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The Relationship Between Understanding the Nature of Science and Teaching Methods Among Biology Teachers in Tabuk City

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ABSTRACT

This study aimed to identify the relationship between the right understanding of the nature of science and teaching methods used by biology teachers in Tabuk city. The researcher used the descriptive method to achieve the study objectives. The data was collected by using the questionnaire as a tool for collecting the study sample's data. This questionnaire contained 25 items and included the basic axis to be studied. The validity of the tool was confirmed by several tests and criteria and by using statistical methods such as (T-tests), repetitions, and percentage. The results showed that there is a big relationship between science nature and teaching methods. The level of scores for choosing teaching methods among biology teachers in the city of Tabuk is high, and that there are no statistically significant differences at the significance level of 0.05 or less in the attitudes of the study sample members regarding choosing teaching methods according to the variable of years of experience of the teacher. The level of understanding of the nature of science among female biology teachers in the city of Tabuk is high. This axis included eleven statements. It was found that there are ten of the statements related to the level of understanding of the nature of science among female biology teachers in the city of Tabuk that came with a degree of yes, and there is one statement related to the level of understanding of the nature of science among biology teachers in the city of Tabuk was "sometimes". According to these results, the study suggests some recommendations:

It is necessary for curriculum designers to pay attention to including and emphasizing the nature of science in the curricula, to training teachers during the period of practical education on science practices, and to organizing training courses to help teachers on scientific practices in teaching.

Keywords: Understanding, Nature of Science, Teaching Methods, Biology, Biology Teachers, teaching in KSA.

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Background of the Study and Its Significance

Introduction:

Human beings interact with the surrounding world and seek to understand it through studying various phenomena and providing possible explanations for them, while predicting new phenomena and modern innovations. This gives science the characteristics of continuity, interaction, and integration, necessitating a logical interpretation of phenomena and events, understanding the nature of science, its methods, and processes (Al-Shaya, 2014). There has been significant and widespread interest among researchers and experts in the field of education in studying the nature of science, its boundaries, concepts, processes, characteristics, and its development. This interest is evident in studies such as those by Lederman (2002) and Driver (1996), among others, which have clarified many arguments and motivations for studying the nature of science and its processes. One of the prominent motivations has been to assist learners in facing and solving their daily problems, as well as in making appropriate decisions that can be relied upon in dealing with various issues. Finally, it also embodies ethical commitments in societies through understanding and applying them.

Since understanding the nature of science is a clear goal for bringing about changes and developments to keep pace with the rapid and successive changes characterizing science today due to the immense cognitive explosion, numerous studies have indicated and addressed the understanding of the nature of science among teachers and students, and the extent to which curricula contain the nature of science and its processes. Additionally, there has been a call for multiple training courses aimed at enhancing and consolidating the understanding and practice of science. Examples of such studies include the work by Saqr (2006), which clarified that understanding the nature of science helps teachers develop their ideas and innovations, increasing their ability to deal with scientific phenomena in terms of interpretation and prediction. Another example is the study by Al-Faraj (2008), which targeted curricula regarding their inclusion of the concept of the nature of science and its practices, identifying the dimensions of the nature of science present in the curricula. The study revealed that there is a weakness in the treatment of science textbooks regarding the nature of science and its practices, or there may be a failure to clarify the concept of the nature of science in a correct and clear manner.

Given that science is one of the fields that advances nations, it was necessary to focus on science curricula and their development, as well as developing teaching strategies that align with modern trends worldwide, which advocate for learning science in all its branches to develop various skills, notably critical thinking, innovation, creativity, and advancing learners and their thinking. Therefore, the interest in science curricula and teaching has received global, Arab, and regional attention. It has become imperative to search for teaching strategies that align with the revolution of immense scientific progress in the era of globalization and move away from the traditional

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methods based on imparting knowledge and its retrieval, or what is known as traditional methods.

