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The extent to which science teachers at the intermediate stage practice teaching according to STEM curriculum

[1]Zainab Katfan Resan, [2]Hayder Muhsin Salman Al-Shuaily

[1]College of Basic Education, University of Sumer, Iraq, Zaynabqaftan@uos.edu.iq
2College of Education for Pure Science, University of Thi-Qar, Iraq

Abstract

The current research aims to:

1-Identifying the extent to which science teachers practice teaching in the intermediate stage of teaching according to the (STEM) curriculum.

2-To identify whether there are statistically significant differences between the practices of science teachers in the intermediate stage of teaching according to the (STEM) curriculum as a result of the variable of experience.

The number of the research community members reached (397) science subject teachers in the intermediate school that affiliated to the Directorate of Education in Dhi Qar / Al-Rifai Education Department, and the number of the research sample members were (90) science teachers in the intermediate school.

The researcher reached the following results:

1- There are differences between the hypothetical average and the arithmetic average in favor of the hypothetical mean in the research sample in the practice of science teachers in the intermediate stage to teach according to the (STEM) curriculum, which means that the teaching practices of science teachers in the intermediate stage according to the (STEM) curriculum are not achieved.

2- The number of realized items in the teaching observation card according to the (STEM) curriculum amounted to (3) items, and with a percentage of (6,122%), while the number of unrealized items in the observation card reached (46) items with a percentage of (93,78%).

3- There are no statistically significant differences in the research sample about the practice of science teachers in the intermediate stage of teaching according to the (STEM) curriculum due to the variable of experience.

Keywords: STEM, science teachers.

INTRODUCTION

Research Problem:

The traditional style in our educational reality is still the most common, as the dominant feature of teaching at the present time is the teachers' use of methods and methods that depend on memorizing and memorizing the scientific material, which made teaching go in a traditional way for most lessons in order to provide students with information, without paying attention to linking it in The student's structure is for integration and balance, and it is no secret that the teacher's role is large and

vital in the educational process, so he should move away from the traditional method, and not be a container of information, but rather his role is to guide students when needed.

Consequently, in teaching, the role of students must be played in learning, in which the student is not only a receiver of information, but also a participant and a searcher of information in various possible ways. The teaching therefore depends on the self-activity and the positive participation of the student, through which he does the research using a set of activities and scientific processes such as observation, exploration, investigation, reading data and conclusion, which helps him to reach the required information himself and under the supervision of the teacher, his guidance and evaluation.

It is no secret that the (STEM) curriculum, despite its wide applications, importance and challenges, has not received the necessary attention from educational research in Iraq, as we note the weakness of educational institutions in keeping pace with the massive development in this field through their programs, plans, and courses.

Moreover, the structure of the curricula, especially the science subject curricula, may lack what is related to the (STEM) curriculum in the textbooks available in schools, or it may not be ready to integrate the fields of this curriculum. This will contributes to the preparation of non qualified students to apply this curriculum in their practical life. Therefore, textbooks must be subjected to continuous follow-up, analysis and evaluation processes to know their effectiveness, quality and suitability in a way that achieves harmony between the content of textbooks and the developments of contemporary life.

The researcher also noted there is a weakness in the teaching practice according to the (STEM) curriculum, despite the global interest in this curriculum.

This supports the results of the exploratory questionnaire directed by the researcher to (90) science teachers in the intermediate stage in (the General Directorate of Education in Dhi Qar Governorate / Al-Rifai Education Department) to express their opinion on the extent to which science teachers in the intermediate stage practice teaching according to the (STEM) curriculum and their professional competence. The survey results showed the following:

1- 95% of teachers is satisfied with relying on the traditional method of teaching.

2- A number of teachers believe that there are difficulties and obstacles in teaching according to the STEM curriculum.

In light of the foregoing, the problem of the current research is determined by answering the following questions:

1- To what extent do science teachers at the intermediate stage practice teaching according to the (STEM) curriculum?

2- Are there any statistically significant differences between the practices of science teachers in the intermediate stage of teaching according to the (STEM) curriculum depends on the variable of experience.

The Research importance:

In light of the successive developments taking place in our current era in order to catch up with civilization, which is the fruit of science and its outcome in various fields of life, and this would affect the lives of individuals and society, it is necessary to prepare the student in a way that enables him to be able to be creative and innovative and to contribute effectively to building and developing society, This is what most of the education systems in the world seek. Education is a preparation for life, and it bears the responsibility of developing the capabilities of students in various fields of education, providing them with scientific expertise and developing their thinking abilities (Sabri and Salah al-Din, 2005: 28).

