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The Effect of Using Process Approach on Science Achievement and Scientific Attitudes among Jordanian Basic Stage Students

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Abstract
This study aimed to investigate the impact of teaching students using operational-oriented in their achievement in science and the trend towards science. Specifically, the study sought to answer the following questions:

- Are there differences in achievement at the eighth grade students in Jordan according to the method of teaching (Operational-approach, the usual way)?
- Does the trend toward science primary grade students in Jordan according to the method of teaching (Operational-approach, the usual way)

Sample of the study consisted of (64) students at the eighth grade enrolling at Ajlune City schools at Ajlune Governorate in the second semester of the school year 2012\2013. The sample was selected using purposeful sampling from Ajlune Basic School For Boys and they were assigned to two sections: the first section (A) containing (32) students and representing the experimental group and was taught using the process approach and the second section represented the control group (B) containing (32) students and was taught using the traditional instructional method.
The experimental group was taught using the Process Approach and the instructional period lasted for one and a half month. As for the control group, it was taught using the traditional instructional method for the same time period. To measure the effectiveness of the Process Approach instructional method compared to the traditional instructional method, a (20) items multiple choice test and (4) alternatives achievement test was developed. The reliability coefficient for the test was calculated using Cronbach alpha formula and was (0.84). Science attitudes scale was also used.To answer the questions of the study, Co- variance analysis (ANCOVA) was used. The study revealed the following studies:

- A significant difference at (α=0.05) was found between student means scores on the achievement test due to the instructional method used and in favor of experimental group students (Process Approach).
- A significant difference at (α=0.05) was found between student means scores on the science attitudes scale due to the instructional method used and in favor of experimental group students (Process Approach).

In light of the results reported in the current study, the following recommendations were suggested:

- To use the Process Approach in teaching school subjects in general and science in particular.Future research is needed examining the effects of using Approach Process in the different subjects and using all school stages

1. Introduction

Educators and non -educators have often criticized the different instructional methods teachers use in delivering the learning material for students. The critics have focused mainly on teachers' overuse of Lecturing Approach. If such an instructional approach is accepted for teaching a certain school subject or teaching a certain age group of students, one can't accept the use of lecturing in teaching an important school subject as science.
Educators' emphasis to improve students' learning experience, to enrich such experience has led them to search for more effective instructional strategies, strategies that can be described as student centered and that students are the main focus of the learning process, especially those processes that enable the student to use and practice higher level thinking skills and to train him to obtain knowledge, use critical thinking skills in assessing this knowledge and to implement the acquired knowledge in the different life situations.
Educators emphasized that one of the goals of science education is to teach students how to think and not to memorize the learning material without understanding it or how to employ it in their daily life. To achieve such objective, science instruction must focus on assisting students acquire scientific thinking skills, focus on science methods and processes. Students' acquisition of science processes is a priority in science instruction where, if students are fully trained how to use them, enable students to be more practical in their thinking. Therefore; science teachers have the responsibility of providing students with scientific opportunities and effective learning situations, activities leading to the practice of higher order thinking skills such as the use of problem solving skills, using science processes. Practicing science processes is one of the most important objectives of science instruction in all basic stage grades (German, Parker, 1994).

Researchers interested in Science Education have dedicated their efforts for centuries to help students use basic and integrative science processes and they asserted the need to develop students' scientific skills and science related values (Padilla, Gerard, 1994).

In science, the term (Process) refers to thinking, measurement, problem solving, using ideas processes which in turn describe student's thinking style and making logical judgments. Thinking skills were categorized into three domains (Valentino, 2000) and these were:

- Science processes skills.
- Science critical thinking skills.
- Scientific inference skills.

In general, science processes describe activities, actions or practices teachers or students use to reach the possible results for science from one hand, and in judging these results on the other (Al Najdi et al, 1999).

Gange asserts that science processes is a basic element in scientific inquiry and discoveries and these processes have many characteristics such as they are a learned behavior (can be learned and taught), can be practiced and rehearsed, can be generalized and transferred to different life situations.

The NSTA has recommended the need to include science processes in science education curricula and to consider science processes as an integral part of science curricula development. The NSTA has provided the following rationales to include the science processes in science textbooks:

- Scientific knowledge is based on the notion that universe was not created by accident and that universe is governed by accurate rules and principles.
- Scientific knowledge is based on organized observation.
- Science progresses and develops by examining the parts step by step.
- Science is an infinite issue.

Science processes are divided into:

- Basic science processes:
  Simple processes relatively and include observation, classification, measurement, communication, prediction, using space and time relationships and using figures and inferences (AttaAllah, 2002).
- Integrated science processes:
  These are advanced processes and more progressive than basic science processes in the scientific processes hierarchy and include data interpretation and procedural definitions, variables control, testing hypotheses and experimentation (Zaitoun, 2004).

Scientific processes help learners in expanding their learning experience via experimentation and decision making and be autonomous in their learning and able to solve problems.

Science teaching is not limited on providing students with scientific knowledge, but it helps students transfer the knowledge they acquire to an action and practice. Students must have the desire to learn and acquire knowledge and thus to have the necessary motivation, aptitude, and attitudes to learn and acquire knowledge. Consequently, the objective of functionally developing students' scientific knowledge is one of the most important objectives in science teaching classes.

The objective of science teaching are constantly changing, developing and they arise from the science attributes, society needs and its characteristics. The most important objectives of science teaching include (AbdelSalam, 2001):

- Help students functionally acquire concepts, facts and scientific thinking skills.
- Help students functionally acquire and develop science processes.
- To develop students' skills in scientific thinking and problem solving.
- To help students develop and promote their science attitudes and tendencies.