In the late 1960s, an educational movement emerged based on competencies rather than relying on prevailing trends in teacher preparation, which focused on providing teachers with a degree of general and specialized culture, the nature of science, and its practices. This movement focused on several concepts, most notably: dealing with learning and assessing the reference narrative thoroughly, as well as self-directed learning, program design, and professional experiences (Hall & Houston, 1981) (Burse & Cross, 2013). As part of its commitment to developing educational processes, Riyadh conducted numerous studies in the same context, perhaps the most prominent of which is a study directly related to the development of teaching strategies and methods adopted in educational institutions throughout the Kingdom. The results and outputs of this study showed that a large percentage of teachers rely on lecturing and rote memorization of scientific material by students, which has contributed to increasing the level of negativity among students in the learning process. The study also revealed a clear weakness among some teachers in applying and using contemporary teaching methods that make the student the focus of the teaching process, in the absence of adequate methods and their inability to develop cooperative work skills, critical thinking, innovation, and creativity, and to develop the necessary competencies for social work. The study recommended the need to resort to the use of contemporary teaching methods that contribute to the development of critical thinking and provide various opportunities for students to refine their skills in creativity, innovation, and initiative, stimulate motivation, form positive attitudes and positions towards the subject, as well as develop students' confidence and impart self-learning ability (Ministry of Education, 2009).

Building upon the results of multiple studies conducted globally, regionally, and locally, continuous improvement, development, and reform activities for the educational system in the Kingdom have continued. Among the most important of these initiatives were the project to develop teaching strategies for mathematics and science subjects, and the King Abdullah Project for the Development of Teaching Strategies and Methods. Given the aforementioned and in light of the numerous challenges facing educational fields and the necessity of keeping pace with scientific and technological developments by nurturing our generations on scientific principles, skills, and positive attitudes that help them in perception, achievement, and advancing their thinking, we need to apply active, constructive strategies to overcome the difficulties and problems facing the learning system, including low academic achievement and negative attitudes towards science.

Problem Statement and Research Questions:

The teaching of science subjects has undergone significant transformations in various aspects of educational processes worldwide, especially concerning attempts to make understanding the nature and structure of science one of the primary objectives of science teaching. Successful, effective, and purposeful teaching processes rely on engaging students in the educational process, activating their roles during this process,

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and emphasizing the positive role of the student within the classroom. Indeed, there is a strong correlation between students and teaching methods, where the more engaged and interactive the student is - according to educational experts - the better and more effective the teaching method becomes, thus bringing the teaching process closer to success and achieving its goals (Holbrook & Rannikmae, 2007: 9) (Ambusaidi et al., 2010).

Teaching methods vary and differ from one educational institution to another or from one region to another. However, in general, there are methods that rely on verbal approaches versus those that rely on scientific methods. Some methods are individual-based versus group-based, and there are traditional methods widely prevalent worldwide versus modern constructivist methods being implemented by most advanced countries. This is in pursuit of developing students' understanding of the nature of science and employing it in teaching methods to equip them to adapt to the present and face challenges (Al-Shailey, 2008).

The researcher, during her work in the field of education, observed a close relationship between the teacher's understanding of the nature of science and her choice of appropriate teaching methods for the lesson and scientific content, as indicated by studies (Al-Janabi, 2016) and (Zaitoun, 2012). A lack of clear understanding by the teacher of the nature of science and its practices, coupled with the multitude of teaching methods proposed in the field, leads to random and unconsidered selection of teaching methods, affecting the success of the educational process and the achievement of its desired objectives.

Therefore, the problem of this study arises from an attempt to delve into the relationship between teachers' understanding of the nature of science and its practices and their choice of appropriate teaching methods for the lesson.

The main research question of the study is: What is the relationship between understanding the nature of science and the teaching methods used by biology teachers in Tabuk City?

From this main research question, the following sub-research questions emerge:

- Are there no statistically significant differences at the (0.05) level between the scores of selecting teaching methods attributed to understanding the nature of science?
- Are there no statistically significant differences at the (0.05) level between the scores of selecting teaching methods attributed to the years of experience of the teacher?
- Are there no statistically significant differences at the (0.05) level between the scores of the level of understanding of the nature of science among biology teachers in Tabuk City?

Study Objectives:

The study aims to achieve the following objectives:

- To identify the current knowledge of biology teachers in Tabuk City about the nature of science and its practices.
- To uncover the relationship between the understanding of the nature of science and the teaching methods used by biology teachers in Tabuk City.