The school curriculum is a tool to modify behavior and develop capabilities, skills and positive trends. Therefore, the curriculum is the vital axis in the educational process, as it develops with the development of life and the increase in its complexities, which makes

attention to the curriculum planning, implementation, evaluation and development of the necessities of education to catch up with the developments and modern educational trends. (Al-Hariri, 2012: 91).

The main task in teaching science is to teach students how to think, not how to memorize the subject without using it and realizing it in life, The science teacher is the main element for achieving the educational goals and objectives of teaching science, and that the type of education that students need should guide them and take care of their intellectual aspect.The best curricula, books, school scientific activities and programs may not achieve their goals unless the science teacher is distinguished in his teaching method, and teach students how to think and use scientific knowledge, so that the student will eventually be a good, proactive and creative citizen in educational and human experiences, and properly prepared and qualified to live in a time other than the time in which he was born, raised and educated (Zaytoun, 2001: 11).

In light of the foregoing, STEM-based learning, learned and educated, is one of the most important global trends and approaches, therefore, scientifically developed countries have adopted an educational vision for teaching STEM curricula at all levels of study, as they have begun to apply it in school stages in general by teaching the basics of science, technology, engineering and mathematics. It is also applied in the intermediate stages to all students by teaching mathematics with an intensive study of technology through experimentation, simulation, manufacturing and arts laboratories. (Ahmed, 2016: 131).

It is clear from this that the curricula, activities and teaching strategies based on integrative education (STEM) should be designed in an innovative scientific way that helps students to understand and realize the keys of science in an easy and simple way and in an interactive and open manner with the environment and in the context of students' knowledge and skills so that the students develop qualitative skills that extend their impact on their life activities. (Al-Muhaisen and Khaja, 2015: 45).

Through the foregoing, the importance of the research becomes clear through the following:

1- The importance of the STEM curriculum.

2- Recognizing the extent to which science curricula at the intermediate stage are close to the modern trends used in curricular design.

3- Enriching the curriculum aspect to work on developing it in line with the most important and latest educational trends that seek to move towards integration in science curricula.

4- Recognizing the reality of science books in the intermediate stage in terms of their inclusion of (STEM) curriculum issues.

Aims of the research

The current research aims at the following:

2. Identifying the extent to which science teachers practice teaching in the intermediate school according to the (STEM) curriculum.

3. To identify whether there are statistically significant differences between the practices of science teachers in the intermediate stage of teaching according to the (STEM) curriculum due to the variable of experience.

Limitation of the Research:

The current research is limited to the following limits:

1. Human limits: a sample of science teachers for the intermediate stage in schools affiliated to the Directorate of Education in Dhi Qar Governorate.

2. Spatial limits: Dhi Qar Governorate / Al-Rifai Education Department.

3. Time limits: the academic year (2021-2022 AD).

4- Objective limits: preparing a tool for the current research, which is a note card for the practice of teaching according to the (STEM) curriculum.

Fifth: Determination of the Terms:

First: Teaching

Teaching is defined by:

1. (Rashid, 2009) as "a purposeful educational process that takes into account all the factors that make up education and through which both the teacher and the students cooperate to achieve the so-called educational goals." (Rashid, 2009: 2)

2. (Al-Fatlawi, 2010) as "a purposeful process that helps the student perceive the educational experience and interact with it and benefit from the results of this interaction by modifying his behavior, or acquiring a new behavior." (Al-Fatlawi, 2010: 18)

- Theoretical definition: the researcher adopts the definition of (Atiya, 2013).

- Procedural definition: the researcher defines it as everything that the teacher does in the intermediate school of educational practices from planning, implementation and evaluation, and the related professional responsibilities within the classroom that help achieve the principles and requirements of integration in teaching.

Second: STEM curriculum (Mathematics, Technology, Engineering and Science)

It was defined by:

1. (Salama, 2009) as "a set of environmental and social issues and problems resulting from society's use of the results of science and technology to a degree that harms the environment at the local and global levels." (Salama, 2009: 250)

2. (Ghanem, 2012) as "a knowledge structure of integration between the branches of science, mathematics, and engineering design with their technological applications. This structure depends on learning through the application of practical and applied activities, digital and computer technology activities, and activities focused on experience, discovery, investigation and manual experience activities, and activities of scientific and logical thinking and decision-making.This knowledge-structure depends in its design on: focus on integrated conceptual experience, focus on problem solving and investigation, and an intensive application of practical activities about experience. (Ghanem, 2012: 32)

- Theoretical definition: the researcher adopts a definition of (Ghanim, 2012).