The great challenge in modern instructional methods has become to give learners a greater part in the learning- teaching process to acquire the different experiences and develop his thinking skills as this contributes in raising individuals' sense of responsibility for self –learning and not just a recipient of information (Mezawi and Al Rabyei, 2006).

As mentioned above, the researchers argue that there is a need to search for instructional methods that can contribute in obtaining scientific knowledge, promoting academic achievement and promote science attitudes. Process Approach based science teaching method is one of the teaching method that can help in achieving as this approach help on providing the individual learner with the necessary skills helping him make solutions and make the suitable decisions for the problem he faces at present and in the future.

In light of this, the main objective of this approach is to provide the learner with the adequate competencies in science methods and scientific skills to make the learner able to adopt the researcher behavior in figuring out the different aspects of the scientific knowledge. This approach enables the learner develop a desire to learn many

scientific facts, concepts, and generalizations which are directly linked with his daily life, thus developing a positive attitude towards science learning (Al Khataibah, 2005).

When students learn science using process approach, they are using a set of different skills including motor skills such as collecting devices, installing them, making observations, doing measurements, recording data and drawing figures. As for the other skills, they include both intellectual and academic skills such as data analysis, making comparisons and contrasts between results. Students are also engaged in several procedures to discover a problem in an integrated manner. It is an experience that make students ready t solve future problems when they encounter them. Students do not rest on memorization and recall as it is common in the traditional instructional methods but they work on developing long life span skills to help them in solving problems they face in the different situations (Abdel Hameed, Hassan, Al Sanhouri, Terab, 2004).

Through the researchers' experience in the educational field as a teacher in Jordanian community colleges, they noticed that teacher still use traditional teaching methods in their classrooms as they rely on using lecturing and memorization in science textbooks, and their objectives are confined to achieving lower level thinking skills. Also, science classrooms are dominant by boredom and students lack learning motivation.

The researchers argue that such conditions may deprive individual earners from obtaining the behavioral and cognitive skills enabling them deal with the constantly changing knowledge. In doing so, learners become more prepared in addressing their future problems that are common in daily life. Learners nowadays are in a state of continuous intellectual and social mobility forcing educators and specialist more responsible of think in more effective teaching strategies and methods based on discussion, dialogue, and intellectual and performance skills, be able to interact with the surrounding environment instead of using traditional teaching methods that are based on lecturing and memorization. The role of the individual learner becomes more positive in the learning process and is based on continuous research for knowledge to solve problems they face in their daily life.

Therefore, the current study sought to examine the effect of one of the modern teaching methods able to help teachers and educators in teaching students science textbooks, leading to better learning outcomes. The current study is an attempt to identify the effectiveness of process approach based science teaching on students' science achievement and their attitudes towards science in the basic schools in Jordan.

underutilisation of labour during low demand seasons is considered a waste of resources. Absenteeism is the measure of unplanned absences from workplace due to some reasons like personal emergency, accident, illness, etc. Turnover occurs when an active worker resigns from the company of his own accord, thus leaving a vacant post until a replacement is found. If such disturbance has caused a large number of tasks become unattended and overdue, the company is then vulnerable to overtime cost, shrunk capacity and productivity, extra queuing time, lost business income, etc. In order to prevent these deteriorative effects, optimising the number of workers can be helpful. As a fundamental branch of knowledge in manufacturing business, workforce management will never fall behind the times. Therefore, it is worth an attempt to incorporate a novel methodology, such as HMS, into the state of the art of workforce sizing.

2. Problem of the Study

After the changes in science curricula in Jordan in the last few years, several challenges arose in teaching science as a school subjects in schools, especially in basic stage grades as new science curriculum has focused on investigation and inquiry skills, giving learners a more active role in the learning process. Some science teachers do not adopt several available modern science teaching methods and they still use the traditional teaching methods which it was proven that they are ineffective. Still, teachers are still using these teaching methods unable to keep abreast with the new developments in science curriculum. As a result, there is an apparent weakness in students science achievement and several complaints by parents that science is a very difficult school subject. Due to the above reasons, the researchers sought to identify the effectiveness of process approach as one of the modern teaching methods on basic stage students' science achievement and measuring its effectiveness in promoting students' attitudes towards science in Jordan.

2.1Elements of the Problem

Elements of the problem can be summarized in the following questions:

First question: Are there differences in eighth grade students' science achievement level in Jordan due to the teaching method used (process approach, traditional teaching)?

Second question: Are there differences in eighth grade students' science attitudes level in Jordan due to the teaching method used (process approach, traditional teaching)?

2.2Hypotheses of the Study

In light of the questions of the study, the study sought to test the following null hypotheses:

- There are no differences at (α=0.05) in eighth grade students' science achievement level in Jordan due to the teaching method used (process approach, traditional teaching)?

- There are no differences at (α=0.05) in eighth grade students' science attitudes level in Jordan due to the teaching method used (process approach, traditional teaching)?

2.3Significance of the Study

The significance of the current study emerges from the fact it attempted to keep abreast with the modern trends and developments in science teaching by encouraging the use of intellectual skills based teaching methods. Learning scientific knowledge is thus strongly intertwined with the daily life of the individual learner leading to positive attitudes among learners. This will in turn promote student learning motivation and promoting self-learning, self- decision making, acquiring scientific concepts, increasing science attitudes and finally employing these skills functionally in different situations.

The most important element in the current study is its attempt to examine process approach based science teaching and the effect of such teaching method in science achievement and attitudes as such a teaching method seeks to promote students' discovery skills and employing what he has learned in daily life problems (the notion of understanding scientific knowledge and employing such knowledge in daily life situations).