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Significance of the Study:

The researcher expects that the study is significant in the field of education for the following reasons:

- It explores the integration between the theoretical and applied aspects among biology teachers.
- It may contribute to the professional development of teachers by increasing their awareness of the importance of understanding the nature of science and its practices.
- It may raise awareness among responsible entities for the preparation and training of teachers about the importance of complete awareness among teachers regarding the nature of science and its practices.
- The results may assist the researcher, given her role in focusing on training students in scientific practices and selecting appropriate teaching methods for the academic content.

Study Terminology:

- **Nature of Science:**

Defined by Al-Asmari et al. (2014) as: "Scientific knowledge with an empirical basis relying on the senses." Operationally, the nature of science is defined as: Accessing knowledge in an organized manner, using methods and techniques of the scientific method while adhering to the ethics of science.

- **Teaching Methods:**

Defined by Al-Faleh (1429 AH) as: "The science that investigates how to deliver knowledge to students effectively, develop their abilities, and improve their skills in a balanced manner." Operationally, teaching methods are defined as: The method used by the teacher to achieve the desired objectives of the educational situation.

Literature Review and Conceptual Framework:

In light of the rapid changes in education, there is a pressing need for updating and revising practical education programs, particularly in the field of Science Education. In this era of rapid change, everyone involved in education is obligated to keep pace with this scientific revolution, adapt to it, and choose alternatives that provide confidence and security in the path of development. Curriculum no longer solely focuses on the quantity of information presented to learners; it also emphasizes the methods and approaches used by teachers to deliver information and how learners acquire and comprehend it from various sources.

One of the most important features of progress and advancement is the continuous assessment of the details of the constantly changing reality. This assists in educational planning, contributes to successful adaptation to change, and moves away from the realm of tradition towards avenues of development and civilization. Modern educational methods and evolving education, always adapting to the evolution of life itself, represent forms of this development. A successful teaching method must prioritize scientific processes over scientific facts and give students a more active and positive role in the lesson.

Regardless of the diversity of teaching methods, they must all aim at a very important foundation: how do we learn, rather than what do we learn? Therefore, it is essential

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when choosing any teaching method and implementing it to contribute to stimulating motivation among learners towards learning, attracting attention to the lesson, organizing the learning environment, and arousing learners' readiness to interact with the educational situation. Teaching through the strategy of the educational theater is one of the methods that give learners a positive role, focusing on their activities, interests, and needs in the activity, with the teacher acting merely as a guide.

Furthermore, a study by Zaitoun (2003) emphasizes the importance of focusing on teacher preparation processes and professionally qualifying them, providing them with precise training on a number of key teaching skills. The study of Al-Khuzai and Al-Mumani (2010) also echoes the recommendations mentioned earlier, considering that using or relying on appropriate teaching methods and selecting the suitable teaching approach for the educational situation are among the most prominent teaching competencies. Finally, a study by Al-Zu'bi (2012) surveyed the opinions of educators in educational science faculties in several Jordanian universities regarding their knowledge of science and its impact on their teaching behavior. The study observed that the beliefs and cognitive achievements of teachers have an impact on the selection of appropriate teaching methods within the classroom.

It is evident that some studies rely on the premise that teaching science subjects should be done through educating by science rather than educating about science, meaning that it should follow a logical sequence based on the expertise and experiences of educational experts who have documented their observations in the form of studies and research. This necessitates the reliance on an organized model related to the nature of science education that should be based on activity theory. This includes understanding the nature of science, developing intelligence, and communication skills (Holbrook & Rannikmas, 2007).

Understanding the nature of science is one of the most important characteristics possessed by scientifically and practically educated individuals. This is because it helps individuals in various aspects such as understanding their surrounding environment and its elements, solving various problems, as well as dealing with different devices used in daily life or at work in a manner compatible with the era of science, technology, and easy living. Understanding the nature of science also helps in comprehending the relationship between cause and effect, as well as studying the natural phenomena related to them, thereby increasing the learner's familiarity with scientific knowledge. Additionally, it assists teachers in building new and effective teaching strategies and in selecting and formulating questions directed to their students within the classroom (Zeiton, 2003) (Lin & Eth, 2012).