Procedural definition: The researcher defines it as an educational approach based on the integrative curve between the fields of science, technology, engineering and mathematics, in which education is carried out in a practical manner through practical experience and the correct scientific research method, in which scientific concepts meet with the reality of the learner.

Theoretical framework and previous studies

1 Curriculum:

The ancient education did not witness a written curriculum. Rather, it is the curriculum in the mind of the teacher, whose basis is the student's teaching of educational materials. The curriculum was mentioned in the writings of a number of philosophers such as Plato in the 4th century BC, and in the writings of some educators such as Commenius (29) in The 17th century, and in the writings of the German educator Froebbel (30) in the 19th century.

Although educators have used the concept of curriculum throughout history as a means of educating individuals, Seguel indicated that the history of thought in the field of curricula dates back to 1890.The curriculum did not appear as a science until the 20th century when Franklin Bobbitt published his book (The curriculum) in 1918, as it was the first book in the curricula that indicated that the definition of the curriculum is determined by studying the activities of members of the community with the aim of discovering the forms of knowledge that they need and what students need; in 1924 he published his second book (How to Make a Curriculum).Two years later, that is, in 1926, the National Society for the Study of Education (NSSE) issued a book in two parts entitled (The Origins and Method of Curriculum Construction),

Then the universities began to open the departments of curricula and teaching methods, and the Curriculum Development Association

was established. In the 1940s, interest focused on curriculum development, and then Tyler published his book (The Fundamentals of Curriculum) in 1969. Then there was a great strengthening of the curricula as a field of study in education by establishing the first department of curricula and teaching methods in a teacher's college at Columbia University in New York in 1973. Thus, the publication of books and the establishment of centers specialized in the study and development of curricula continued (Zayer and Yunus, 2013: 23).

The term curriculum is originally from the Latin language and means a race that takes place in a certain field, which was held from time to time in the Greek and Roman times.With the time, the requirement of the race turned into a training course, so the word “curriculum” was applied to the study courses.Then the matter continued after that to mean the content of the study materials or their plans,this means that curriculum is a word of Latin origin that means the method that an individual pursues in order to reach a specific goal (Abdul Halim et al., 2009: 15).There is another word that is sometimes used as a synonymous with the word "curriculum" and sometimes is used in a special meaning , which is the word “syllabus”, that means in Arabic and English the knowledge that students are required to learn in each academic subject (Maree and Al-Heila, 2000:21).

The (STEM) curriculum is one of the modern trends that educational scientists have been interested in, and they have provided many definitions, including:

(Abdul-Hamid, 2019) mentioned that it is “an integrated curriculum in which academic concepts are taught to students in the fields of science, technology, engineering and mathematics through problems related to the real world and by using integrative units based on research and investigation across academic subjects.” (Abdul-Hamid, 2019: 37)

The American Council on Economic Competitiveness defined it as: a global teaching curriculum based on the integration of science, technology, engineering, and mathematics, by providing a learning environment that focuses on student education through the use of different life problems and situations in daily life, as well as exploration and invention. (Al-Saeed and Al-Gharqi, 2015: 139).

The researcher notes that all the previous definitions agree that the (STEM) curriculum is based on the integration of science, technology, engineering and mathematics and linking them to the real world of students and life situations by thinking on a context that enhances discovery and improves students’ understanding of the learning fields around them and builds a conceptual framework for science by linking it to its applications life.

Previous studies

1- Study (Al-Mohammadi, 2018):

The study aimed to identify the effectiveness of teaching according to the STEM curriculum in developing the ability of secondary school female students to solve problems, the study sample consisted of 30 secondary female students, and the researcher used "Problem-solving ability test, semi-experimental method " as a study tool. While the statistical means that he used are the arithmetic means and deviations, and the “t” test for the linked samples. The researcher concluded there are statistically significant differences between the pre and post arithmetic means of the study members’ responses to the problem-solving test and toward the post-application.