The study will also seek to identify the effect of process approach on the two dependent variables (science achievement and science attitudes). The current study will open the way for future research to investigate the effect of using process approach in teaching other school subjects and examining its effect using other variables not examined in the context of the current study. To the researchers' knowledge, the current study is one of the pioneering studies examining the use of process approach as a teaching method in Jordan.

2.4 Procedural Definitions

Process Approach: one of the teaching methods built on the notion that students are instructed to use targeted scientific process skills via the use of gradual experimental tasks. Then, such skills are applied in a real situation, then teachers evaluate students' mastery of such process.

Science Achievement**:** the total grade student scores on the (30) items multiple choice science achievement test developed by the researchers.

Science Attitudes: a state of mental aptitude at the learner organized through learners' previous experiences and they lead to a specific direction or an influence on the individual's responses to a specific stimuli. Attitudes are measured operationally by science attitude test developed by the researchers.

Traditional Teaching: the traditional teaching methods commonly used in schools and they mainly rely on using lecturing and recitation, emphasize teacher role in transferring knowledge to students.

2.5 Limitations of the Study

Limitations of the study can be summarized in the following:

- The study sample was confined to 8th grade students at the public schools in Ajlune Governorate in the school year 2012\2013.
- The instructional unit was limited to (Material) in 8th grade science textbook, so it is difficult to generalize the results obtained in the current study to other units in the textbook.
- The study was limited to (5) levels of Bloom Taxonomy (comprehension, recall, analysis, synthesis and implementation).
- The generalization of the results obtained in the current study are limited by the study instruments validity and reliability levels and by to what extent was the use of Process Approach successful in the teaching environment to achieve a better achievement among students and promote their attitudes towards science.

3.**Theoretical Framework& Previous Literature**

3.1Theoretical Framework

There is an agreement between scholars and educators in science teaching literature that there are some fundamental objectives science teaching seek to achieve among learners. These objectives are included in the following educational domains (Zaitoun, 1992):

- Mental Knowledge: this includes the scientific knowledge acquisition, science methods and science process.
- Emotional: developing scientific attitudes, tendencies and interests.
- Psychomotor: acquiring manual and scientific skills,

The observer of the educational scene may see that there is an apparent deficiency in achieving the desired educational objectives on the educational and social level. Thus, there is a need to reconsider science teaching strategies as they must be based on well defined, advanced and principles and thus there is a need for both teachers and students to be part of the learning process and they participate actively in this process in the class to achieve an active level of learning based on the using the basic science processes (Zaitoun, 2004).

Researchers and scholars argue that successful teaching methods enable the student connect what he\ she learns at school with his\ her daily life and be able to solve his\ her daily problems based on scientific logical methods.

Teaching methods vary according to objective level and type, therefore; there is a need to identify the most appropriate method that can contribute in achieving this objective. A teaching method can't be judges as successful because it is modern or unsuccessful because it is old. The most effective criterion for judging the effectiveness of any given teaching method is its ability to achieve the goals with the least effort (Obaidat, 1999). Researchers and scholars working on the process approach have asserted that learners needs to acquire the skills to effectively deal with science. In other words, the individual learner must acquire the basic skills in learning information, knowledge acquisition skills (processes skills) and these are similar to the procedures scientist use in reaching new knowledge (Khataibeh, 2005).

Educational scholars and researchers emphasize that students' acquisition of science processes must be one of the priorities in science teaching (Baker& Michael, 1991). Science methods are integrated with science methods in scientific thinking and scientific research. To conduct scientific experiments, learners need these mental skills which are thought to be a major contributor in learner's acquisition of the effective skills enabling him practices science processes. If not, he\ she will face many challenges in his\ her studies or will face difficulties in performing daily activities. These special mental skills are termed the science processes or scientific inquiry (Zeitler, Baruf, 1988). Accordingly, sciences processes are defined as a set of mental processes or abilities needed to perform scientific thinking methods accurately (Zaitoun, 1991).

By considering the different teaching methods, there are devided into two basic categories:

- Those based on teacher activity (those are defined as traditional teaching methods).
- Those based on learners' activity which made the learning teaching process an interactive process as the learner rely in obtaining the desired knowledge on such teaching methods.

One of the teaching methods that are based on learners' activities and that have gained much support by educators and researcher is the inquiry teaching method which require deeper understanding by the student. Such teaching method is based on the notion that student needs a mentality able to analyze, deduct and infer in the quest of knowledge.

3.2Process Approach in Teaching

When students are taught science using process inquiry approaches, they are required to use many skills' some are motor requiring performing a physical motor activity such as assembling a device, synthesizing a device, performing observation and measurements, recording data, and drawing schematic figures.

As for the other skills to be used by the student, they include intellectual and academic skills such as data analysis, making contrasts and comparisons, communicating with teachers and other students. Students are engaged in a variety of required activities to thoroughly identify a certain problem and this is an important experience preparing them to face future problems. Here, the student does not depend on memorization and recalling as it is common in the traditional teaching methods, but students develop learning skills able retained for a long period of time. In doing so, students are more able to face future problems, be more effective decision makers, thus,; able to confront challenges (AbdelHameed, Hassan, Al Safhouri, Yetrab, 2004).

For a student to acquire the needed knowledge using the process approach, he\ she has to possess a variety of basic scientific skills and if not, his practice of inquiry approach makes him acquire gradually these skills until he is able to employ them individually.

In his study, Zaitoun (1999) indicate that inquiry scientific activities are characterized by many advantages in science teaching, and these include:

- The learner becomes the main focus of the learning teaching process.
- This approach is mainly interested in developing intellectual skills and mental processes in the learner.
- This approach promotes scientific inquiry and investigation skills (science processes) in addition to observation, measurement, classification, interpretation, experimentation and inference skills.
- Promotes students scientific thinking.
- Emphasizes students' long life learning and learning motivation among students. Thus; the learning teaching process is an infinite endeavor never ending by teaching the subject in the school, but the learning experience goes beyond school walls.