As for understanding the nature of biology, it is known that biology encompasses multiple branches, each focusing on a specific vital aspect. It is a science that studies living organisms from various perspectives, starting from structure to interactions between them, and distinguishing between humans, animals, plants, microorganisms, and inanimate objects (Al Aqila, 2017).

There is significant importance in linking the understanding of the nature of science with teaching methods. This directly leads to the acquisition of positive scientific attitudes by students, which is more beneficial than learning that leads to knowledge

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acquisition since knowledge is subject to modification and forgetting, whereas attitudes are continuous and enduring (Hattab, 2002).

Therefore, it is imperative for teachers to strive to understand the true, real, and abstract nature of science, contributing to imparting that knowledge to students using teaching methods that align with the cognitive content of the subject, as well as the requirements of students, society, and education in general.

Studies have continued in this field due to its importance in achieving correct and strong educational outcomes and helping in the proper development of individuals.

2-Study Methodology and Procedures:

Study Methodology: The researcher adopted a descriptive methodology suitable for this study, which aims to clarify the relationship between two variables: understanding the nature of science and teaching methods.

Study Population and Sample: The study population includes all female teachers teaching biology in public schools in Tabuk City, Saudi Arabia, during the second semester of the academic year (1441 AH - 1442 AH), totaling 106 teachers. The study sample was randomly selected from the study population, and the study was conducted on all members of the sample, totaling 32 teachers, representing 30% of the original population. The selection process ensures equal opportunities for individuals in the community to join the sample (Dalain, 2007), and it also helps to reduce the effort, time, and cost for the researcher while obtaining more accurate information.

Study Limits: The limits of this study are as follows:

- **Temporal Limits:** The second semester of the academic year (1439 AH - 1440 AH).
- **Spatial Limits:** Girls' high schools in Tabuk City, Saudi Arabia, as the study's community.
- **Human Limits:** Biology teachers in Tabuk City.
- **Research Limits:** The study focuses on measuring the relationship between understanding the nature of science and selecting appropriate teaching methods.

Study Tools and Description:

- **Study Tools:** The researcher used a questionnaire as a tool for collecting data from the study sample.
- **Construction of Study Tools:**
- The researcher identified the key dimensions of the nature of science and its practices, as it is difficult to exhaustively list all dimensions. These dimensions include the goals of biology, scientific processes and ethics, and the interaction between science and technology.
- Selection of items or phrases representing each dimension of science and its practices as mentioned above.
- Organizing the phrases into paragraphs in the questionnaire.

Presenting the questionnaire to reviewers for feedback.

3-**Arbitration of Study Tool:**

The process of refining the study tools went through two stages:

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- **Initial Stage (Tool Validity):** a. Face Validity: To ensure the validity of the tool, it was presented to a group of experts (Appendix 1) to assess its suitability for the study's objectives and to judge the clarity and accuracy of its items. After reviewing the experts' opinions and suggestions, the final version of the tool was constructed, consisting of (25) items. b. Content Validity:
- **Second Stage (Tool Reliability):** To ensure the reliability of the tool, it was applied to a sample of teachers, and after two weeks, it was reapplied to the same teachers. Using the Pearson correlation coefficient, the result showed a high correlation coefficient of approximately (0.81), indicating strong reliability of the tool.

Final Study Tool: After passing through multiple stages including construction, arbitration, and refinement, the study tool was formulated in its final form consisting of (25) items. These items were divided between selecting teaching methods and understanding the nature of science. Items (4-10, 13-15, 17-25) represented the first question concerning the selection of teaching methods, while items (1-3, 5-9, 11-12, 16) represented the second question concerning understanding the nature of science.

Study Procedures:

- Identifying the main topic of the study.
- Determining the study population and deriving the sample.
- Constructing study tools, ensuring validity and reliability.
- Applying research tools to the sample.
- Collecting data from the study tool and applying statistical methods to it.

Statistical Methods Used: The study relied on several statistical methods, including:

- Arithmetic mean tests.
- Frequencies and percentages.
- One-sample t-test.
- Pearson correlation coefficient.
- Cronbach's alpha coefficient.

