowledge and experience are usually built on previous knowledge. The behavior acquired by a student in the fifth grade moved with him to the next grades with continuity in building knowledge and expertise.

It is known that the Jordanian curriculum are developed based on continuity, this result conflicts with Rashid study (2004), which pointed out that science books in Saudi Arabia lack continuity in including the topics of energy.

Third: discussing the results relating to the third question:

What are the attitudes of students in Tafila education directorate towards the rationalization of energy consumption?

We note from Table (8) that the attitudes of eighth-grade students towards the rationalization of energy consumption were positive and got high grades , the average for the general attitude of students reached (3.76) with a standard deviation of (0.97).

The results in the Table show that the most of the items of the attitude measure got high grades, and some got a medium grade, and neither item scored a low-grade.

Item "I *prefer drying clothes under the sun in warm days*" occupied the first rank, with an average of (4.42), standard deviation of (0.97), and a high grade. Item "I *remove the curtains from windows during the day to take advantage of sunlight in lighting the house*", came in the second rank with an average of (4.32), a standard deviation of (0.92), and a high grade.

Item "*I shut down unused electrical appliances"* came in the third rank with an average of (4.30), a standard deviation of (1.02), and a high grade the item with the lowest rank was "*I encourage the purchase of hybrid vehicles*" with an average of (3.05), a standard deviation of (1.39), and a medium grade.

The researcher attributed this result to the Jordanian student awareness of the importance of energy rationalization, and awareness of the risks resulting from wasteful consumption. Students' high awareness about energy rationalization refers to different aspects, including:

-Whereas the predominant religion in Jordan is Islam, we as Muslims abide by the provisions of our religion, particularly, the orders and prohibitions related to consumption, rationalization, extravagance and waste. Our religion urges us to rationalize and be moderate in consumption in various aspects of life, and forbids extravagance and waste, and this is what has been referred to in the theoretical framework, and referred to also in lessons religious speeches, and media.

- The role the Jordanian curriculum plays including science books in teaching students how to cope with the problems faced by the individual and society and how to solve them, including problems resulting from the energy.

-The inclusion of consumption rationalization concepts in the content of science textbooks by authors of the Jordanian curriculum, given that such concepts are directly related to energy. As stated in the theoretical framework, the general framework of science books in the basic stage aims to invest environmental resources, and to focus on the incorporation of environmental and social issues, and this has been confirmed by the results of the second question, where the results showed that the science books that

have been analyzed have been incorporated with most of the concepts of energy consumption rationalization which came in the analysis instrument

- The great role played by the family in educating their children towards a positive behavior in the rationalization of consumption, and to reduce the value of energy bills.

- The great role played by the various media in encouraging citizens to save energy consumption, and in teaching them to do some appropriate action to rationalize: for example Abu Mahjoob comic character that calls for saving energy.

This result agreed with Baker's study (1995) which showed that students' responses about energy concepts were affected by the daily life and the nature of the science curriculum. It also agreed with Kolo and Botzn's study (2012) which reflected a rise in students' awareness of the concepts of energy. This result disagreed with Abdelraheem's study (2012) which showed a decline in students' attitudes in Saudi Arabia towards a culture of rationalization of consumption, also disagreed with the study of Fah Les and his colleagues (2013), the results of which showed that the students' attitudes towards energy concepts came low in grades, also differed with Golderng and Osborn's (1994) study, which showed that half of the study sample had a difficulty in understanding the energy and the associated concepts.

The researchers presented the recommendations are :

1. Benefit from the list of analysis used in this study when planning or developing science textbooks; to include the concepts of rationalization of energy consumption in science books.

2. Conduct further studies similar to this study on the remaining science textbooks.

3. Make sure that science curriculum developers incorporate the concepts of energy rationalization in the content of science books in an orderly and balanced manner.

4. Include all the needed concepts of energy consumption rationalization in science textbooks

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