As noticed above, using process approach in teaching has focused on skills more than the science itself. The knowledge explosion in science has helped the process approach in verifying the benefits of such a teaching method. Such a teaching method emphasizes the importance of science processes more than subject content. Furthermore, it provides the individual learner with the needed mental skills that are required for solving future problems.

3.3Scientific Attitudes

Scientific attitudes are factors motivating the student to engage in science learning. As such, they are factors assisting the student acquire scientific ideas and skills and employ them in new situations. Furthermore, negative attitudes impede the acquisition of scientific skills and ideas among students.

The importance of these scientific attitudes among students are attributed to three major factors (Al Khataibeh, 2005). These are:

- Individual learner expresses a mental aptitude. Learners positive attitudes make him more sensitive to scientific topics, scientific activities and other individuals.
- Attitudes are not intuitive or inherited by the learner. Several psychologists have asserted that children firstly learn attitudes then these attitudes are organized through experience in the different developmental stages. As such, learners' attitudes change by different experiences.
- Attitudes are dynamic outcomes as it is the case for experiences which work as directing factors for behaviors when the student is engaged in new experiences. So, attitudes comprise three basic components: cognitive, emotional and behavioral. All these elements lead to make accurate decisions and judgments.

From this perspective, science training asserts the need for formulating scientific attitude, develop them in student as they are very important in the learner's personality, direct his behavior and predict it. Also, they provoke students' interests and attitudes.

Several studies in the educational literature in science training have asserted that science teaching methods, science teachers and school may play an important in promoting science attitudes. Thus, science educators and scholars have suggested different scientific programs, activities in addition to a set of teaching methods making the learner an active participant in the science learning process by mainly focusing on science curricula and science teaching methods as the basis for developing students' scientific attitudes. Several studies have indicated that process inquiry approach contributes positively in the formulation of positive scientific attitudes or promoting them compared to science traditional teaching methods (Salameh, 2002).

3.3.Previous studies

Ghabayen (1982) conducted a study to identify the effect on inquiry teaching method on preparatory school students' acquisition for physics concepts and scientific methods. Sample of the study consisted of (16) seventh grade sections containing (228) male students and (340) female students assigned randomly into two groups: the first group was the experimental study group taught using the inquiry teaching method and the second group was the control and was taught using the traditional teaching method. The researcher used an achievement test and scientific methods test. Results of the study indicated that students in the experimental group students outperformed control group students in the physics concepts achievement test and in the acquisition of scientific methods.

Brian at al., (1994) conducted a study on a group of basic stage students teachers. Sample of the study was divided into (4) groups taught using (4) different teaching methods to identify the effect of each of these teaching strategies on students teachers acquisition for integrated science processes. Results of the study indicated that cooperative learning group and lab activities based teaching method significantly outperformed students taught using the traditional teaching methods in acquiring scientific inquiry processes.

In another study, German, Aram and Burke (1996) examined and evaluated 7th grade students' perceptions towards scientific inquiry processes skills. The study focused mainly on data recording, data analysis, data representation, findings representation and providing scientific evidence skills. Sample of the study consisted of (364) 7th grade students and the Alternative Assessment of Science Process Skills (AASPS)to identify students' acquisition of scientific inquiry processes. Results of the study indicated :

- Only (61%) of students were successfully able to perform the data recording related activities.
- (69%) of students have not reached the required level in findings data representation skills in the designated activities.
- Dents (81%) of students were not able to provide supportive scientific evidences to support the findings obtained in certain activities.

In another study, Zaitoun (1999) conducted an experimental study to identify the effect of inquiry based teaching method on learners' achievement and retention of knowledge presented in one biology course presented in the university. Results of the study indicated that students in the experimental group were more able to acquire the learning material (by 2 and a half) and retain it compared to the students in the traditional group indicating that inquiry teaching method was more effective compared to the traditional teaching method in increasing scientific achievement (learning scientific concepts) and retain them and thus, the use of inquiry teaching method has been proven to be effective in science teaching in the university level.

Al Khataibeh and Barah (2002) conducted a study to investigate the Jordanian chemistry majors enrolling in Jordanian public universities understanding level of integrated and basic scientific processes. Sample of the study consisted of (208) chemistry major undergraduates enrolling in Yarmouk University, Muta' University, and Jordan University for Science and Technology. The researchers used Allouh (1994) Scale to measure chemistry students' understanding for basic and integrated science skills. The scale consisted of (24) multiple choice items. Results of the study indicated that level of understanding for the basic and integrated among

chemistry major undergraduates was low according to the common educational standards. There were no significant gender at (α=0.05) between the study sample understanding level.

Lee and Butler (2003) examined the effect of designing and using inquiry tasks in increasing scientific knowledge and problem solving skills. Sample of the study consisted of (59) male and female students who performed a set of real inquiry tasks (prediction, measurement, decision making). Results of the study indicated that the used teaching method was effective in promoting students' scientific understanding, enriching their knowledge base and their problem solving ability which in turn contributes in preparing students to be active participants in the community.

Al Jbour (2007) conducted a study to examine the use of process approach on increasing students science achievement and their attitudes towards science. Sample of the study consisted of (48) basic stage students selected using purposeful sampling from one of the basic school at Al Shareqa Emirate in the united Arab Emirates in the school year 2006\2007. The study sample was divided into two groups: the first representing the experimental group and was taught using the process approach teaching method while the second represented the control group and was taught using the traditional teaching method. Results of the study revealed:

- A significant difference at (α=0.05) was found between study sample means scores on the achievement test due to the teaching method used, in favor of experimental group students (process approach).
- A significant difference at (α=0.05) was found between study sample means scores on the science attitudes measure due to the teaching method used, in favor of experimental group students (process approach).