Fourthly: Presentation and Analysis of Study Data and Results, and Their Interpretation

Firstly: Results related to the personal and professional variables of the study sample:

With the aim of describing the individuals of the study community, the researcher utilized frequencies (N) and percentages (%). The researcher classified the members of the study community based on: (the source of obtaining the academic qualification, years of experience, and the number of teaching-related training courses obtained). This will be presented in the following tables:

- Study sample according to the source of obtaining the academic qualification:

Table (1):

Source of Obtaining Academic Qualification	Frequencies	Percentage
America	**1**	**3.1**
University of Tabuk	**30**	**93.8**
University of Dammam	**1**	**3.1**
Total	**32**	**100٪**

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It is evident from the table above that out of the study sample, 30 individuals (93.8%) obtained their academic qualifications from the University of Tabuk, while 1 individual (3.1%) acquired their academic qualification from America. Additionally, it was found that 1 individual (3.1%) represents 3.1% of the total study population and obtained their academic qualification from the University of Dammam.

- **Study Sample According to Years of Experience:**

Table (2):

Years of Experience	Frequencies	Percentage
Less than 5 years	**8**	**25**
5 to less than 10 years	**10**	**31.3**
10 years or more	**14**	**43.7**
Total	**32**	**100٪**

It is evident from the table above that (14) individuals in the study sample, representing (43.7%), have 10 years or more of experience. Additionally, (10) individuals, accounting for (31.3%), have 5 to less than 10 years of experience, while (8) individuals, constituting (25%), have less than 5 years of experience.

- **Study Sample According to the Number of Training Courses Related to Teaching:**

Table (3)

Number of Training Courses Related to Teaching	**Frequencies**	**Percentage**
Less than 5 courses	**14**	**43.7**
From 5 to less than 10 courses	**10**	**31.3**
10 courses or more	**8**	**25**
Total	**32**	**100٪**

The table above shows that (14) of the sample, representing (43.7%), obtained less than 5 training courses, while there are (10) of them, accounting for (31.3%), who obtained from 5 to less than 10 training courses, and finally, there are (8) of them, representing (25%), who obtained 10 or more training courses.

Secondly: Results related to answering the study questions: Analyzing and discussing the results related to the first question: "What is the level of choosing teaching methods among biology teachers in Tabuk City attributed to their understanding of the nature of science?" The results of frequencies, percentages, means, standard deviations, and ranks for the responses of the study participants are as follows:

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Table (4):

Phrase number	The phrase	The repetitions and percentages	Degree of agreement			The arithmetic mean	Standard Deviation	The arrangement
			"Yes"	"sometimes"	"No"			
4	Biology aims to train students in using the scientific method for thinking.	K	26	4	2	2.75	0.568	5
		٪	81.3	12.5	6.3	2.84		
10	Technology and technological tools are used to arrive at answers to various questions.	٪	27	5	0	2.88	0.369	2
			84.4	15.6	0	2.50		
13	The diversity of scientific subjects is one of the reasons that calls for the use of different teaching methods.	k	29	2	1	2.63	**0.421**	1
			90.6	6.3	3.1	2.81		
14	Discovery	%	21	6	5	2.75	**0.762**	7

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	learning strategy is one of the teaching strategies associated with cognitive theories of learning.		65.6	18.8	15.6	1.22		
15	The changing roles of both the teacher and the student are among the effects of the cognitive explosion in the field of education.	k	22	8	2	1.22	**0.609**	6
			68.8	25.0	6.3	2.16		
17	Delivering information to students through multiple methods is considered an art form within the realm of teaching.	%	28	2	2	2.75	**0.535**	3
			87.5	6.3	6.3	2.88		
18	The strategy	k	26	4	2	2.44	**0.568**	5

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	is the approach through which the teacher addresses a specific teaching style, and it varies from one teacher to another within the same specializatio n.		81.3	12.5	6.3	2.88		
19	Teaching science aims not only to impart specialized skills to students but also to foster critical thinking and problem-solving abilities.	%	2 6.3	3 9.4	27 84. 4	2.44 2.88	**0.553**	11
20	Experiment	k	1	5	26		**0.491**	10