Objectives

To achieve the objectives of the current research, the researcher will address in this chapter the procedures followed by the researcher, by defining the method, the research community, selecting the sample, building and applying the two research tools, as well as selecting the appropriate statistical tools that researcher will follow in analyzing the statistical data.

In order to fulfill the research requirements and achieve its objectives, the researcher followed the following procedures:

First: Research Methodology:

The educational value of the research and its results are closely related to the methodology that the researcher follows by designing the research and determining all the tools that will be used in each of its stages (Melhem, 2002: 246).

In this research, the researcher relied on the analytical descriptive method (work analysis) to achieve the objectives of the research, and to reach responses that contribute to the analysis and interpretation of the responses of the sample members.

Second: The Research Community:

Determining the research community is one of the important methodological steps in educational research, and it requires great accuracy, as it depends on the conduct of the study, the design of its tool, and the adequacy of its results (Shafiq, 2001: 184).

A community is defined as a group of clearly known statistical units that are intended to obtain data. (Al-Azzawi, 2008: 161)

The research community is also defined as: "It is a number of individuals who share a characteristic or group of traits that distinguishes them from another community." (Awath, 2008: 182).

The researcher chose the General Directorate of Education in Dhi Qar Governorate, which included the sections (Al-Nasiriyah, Suq Al-Shuyoukh, Al-Jbayish, Al-Fuhud, Al-Shatrah, Al-Rifai, Qalaat Sukar) to be her research community. Table (1) illustrates this.

Table (1) *shows the education departments affiliated to the General Directorate of Education in Dhi Qar Governorate.*

No.	Names of the educational departments
1	Al-Nasiriyah Educational Department
2	Suq Al-Shuyoukh Educational Department
3	Al-Jbayish Educational Department
4	Al-Fuhud Educational Department
5	Al-Shatrah Educational Department
6	Al-Rifai Educational Department
7	Qalaat Sukar Educational Department

The number of teachers in intermediate and secondary schools has reached (397), distributed among intermediate and secondary schools affiliated to the education departments in the General Directorate of Education in Dhi Qar Governorate.

Third: The research sample:

After the size of the community has been determined, the next step is to determine the research sample from this community, and the selection of the research sample is vital for the researcher.

The research sample is defined as a model that includes a side or part of the units of the original community concerned with the research, and is representative of it, so that it represents its common characteristics.

This model or part enriches the researcher to study all the units of the original community (Kandilji and Al-Samarrai, 2009: 255).

The research sample is also defined as "selecting representative individuals from the community list" and it also means "a subset of the community," which is a very important step, because the possibility of correctly generalizing the results to the community depends on the extent of the sample's integrity and that the "intact" sample is the representative sample of the community that the sample was chosen from (Abu Allam, 2011: 162-169).

After identifying the directorates of the education departments in Dhi Qar governorate and knowing the number of teachers, the researcher chose the Al-Rifai Education Department. The researcher visited the Al-Rifai Education Department of the General

Directorate of Education in Dhi Qar Governorate to find out the number of teachers in intermediate and secondarys for the academic year (2021-2022). The researcher obtained the names of the 33 schools, as shown in Table (2).

Table (2) *Shows the names of the schools affiliated to the Directorate of Education of Dhi Qar / Department of Education of Al-Rifai District*

No.	School's name	School's location
1	Al-Shumuq	Rifai District
2	Hussein Al-Ghezi	Rifai District
3	Al-Shaikh Abdul-Sahib	Rifai District
4	Al-Thiqa	Rifai District
5	Al-Nebras	Rifai District
6	Al-Nawaris	Rifai District
7	Bawabat Al-Iraq	Rifai District
8	Al-Hathib	Rifai District
9	Al-Sada Al-Eqwan Secondary	Rifai District
10	Al-Mansura mixed secondary	Rifai District
11	Al-Numan mixed secondary	Rifai District
12	Al-Eqtidar mixed secondary school	Rifai District
13	Nahthat Al-Hussein mixed secondary school	Rifai District
14	Mu'ta mixed secondary school	Rifai District
15	Al-Shahama mixed secondary school	Rifai District
16	Al-Ithar mixed secondary school	Rifai District
17	Al-Mubahala mixed secondary school	Rifai District
18	Al-Sadir Al-Awal mixed secondary school	Rifai District
19	Al-ShaiqhAal-Khamasi mixed secondary school	Rifai District
20	Al-Shaibani mixed secondary school	Rifai District
21	Al-Hasan Al-Mujtaba mixed secondary school	Rifai District
22	Al-Furghan	Al-Nasir District
23	Arkan Al-Huda	Al-Nasir District
24	Ilaf	Al-Nasir District
25	Jaafar Al-Tayar	Al-Nasir District
26	Al-Turath	Al-Nasir District
27	Dhiaa Al-Salihin	Al-Nasir District
28	Al-Tathamin Al-Thania	Al-Nasir District
29	Al-Nasir mixed secondary school	Al-Nasir District
30	Al-Thuglain mixed secondary school	Al-Nasir District
31	Usamah Bin Zaid Mixed School mixed secondary school	Al-Nasir District
32	Al-Hasanain Mixed School	Al-Nasir District
33	Al-Saded Mixed School	Al-Nasir District