3.4Summary of Previous literature

After reviewing previous literature, the researchers conclude with the following:

- Several school subjects were used to test the effectiveness of process approach on students achievement in these school subjects. Also, different school levels were used in examining the effectiveness of this teaching method.
- Results of previous studies indicated that students reported gains in their overall achievement and an increase in their attitudes (Al Jbour, 2007; Lee, Butler,2003; Al Khataibeh and Barah, 2002).
- The current study is different from the previous studies as it takes into consideration more than one single dependent variable (achievement and attitudes). Furthermore, the current study is one of the few studies investigating the effectiveness of process approach on science achievement and attitudes. The researchers hope that the results of the current study will contribute in enriching the theoretical framework in the local educational field and be will encourage other researchers to conduct future studies examining the effect of process approach in other school subjects.

4.Methodology

4.1Sample of the study

The sample of the study consisted of (64) 8th grade students at Ajlune city in Ajlune Governorate in the second semester of the school year 2012\2013. The students sampled were enrolled in Ajlune Basic School for Boys and were distributed on two sections: Section (A) which included (32) students and was taught using the process approach and representing the experimental study group and section (B) consisting of (32) students and representing the control group and was taught using the traditional teaching method.

The school was selected using the purposeful sampling procedure as the teachers and school administration in this school were very collaborative with the researchers. The two students groups (experimental and control) were selected using simple random sampling .

4.2Instruments of the study

Two instruments were used in the current study:

- An achievement Test.
- Science Attitudes Scale.

4.3The Achievement Test

- An achievement test was developed to achieve the objectives of the current study and to measure the cognitive domain in (Material) unit which is one of the learning units in 8th grade science text book. The achievement test consisted in the preliminary format of (25) multiple choice items in accordance with the objectives levels in the cognitive domain.
- The material to be learned was identified in accordance with process approach teaching method.
- The (Material) unit was identified from 8th grade science textbook in the school year 2012\2013.
- The learning material objectives to be taught, the learning activities to be performed by the student in accordance to process approach and traditional teaching methods were identified by reviewing the science textbook, teacher guide and the curriculum objectives.

- The cognitive and behavioral objectives for each of the subjects were identified and categorized in accordance to Bloom Taxonomy for the cognitive domain.
- The objectives of the material relative weights of the subjects and the objectives levels in the cognitive domain were distributed.

4.3Validity of the achievement test

The achievement test was validated by a group of educational specialists from Al Balqa' Applicable University faculty members, a group of science educational supervisors in addition to a group of science teachers teaching this school subject. These experts were asked to give their opinion concerning the test items (language and the belonging of the items to the different domains). In light of the opinions of these experts, (5) items were eliminated and the final format of the achievement test consisted of (30) items. The test instruction were also developed by the researchers (Appendix 3).

4.4Reliability of the achievement test

The reliability of the achievement test was established by the administration of the test on a pilot sample consisting of (25) items selected from out of the original study sample. The test lasted for (1) hour, then students' responses were scored. According to the reliability coefficient computed using Kuder- Richardson Formula (K-R 20), reliability coefficient value was (0.87) and this value is more than adequate to achieve the objective of the study.

4.5Students' Science Attitudes Scale

The science attitudes scales was developed to measure experimental group students' attitudes towards science. These students were taught using the process approach teaching method and then the scale was developed using the following procedures:

- The researchers reviewed educational literature and previous studies examining students science attitudes such as Al Ahad study (2002), Al Qerem study (2004), Al Rabadi study (2007) and Al Jbour study (2007).

  Then, the researchers developed the scale to measure students attitudes towards being taught using the process approach. The scale consisted in the final format of (25) five point Likert scale items (appendix 2).

4.6Validity of the science attitudes scale

The science attitudes scale was validated by a group of educational specialists from Al Balqa' Applicable University faculty members, a group of science educational supervisors in addition to a group of science teachers. These experts were asked to give their opinion concerning the test items (language and the belonging of the items to the different domains). In light of the opinions of these experts.

4.7Reliability of the Science Attitudes Scale

The reliability of the science attitudes scale was established by the administration of the test on a pilot sample consisting of (25) items selected from out of the original study sample. The test lasted for (55) minutes, then were administrated the same scale with an interval of (2) weeks (pretest- posttest). Pearson coefficient value was computed and was (0.75).Then, Cronbach alpha reliability coefficient was computed and was (0.84) and this value is more than adequate to achieve the objective of the study.

4.8Procedures:

a. A teacher guide teaching the material was developed in accordance with the process approach as follows:

- Analyze the cognitive content of the learning unit (Material).
- Defining the special objectives for the instructional unit .
- Distributing the objectives on (14) lesson plans as shown in Appendix (2).
- Identifying the science processes skills that students can use in each science class.

b. Defining the study sample

c..Designing the instruments of the study (the achievement test and science attitudes scale) in accordance with the scientific research guidelines for reliability and validity indicators.

d. Administration of the achievement test and science attitudes scale on the pilot study.

e. Observing students while using the process approach teaching method (experimental group) to answer the main questions teaches would ask and to help him while using the process approach teaching method. The administration of the teaching program lasted for (6) weeks. .

f. The administration of the achievement test and science attitudes test to both study groups (experimental and control) after the completion of the teaching program.

g. Data was collected, analyzed to obtain the most significant results and then the interpretation of these results.

4.9 Variables of the study

The study included the following variables:

- Independent variables:
  teaching method using process approach and the traditional teaching method.