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	ation is not limited to laboratory settings; it extends to various real-world contexts where hypotheses are tested and conclusions are drawn based on evidence and observations.		3.1	15.6	81.3	2.52		
21	An increase in the number of students prompts the teacher to utilize different teaching methods.	%	13	11	8	**2.52**	0.808	9
			40.6	34.4	25.0	٪		
22	The systemic teaching approach involves using skills to identify, interpret, and predict the outcomes of problems.	k	25	6	1	ك	**0.508**	4
			78.1	18.8	3.1	٪		
23	Linking	%	29	2	1	ك	**0.421**	1

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	different subjects contributes to the cognitive expansion of students.		90.6	6.3	3.1	٪		
24	The relationship between an increase in the number of students in the classroom and the emergence of individual differences is considered a negative correlation.	k	17	12	3	ك	**0.669**	8
			53.1	37.5	9.4	٪		
25	Proper preparation of the teacher during the training and working stages helps to increase her ability to choose effective and suitable teaching methods.	%	29	2	1	ك	**0.421** 0.192	1
			90.6	6.3	3.1	٪		
yes	**0.192**	**2.52**	**The overall arithmetic mean.**					

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The table above indicates the following:

- The overall arithmetic mean for the axis related to the level of agreement with selecting teaching methods among biology teachers in Tabuk city was 2.52 out of 3, indicating a high level of agreement with selecting teaching methods among these teachers.
- There is a clear difference in the degree of agreement among the study community regarding the level of agreement with selecting teaching methods among the study sample. The average agreements ranged between 1.22 to 2.88, falling within the first, second, and third categories of the three-tiered scale. The arithmetic means for these statements ranged between 2.44 to 2.88. Additionally, one statement regarding the level of agreement with selecting teaching methods among biology teachers in Tabuk city scored "sometimes," with an arithmetic mean of 2.16, falling within the second category of the three-tiered scale, indicating a moderate level of agreement with the study tool.

▪ Analysis and discussion of the results related to the second question: (Are there statistically significant differences at a significance level of less than 0.05 between the means of the grades of selecting teaching methods attributed to years of experience for the teacher?) The researcher used "one-way analysis of variance" (one-way ANOVA), and the results are as shown in the following table:

Table (5):

Variable	Groups	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Significance Level	
Teaching Method Choice	Between Groups	0.014	2	0.007	0.180	0.836 (Not significant)	significant)
	Within Groups	1.129	29	0.039			
	Total	1.143	31				

***Significant differences at a level of 0.05 or less.**

The results in the above table indicate that there are no statistically significant differences at a significance level of 0.05 or less in the attitudes of the study sample regarding the choice of teaching methods based on the differences in the variable of years of experience among the teachers. The variance value was 0.180 at a significance level of 0.836, which is greater than 0.05, indicating that there are no statistically significant differences at a significance level of 0.05 or less in the attitudes of the study sample regarding the choice of teaching methods based on the differences in the variable of years of experience among the teachers. The researcher attributes this result to several factors, most notably the clear convergence in the number of years of experience among the teachers in the study area.

*Translated text: It's clear from the results provided in the above table that there are no statistically significant differences at a significance level of 0.05 or less in the study sample's attitudes towards choosing teaching methods based on differences in teachers' years of experience.

The variance value was 0.180 at a significance level of 0.836, which is greater than 0.05, indicating no statistically significant differences at a significance level of 0.05 or

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less. This lack of significance in the study sample's attitudes towards teaching methods choice based on differences in teachers' years of experience is attributed by the researcher to several factors, primarily the noticeable convergence in teachers' years of experience in the study area.

Table (6):

Statement No.	**The phrase**	"Arithmetic mean"	"Degree of Agreement"			"Repetitions and proportions."	Standard deviation	"Phrase Number"
			YES	**SOMETIMES**	**NO**			
1	"Biology helps individuals understand the world around them."	2.88	28	4	0	K	**0.336**	4
			87.5	12.5	0	٪		
2 3	"Ancient scientific knowledge in the field of biology is influenced by modern discoveries."	2.59	20	11	1	K	**0.560**	9
			62.5	34.4	3.1	٪		
4	"The information and knowledge in biology are influenced by social beliefs."	1.88	7	14	11	K	0.751	10
			21.9	43.8	34.4	٪		
5	"One of	2.94	30	2	0	K	**0.246**	5