The total number of science teachers and specialists in teaching science in intermediate and secondary schools for girls in the General Directorate of Education in Dhi Qar Governorate / Al-Rifai Education Department for the academic year 2021-2022 has reached (130) teachers distributed by (33) schools.

Based on the foregoing, this sample was chosen by the stratified random method, and the sample was chosen by (32.75%) of the research community, which is a good percentage, because in the descriptive research if it reached (20%) it represents an appropriate sample. (Al Kubaisi, 2007: 219).

In light of the foregoing, the main research sample was chosen from science teachers in intermediate and secondary schools for boys. At first, intermediate and secondary schools for boys were chosen, and then teachers in these schools who actually teach science were chosen.

This percentage is considered good for representing the community, which provides the opportunity to select the sample in a manner appropriate to its size in the original community.

A table was made showing the number of sample members distributed according to years of experience.

Table (3) *shows the number of science teachers, according to years of experience.*

No.	The number of sample members	Years of Experience
1	1(- 5) years	6
2	(6-10) years	10
3	> 10 years<16	21
4	> 16 years	53
Total	90	

In light of the foregoing, the research sample was divided into two parts:

1. The basic sample: It was (90) teachers of science teachers to teach according to the (STEM) curriculum.

2. The exploratory sample: its number reached (90) teachers of science teachers to teach according to the (STEM) curriculum.

Fourth: the search tool

One of the requirements of the current research is to prepare a tool by which the data that is related to it can be collected. “The difference in the nature of research forces any researcher to use a specific set of tools. The questionnaire is one of the tools that are frequently used in descriptive research.” (Melhem, 2002: 164)

To achieve the objectives of the research, the researcher prepared a tool for the current research, which is the note card for (the teaching practice of science teachers according to the (STEM) curriculum).

1. Exploratory experience:

The researcher applied the tool (the teaching practices observation card for science teachers according to the (STEM) curriculum) to an exploratory sample of (30) teachers who were randomly selected from intermediate schools affiliated to the Directorate of Education in Dhi Qar Governorate / Al-Rifai Education Department.

The evaluation process was watched, and the teaching practice was judged according to the (STEM) curriculum, and the researcher was able to make notes, and it became clear that all the paragraphs and instructions were understandable and clear, and that the approximate average time for evaluation and observation of the tool was (38) minutes.

3. Authenticity of the tool:

1. Apparent Validity:

Honesty is one of the important conditions that must be met in the data collection tool, and it means the ability of the tool to measure what it was actually prepared to measure. The validity of the test is linked to the honesty of each paragraph (Abbas et al., 2012: 261)

The researcher relied on (80%) of the arbitrators' approval to keep the paragraph, and if it does not achieve this level, it will be deleted from the tool.

If the researcher feels the importance of this paragraph, she will review the arbitrators who did not agree with it and clarify their opinion on its validity, if the arbitrators insist on their opinion, it will be deleted, bearing in mind that some arbitrators have indicated the necessity of making linguistic modifications, and the researcher has taken these observations, and thus the tool has acquired the character of apparent honesty.

After the researcher took the arbitrators’ opinions, observations and suggestions in changing some words and modifying some paragraphs linguistically, the researcher kept the tool as it is in terms of its number and it is composed of (49 items) distributed over seven areas.

1. The honesty of construction

It is the ability of the tool to distinguish between different groups or groups in their performance on an aspect of behavior (Abu Jadu, 2003: 400). The construction validity was extracted by a number of methods.

. Stability (stability of the tool note):

In order to be able to rely on the study tool, it must be characterized by stability, which is the application of the research tool to a sample of respondents, more than once and for similar circumstances (Melhem, 2002: 247).