- Dependent variables:
- Achievement test: it was measured by study sample responses (experimental and control group student) on the achievement test items.
- Science attitudes scale: it was also measured by study sample responses (experimental and control group student) on the science attitudes scale developed by the researchers.

4.10 Study Design

The current study has adopted the semi- experimental design. The design of the study can be represented in the following symbols:

EG O O_1 X O O_1
CG O O_1 X O O_1

EG: Experimental group taught using the process approach teaching method.
CG: Control group taught using the traditional teaching method.
O : Achievement test.
O_1: Science attitudes.
X: Teaching using the process approach teaching method.

4.11 Statistical Analysis:

Data obtained was analyzed using statistical software to answer the questions of the study. Means, standard deviations were computed in addition to the use of ***F test*** and variance analysis.

4.12. Results of the study

In this section, findings obtained in the current study are presented after the administration of the achievement test and the science attitudes scale for both study groups (experimental and control) then these were analyzed statistically.

First question: Are there differences in achievement among grade students at Jordan due to the instructional method used (process approach, traditional)?

To answer the first question of the study, means and standard deviations were computed for the both study groups means scores (experimental and control) on the pre- post achievement test. Table (2) shows these results:

Table (2)

Means and Standard Deviations for Study Sample Means Scores on the Pre- Post Achievement Test

Achievement Test				
Posttest		Pretest		
SD	Mean	SD	Mean	Group
5.6	26.6	3.3	11.11	Experimental
3.31	19.4	2.3	12.3	Control

As shown in the previous table (table 2), there is an apparent difference between the means scores of both study groups on the post achievement test and this difference was in favor of experimental group students taught using the process approach teaching method (M=26.6), while means scores for the control group on the post achievement test was (19.4) taught using the traditional teaching method. ANCOVA was performed for the scores on the achievement test . Table (3) shows the results of this analysis.

Table (3)

ANCOVA analysis for study sample scores on the post achievement test

Significance	Calculated F	Means squares	Degree of freedom	Total squares	Source of variance
0.0136	2.32	47.8	1	47.8	ANCOVA pretest
0.000	28.8	600.1	1	600.1	Group
		20.6	45	931.5	Error
			47	1580.1	Total

**Significant at the significant level (α=0.05).*

As shown in table (3), there is a significant difference at (α=0.05) between the means scores of students sample on the posttest due to the teaching method used, and these differences were in favor of experimental group students (process approach). Means scores for the experimental group was (M=26.6) while means scores for the control group was (M=19.4) indicating that students taught science using the process approach teaching method significantly outperformed the students taught the science material using the traditional teaching method.

This means that the first hypothesis of the study stating " There are no differences at (α=0.05) in eighth grade students' science achievement level in Jordan due to the teaching method used (process approach, traditional teaching) is rejected and the alternative hypothesis stating " There are differences at (α=0.05) in eighth grade

students' science achievement level in Jordan due to the teaching method used (process approach, traditional teaching) is accepted.

Second question: Are there differences in science attitudes among 8th grade students at Jordan due to the instructional method used (process approach, traditional)?

To answer the second question of the study, means and standard deviations were computed for the both study groups means scores (experimental and control) on the pre- post science attitudes scale. Table (2) shows these results:

Table (2)

Means and Standard Deviations for Study Sample Means Scores on the Pre- Post Achievement Test

Achievement Test				
Posttest		Pretest		Group
SD	Mean	SD	Mean	
0.46	4.3	0.45	2.6	Experimental
0.50	2.9	0.46	2.67	Control

As shown in the previous table (table 4), there is an apparent difference between the means scores of both study groups on the post science attitudes scale and this difference was in favor of experimental group students taught using the process approach teaching method (M=4.3), while means scores for the control group on the post science attitudes scale was (2.9) taught using the traditional teaching method. ANCOVA was performed for the scores on the achievement test . Table (3) shows the results of this analysis.

Table (5)

ANCOVA analysis for study sample scores on the post achievement test

Significance	Calculated F	Means squares	Degree of freedom	Total squares	Source of variance
0.905	0.014	0.003	1	0.003	ANCOVA pretest
0.000	90.88	22.003	1	22.003	Group
		0.241	45	10.88	Error
			47	32.9	Total

*Significant at the significant level (α=0.05).

As shown in table (5), there is a significant difference at (α=0.05) between the means scores of students sample on the posttest due to the teaching method used, and these differences were in favor of experimental group students (process approach). Means scores for the experimental group was (M=4.3) while means scores for the control group was (M=2.9) indicating that students taught science using the process approach teaching method significantly outperformed the students taught the science material using the traditional teaching method on the science attitudes scale.

This means that the first hypothesis of the study stating " There are no differences at (α=0.05) in eighth grade students' science attitudes in Jordan due to the teaching method used (process approach, traditional teaching) is rejected and the alternative hypothesis stating " There are differences at (α=0.05) in eighth grade students' science attitudes in Jordan due to the teaching method used (process approach, traditional teaching) is accepted.

5. Discussion

In this section, results obtained are discussed and interpreted in light of the previous studies and some recommendations are suggested in accordance with the results obtained.

5.1 Discussing Results Pertaining the First Question of the Study:

First question: Are there differences 8th grade students science achievement at Jordan due to the instructional method used (process approach, traditional)?

Results of the study indicated significant differences at (α=0.05) in 8th grade students achievement on the post achievement test in favor of those taught using the process approach. This positive effect can be attributed to the use of the process approach on increasing students; achievement. This result is consistent with the results reported by (Theyab, 1989; Zaitoun, 1999; Lee& Butler, 2003). This result can be explained by the fact that students in the experimental group have made more effort in obtaining the needed information using these science processes skills via the use of dialogue and debate between peers and using inquiry as they were more engaged in the learning activities and they try to identify the scientific conclusions and inferences on their own as this knowledge becomes an integral part of their knowledge structures. Thus, their ability in knowledge retrieval acquired while experiencing certain situations and they can use the skills they have acquired in the science processes in solving problems.