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6	the most important ethics of science is exercising caution and precision in describing phenomena and events."		93.8	6.3	0	٪		
7	"Scientific discoveries indicate that science is an accumulative and ongoing process."	2.91	30	1	1	K	**0.390**	6
			93.8	3.1	3.1	٪		
8 9	"The objective ethics of science lie in objectivity and detachment from personal biases."	2.88	29	2	1	K	0.421	7
			90.6	6.3	3.1	٪		
10	"Recogniz	2.94	30	2	0	K	**0.246**	8

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11	ing the contributions of others and documenting references even in scientific discoveries is considered scientific integrity."		93.8	6.3	0	٪		
12	"Keeping up with the latest advancements in science ensures scientific ethics and progress."	2.81	28 87.5	2 6.3	2 6.3	K ٪	**0.535**	9
13 14	0.177 "Identifying, interpreting, and predicting problems is the scientific method of learning."	2.97	31 96.9	1 3.1	0 0	K ٪		11
15	"The	2.72	24	7	1	K	**0.523**	12

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	scientific output that proves its validity under certain temporal conditions is termed a scientific fact."		75.0	21.9	3.1	٪		
16 17	"The ability to formulate information in new formats within the application level is considered within the cognitive levels of Bloom's taxonomy. "	2.69	25 78.1	4 12.5	3 9.4	K ٪	**0.644**	16
	0.138	**2.76**	**The general arithmetic mean**					

From the table above, the following points are evident:

- The overall arithmetic mean for the axis related to the understanding level of the nature of science among biology teachers in Tabuk city was 2.52 out of 3, indicating a high level of understanding of the nature of science among biology teachers in Tabuk city.
- There is variability in the level of agreement of the study community members on the understanding level of the nature of science among biology teachers in Tabuk city, where their agreement averages ranged from 1.88 to 2.97.

From the above results, it is clear that there is an increase in the level of understanding of the nature of science among biology teachers in Tabuk city. This may be attributed to the fact that the majority of the sample had 10 years or more of

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experience, indicating that experience may contribute to deepening the understanding and practice of science. Additionally, the source of qualification acquisition was the same for all sample individuals with very few exceptions.

Fifth: Study Results and Recommendations

Study Results:

- The results showed that (30) of the sample individuals, representing (93.8%), hold academic qualifications from the University of Tabuk.
- The results indicated that (14) of the sample individuals, representing (43.7%), have 10 years or more of teaching experience.
- The results revealed that (14) of the sample individuals, representing (43.7%), obtained fewer than 5 training courses.
- The results showed that the level of agreement on teaching methods selection among biology teachers in Tabuk city is high. This axis included fourteen phrases, indicating that eleven of the phrases related to the level of agreement on teaching methods selection among biology teachers in Tabuk city were highly agreed upon, and one phrase related to the level of agreement on teaching methods selection among biology teachers in Tabuk city was somewhat agreed upon, while two phrases related to the level of agreement on teaching methods selection among biology teachers in Tabuk city.
- The results showed that the level of understanding of the nature of science among biology teachers in Tabuk city is high. This axis included eleven phrases, showing that ten of the phrases related to the level of understanding of the nature of science among biology teachers in Tabuk city were highly agreed upon, and one phrase related to the level of understanding of the nature of science among biology teachers in Tabuk city was somewhat agreed upon.

Recommendations: In light of the study results, the researcher recommends the following:

- Curriculum designers should focus on incorporating and emphasizing the nature of science in the curricula.
- Attention should be paid to training teachers during the practical education period on scientific practices.
- Training courses should be conducted to assist teachers in scientific practices in teaching.
- Discussing with teachers and taking their opinions to identify points of failure in understanding the nature of science and its practices.
- Encouraging teachers to diversify the use of teaching methods and work on innovating new methods.
- Conducting similar studies elsewhere other than Tabuk city.
- Conducting similar studies on subjects other than biology.
- Conducting similar studies on biology teachers.
- Conducting similar studies with a focus on different dimensions of science than those mentioned in this study.
- Conducting similar studies using research tools not used in this study.

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