The tool (note card) for teaching according to the (STEM) curriculum in its final form:

After the procedures that were achieved in the previous steps, the tool became in its final form consisting of (49) paragraphs, distributed into (7) fields.

As for the gradation of the answers, it was quintuple, which is in the order (1,2,3,4,5) and the answer degrees range between (5-1) from the highest degree to the lowest degree, and thus the maximum degree for the observation card is (245) degrees and the minimum degree for the observation card (49) degrees, appendix ( ). Thus, the tool became ready to be applied to the current research sample (the basic sample), which are science teachers in intermediate schools, on Wednesday 12/1/2021 and ended the application on Monday 31/1/2022.

The researcher explained to the sample members the objectives of the current research without affecting their motivation to teach in order for the researcher not to have an influential opinion on the research samples from the teachers. Then the answers were written in special forms prepared for this purpose.

Fifth: Statistical methods:

In order to achieve the objectives of the research, the researcher used statistical methods by making use of the Statistical Package for the Social Sciences (SPSS) program, whether in the procedures or in analyzing the results, these methods are:

1. Frequencies and percentages: in order to find the proportion of the sample for the research community, and convert the frequencies of each paragraph of the two search tools into percentages, for the purpose of knowing the value of each paragraph of the domains, and to determine the apparent validity of each paragraph of the two tools.

2. T-test for one sample: to calculate the significance of the difference between the individuals of the research sample in the two search tools.

3. Chi-square test (x^2): for the purpose of calculating the statistical significance of the arbitrators' opinions of the two search tools.

4. Alpha-Cronbach coefficient: to calculate the stability of the professional competence resolution.

5. Cooper's equation: to calculate the stability of the observation card of the researcher with a second observer.

6. Analysis of the unilateral variance to find out the significance of the statistical differences between the degrees of the research sample according to the years of experience of the two research tools.

7. Scheffe Test to find out the differences for the arithmetic means from the analysis of variance.

8. Equation of the weighted mean for arranging the paragraphs of the two tools, and knowing the strengths and weaknesses in each field.

9. Percentage weight: to indicate the relative value of each of the two tools' paragraphs and to benefit from them in interpreting the results.

Presentation and interpretation of the results:

The first objective: to identify the extent to which science teachers in the intermediate stage practice teaching according to the (STEM) curriculum.

For the purpose of identifying the extent to which science teachers in the intermediate school practice teaching according to the STEM curriculum), the researcher applied the observation card to the research sample of (90) science teachers in the intermediate school, after extracting the results and tabulating the data, the researcher calculated the arithmetic mean of the sample, which amounted to (83,4333) with a standard deviation of (13,77104).To verify the above objective, the researcher used the T-test for one sample to identify the differences between the average of the general judgment and the hypothetical mean of the tool. It was found that the

calculated T-value is greater than the tabular T-value with a degree of freedom of (89), and at a significance level (0.05), which means that there are differences between the hypothetical mean and the arithmetic mean and towards of the hypothetical mean in the research sample in the practice of science teachers in the intermediate stage to teach according to the (STEM) curriculum and in a statistically significant way, seetable ( ).

Table (4) *T-test results for one sample of the Teaching Note Card according to the (STEM) curriculum*

The variable	Sample	Arithmetic mean	Standard deviation	Hypothesis mean	Degree of freedom	Calculated	Tabular	Significance
Professional Competencies	**90**	**83,4333**	**13,77104**	**147**	**89**	**43,791**	**1,960**	**statistically significant**

The researcher attributes this result to the interpretation. The researcher decided to analyze the results to identify the extent to which the goal was achieved by calculating the weighted mean and the percentage weight for all paragraphs of the observation card tool teaching according to the (STEM) curriculum, and then calculating the weighted mean and percentage weight for each field of the tool.

The second objective: To identify whether there are statistically significant differences between the practices of science teachers in the intermediate stage of teaching according to the (STEM) curriculum due to the variable of experience.

In order to identify the significance of the differences in the practices of the research sample for the teaching observation card according to the (STEM) curriculum and according to the variable of experience, the researcher extracted the average scores of the sample members according to the experience of (90) science teachers in the intermediate stage to teach according to the (STEM) curriculum (Appendix ()).