5.2 Discussing results Prtaining the Second Question of the Study:
First question: Are there differences in 8th grade students science attitudes at Jordan due to the instructional method used (process approach, traditional)?
Results obtained using ANCOVA indicated significant differences at (α=0.05) in 8th grade students science attitudes on the attitudes posttest, in favor of those taught using the process approach. The means scores of the experimental group students taught using the process approach was (M=4.3) while the means scores of the control group students taught using the traditional teaching method was (M=2.9). this means that the process approach was significantly effective in promoting students science attitudes . this results can be attributed to the following reasons:

- The use of process approach is not common among students as an organized and well-structured teaching method as it is still new in the educational field and thus, it was highly accepted by students and students had positive attitudes towards the use of such a teaching method.
- This teaching method has given all students the opportunity to participate in the learning experience and to provide a suitable response to the learning task. This in turn promotes students' academic motivation, their self- confidence leading eventually to higher levels of attitudes towards science/

6. Recommendations:

In light of the results reported in the current study, the following recommendations were suggested:

- The use process approach in science teaching as it has proven to be effective in increasing students' science achievement.
- Training teachers how to effectively use the process approach as it was one of the effective teaching methods able to promote students science attitudes.
- Future research investigating the use of process approach in other school subjects and in all school levels is needed.

References

First: Arabic References

- Khataibeh, Abdullah & Barah, Hussein (2002). Chemistry students in Jordanian public universities understanding of basic and integrated science skills. Journal of Arab Universities Union for Education and Psychology, 1(2), p. 194.
- Al Jbour, Faris (2007). The effect of process approach based teaching method on science achievement and attitudes among first round basic stage students at United Arab Emirates. MA thesis, Amman Arab University For Higher Studies, Amman- Jordan.
- Khataibeh, Abdullah (2005). Teaching Science For All. 1st ed, Amman, Dar Al Maseera for Publication & Distribution.
- Zaitoun, Ayesh (2004). Science Teaching Methods. 1st Ed, Amman, Dar Al Shorouk for Publication & Distribution, Hashemite Kingdom of Jordan.
- Zaitoun, Ayesh (1991). Nature and Environment of Science: Applications in Practical Education. Dar Amman for Publication & Distribution, Hashemite Kingdom of Jordan.
- Zaitoun, Ayesh (2004). Science Teaching Methods. 1st Ed, 3rd Issue, Amman, Dar Al Shorouk for Publication & Distribution, Hashemite Kingdom of Jordan.
- Salameh, Adel Abu Al Ez (2002). Science Teaching Methods. 1st Ed, Amman, Dar Al Fiker for Publication & Distribution, Hashemite Kingdom of Jordan.
- Abdel Salam, Mustafa Abdel Salam (2001). Modern Trends in Science Teaching. 1st edition, Al Mansoura, Dar Al Fiker Al Arabi.
- Abdel Hamid, Hasan& Al Sanhouri, Wethrean (2004). A Translation Of Science Training In Secondary Schools : Strategies For Scientific Culture Development: Written By: Rodjer Bybede Lesilew, Trowbirdje. University Book Dar: United Arab Emirates.
- Attaallah, Michael Kamil (2002). Science Teaching Methods. 2nd ed. Dar Al Maseera for Publication & Distribution.
- Ghabayen, Omar (1982). The Effect Of Discovery (Inquiry) Teaching Method On Preparatory School Students Acquisition For Physics Concepts And Scientific Methods. Unpublished MA thesis, University of Jordan.
- Magharawi, Abdel Mumen Mohammad; Al Rabeye, Saeed Bin Hamad (2006). Self- Learning. 1st Ed., Al Ain: Al Falah library for Publication & Distribution, United Arab Emirates.
- Al Najdi, Ahmad et al., (1999). Introduction to Science Teaching. Cairo: Dar Al Fiker Al Arabi.

Second: Foreign References

- Baker, D., Michael, P. (1999). Process Skills Acquisition, Cognitive Growth And Attitudes Change Of Ninth Grade Students In A Scientific Literacy Course. Journal of Research in Science Teaching, 28 (5): 423-436.
- Brian, O., and others (1994). The Effect Of Four Instructional Strategies On Integrated Science Process Skills Achievement. Journal of Elementary Science Evaluation, (1st Ed).,
- German, J.; Aram, R.,& Burke, G., (19960. Identifying Patterns And Relationship Among The Responses Of Seventh Grade Students To Science Process Skill Of Designing Experiments. Journal of Research in Science Teaching, 33 (1): 9-99
- Lee, H., And Butler, N., (2003). Making Authentic Science Accessible To Students. International Journal of Science Education, 25 (8): 923-984.
- Padilla, M.; Okey, J; Gerard, K., (1984). The Effect Of Instruction On Integrated Science Process And Skill Achievement. Journal of Research in Science Teaching, 21(3): 277-287.
- Valintino, C. (2000). Developing Science Skills. Houghton Mfflin Company, USA.
- Zeitler, W.; Barufaldi, J. (1988). Elementary School Science: A Perspective for Teachers. New York, Longman Inc.

Appendix (A)

Science Attitudes Scale

Dear respondent

The following items are administrate to reflect your opinion and attitude toward science learning, as such, there is no correct or wrong response.

We would like to read these items carefully totaling (25) items and decide if the content of each of the individual items reflects your feeling then put a (X) in the near blank beside the item. We would like to inform you that al information obtained will be confidential and will be used for research purposes only.

Thank you

The researchers

Science Attitudes Scale

We would like to read these items carefully totaling (25) items and decide if the content of each of the individual items reflects your feeling then put a (X) in the near blank beside the item. These items are worded to reflect your opinion objectively.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Item	No.
					I miss science classes	1
					I enjoy discussing the scientific subjects	2
					I feel that I learn much in science classes	3
					I feel that I need to understand science	4
					I hate science classes	5
					I value the contribution of science in community development	6
					I wish to be a science teacher in future	7
					I have good feelings for science	8
					I feel anxious in science classes	9
					I wish I can have a scientific profession in the future	10
					I think that science have more advantages than disadvantages	11
					I feel that what I learn in the science classes is important in my daily life	12
					I support funding scientific research strongly	13
					I wish to work with scientists after completing my studies	14
					I appreciate scientists efforts and I am grateful to them	15
					I only learn science because it is a required school subject	16
					I feel happy when I make scientific experiments	17
					I feel that I am capable of understanding science topics	18
					I enjoy discussing scientific topics with my friends	19
					I long to implement what I learn in science classes in my daily life	20
					I enjoy reading science books	21
					I feel bored in science classes	22
					I wish to work in a profession that does ned any scientific knowledge	23
					I feel that I am capable of recalling science topics	24
					I feel that science is very important to understand our current life	25

Appendix (2)

Lesson plan for the unit topics

-A checklist is used to understand students' performance while performing the skill in each class in addition to the use of the science attitudes scale to assess students attitudes towards science.

-At the end of each of the learning activity, the skill to be applied is presented.

Lesson (1)

Unit title: Material and Material Measurement Class:

Lesson title: Size Grade& Section:

Day& Date:

Behavioral objectives:

- At the end of the lesson, the student must be able to know and understand the concept of volume.
- The student will be able to conclude that two objects can't occupy the same space at one time.
- The student will be able to name the volume measurement units.
- The student will be able to identify the tools used to measure the volume of liquids.

Content:

- Volume is the space an object occupies in a certain space.
- Two objects can't occupy the same space at one time.
- The international unit used in the measurement of volume is M^3 and there is also CM^3 and liter.
- The tools used to measure liquids volumes is graded testers, straw.

Learning activities

- Presenting anthropomorphic with different shapes and volumes and then ask students to compare them using direct observation.
- Filling a tub with water, then asking one student to put an anthropomorphic in the tub then students describe what happened by observation, experimentation and measurement.
- To perform the exercise described in the textbook using a glass pot, collecting and pouring water in the sealed pot and then observing what happens to the water (does it spill out of the pot? why? (Scientific experimentation).

  Evaluation methods
- Define volume.
- Is it possible that two objects occupy the same space at one time.
- What is the unit used to measure volume? What are its components?
- Name the unit used to measure liquid volume.
- Name the tools used to measure liquid volume.

Appendix (3)

Dear respondent

- This test consists of (20) items.
- Each of these items have (4) alternatives and only one is the correct answer. Put a circle around the symbol of the correct answer.
- The score you obtain in this test is the sum of the individual scores obtained on the individual items.

The researchers

The Achievement Test

Put a circle around the correct answer

1-The Libra is used to measure:

A- Density B-Mass C-Weight D- Volume

2- The unit used to measure weight is

A-Kilogram B-Newton C-Liter D- Kilometer.

3-Liter is one of the units used in volume measurement and it equals in milliliters

A-10 B-100 C-1000 D-10000.

4-the space occupied by the object in the space is

A-Volume B-Mass C-Weight D-Material.

5-The formula (4\3 Half the diameter) is used to determine the volume of

A-Cylinder B-Ball C-Cube D- Cuboid

6-a box on the form of a cube having the following measurements (3,2,1), its volume is

A-$6m^3$ B- $6m^2$ C-$5m^3$ D-$5m^{2.}$

6-Liter is a unit used to measure the volume of:

A-Solid materials only B-Liquid Materials only

C-Gases only D-Liquids and Gases.

7-If a given object is 5 Kg, then it weight in Newton is:
A-500 B-50 C-10 D-5.
8-the relationship between the body density, its mass and volume is expressed as follows:
A-volume\ mass B-Mass\volume C-Volume X mass D-Volume +Mass .
9-Newton approximately equals the magnitude of earth gravity of an object with a mass of
A-100 Kg B-100g C-1000Kg D-1000g.
11-the hydrometer is one of the measurements used to measure one of the following liquid physical features:

- Density B-Pressure C-Mass D-weight.

12-the straw is one of the tools used to measure
A-liquids density B- liquids mass C- liquids volume D- Gases mass.
13-Kilogram is one of the measurement units used to measure mass and it is in grams:
A-10 B-100 C-1000 D-10000
14 a piece of wood having a mass of 600 grams and a volume of 1000cm^3 , its mass in gm\cm^3 is
A-0.6 B-6 C-0.06 d-60.
15- the mass of the volume unit of material is
A-Mass B-Weight C-Volume d-Density.
16-to identify the volume of the salt, we use a graded tester filled with
A-Water B-Kerosene C-Water and a gas D- All is true
17-the traditional balance is used to measure:
A-Weight B-Density C-Volume D-Mass.
18- the international unit used to measure volume is
A-m B-m^2 C-m^3 D-cm^3
19-the contents of any given object is expressed by
A-Volume B-Weight C-Mass D-Density
20- A cube with a leg of 2cm, its volume is:
A-2cm^3 B-6cm^3 C-12cm^3 D-8cm^3
Good luck
Scoring key

Correct answer	No.	Correct answer	No.
A	11	C	1
C	12	B	2
C	13	C	3
A	14	A	4
D	15	A	5
B	16	A	6
D	17	D	7
C	18	B	8
C	19	B	9
D	29	B	10