After processing the data statistically, the researcher extracted the average scores of the sample members according to experience, and it was found that the arithmetic mean of teachers whose experience is less than (5) years reached the arithmetic mean (93,6667) and the standard deviation was (9,87252), while the teachers whose experience ranges between (6 - 10) years, the arithmetic mean reached (84,2000) and standard deviation was (11,39981), and teachers who have experience ranging between (11-15) years, the arithmetic mean reached (83,5455) and standard deviation was (12,70443), and teachers who have more than (15) years of experience, the mean reached (82,5455) and the standard deviation was (14,75209).

The sum of the arithmetic means of the research sample, which was (90) teachers, amounted to (83,433) with a total standard deviation of (13,77104), and table ( ) illustrates the above.

Table (5) *Arithmetic mean and standard deviation of the teaching note card according to the (STEM) curriculum and based on the variable of experience*

Experience level	Number of sample members	Arithmetic mean	Standard deviation
< 5 years	6	93.6667	9.87252
6-10 years	10	84.2000	11.39981
11-15 years	21	83.5455	12.70443
> 15 years	53	82.0577	14.75209
Total	90	83.4333	13.77104

In order to confirm the differences in the teaching observation card tool according to the (STEM) curriculum based on experience, the

researcher used the analysis of variance test and the results were as shown in Table ( ).

Table (6) *The results of the one-way analysis of variance to identify the differences for the teaching observation card according to the (STEM) curriculum*

Source of Variance	Sum of squares	Degree of freedom	Mean of squares	Value(F)		Significance level at (0,05)
				Calculation	Tabular	
between groups	732,885	3	244,295	1,301	3,96	Statistical function
within groups	16145,215	86	187,735			
Total	16878,100	89				

Through the unilateral variation between groups, we find that the source of the variance between the groups is equal to (732,885), with a degree of freedom of (3), and a total of means (244,295). while for the source of variance within groups is equal to (16145,215) with a degree of freedom of (86), and the total of the variance source is equal to (16878.100),The calculated (F) value amounted to (1,301) which is smaller than the tabular (F) value which was (3,84) at the significance level of (0.05), and this indicates there are no statistically significant differences for the degrees of the research sample for the teaching observation card according to the (STEM) curriculum due to the variable of experience.

Conclusions:

In light of the findings, the researcher concluded the following:

1- There are differences between the hypothetical mean and the arithmetic mean in favor of the hypothetical mean in the research sample in the practice of science teachers in the intermediate stage to teach according to the (STEM) curriculum, which means that teaching practices in the intermediate stage according to the (STEM) curriculum have not been achieved.

2- The number of realized items in the teaching note card according to the (STEM) curriculum amounted to two paragraphs with a percentage of (4.09%), while the number of unrealized paragraphs in the observation card amounted to (47) paragraphs with a percentage of (95.91%), and this means that science teaching at the intermediate stage according to the STEM curriculum (the research sample) was not achieved.

3- There are no statistically significant differences in the research sample about the practice of science teachers in the intermediate stage of teaching according to the (STEM) curriculum due to the variable of experience.

Recommendations:

Based on the results of the current research, the researcher suggest the following recommendations:

1. Introducing the (STEM) curriculum to the science teachers in the intermediate stage .

2. Enrolling the science teachers for the intermediate stage through educational qualification courses such as teaching methods courses and their modern methods.

3. The necessity of keeping pace with the science teachers of the intermediate stage with the modern trends in teaching their subject.

4. Encouraging science teachers at the intermediate stage to pay attention to preparing daily and annual plans for the subject, which help them to organize and facilitate the educational process, and directing supervisors and managers to follow up on it.

5. Paying attention to the educational plans for the intermediate school stage and making the

(STEM) as one of the curricula that can be taken into account when preparing the plans.

6. Familiarize students with following the correct methods in studying lessons, which are based on a correct logical method instead of memorizing and remembering.

7. Text books should be prepared on a field basis that meets the needs of the community, learners and faculty.

8. The necessity for science books in the intermediate stage to take into account the (STEM) curriculum when preparing them to increase their sobriety and contribute to achieving the goals for which they were set.

9. Adoption of the guide prepared by the researcher in defining teachers of scientific disciplines with the (STEM).

Suggestions:

To complement the research results, the researcher suggested conducting studies on:

1. Evaluating the teaching of Biology, Physics or Chemistry for the secondary school stage according to the (STEM) curriculum.

2. Evaluation of teaching performance in the primary stage according to the (STEM) curriculum.

3. Evaluation of the professional preparation program for science teachers according to the (STEM) curriculum.

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