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Relation Level between Physics Nature and Science Teaching Methods for Preparatory Grade Physics Teachers

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ABSTRACT

this research aims to identify the relation level between understanding nature of physics and science teaching methods**,** the descriptive approach has been used to verify the two research tools and testing first tool which is the nature of physics by its aspects (aims, nature, ethics and the interaction between physics and technology) in addition to choosing science teaching methods. The results indicate that there is a poor relation between nature of physics and science teaching methods; many recommendations have been reached in this matter.

Keywords: *testing nature of physics, testing science teaching methods.*

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INTRODUCTION

Physics plays an important role in most scientific and practical fields as well as it is regarded as one of the main domains in technical development and other theoretical sciences such as: chemistry, biology, mathematics and applicative sciences such as: medicine, engineering and agriculture [1]. We can say that it covers a large field since it studies the phenomena of the universe and the particles of the material, through this importance comes the importance of paying attention to it and its methods of teaching.

Teaching the nature of a science is considered a massive challenge in the field of science teaching and this matter calls for developing teachers teaching guides which depend on educational science curriculums standards that contribute in the method of learning the nature of science in a manner that positively reflects on the teachers educational practices and their students' performance to deeply understand the nature of that science, scientific knowledge and educational contemplating, therefore, this research is considered one of the supplemental researches as it links between theoretical and applicative aspects in the fields of science philosophy and teaching methods. A lot of new trends emerged in teaching science and physics depending on modern teaching methods that show the relation between science and technology since it forms a proper introduction to science teaching through transforming the theoretical fact of aspects into practical fact in a manner that facilitates the student's improvement of scientific output since these methods are the result of steps and stages followed by the teacher to achieve certain goals as well as modern and various teaching methods. The following studies tackle the nature of science: [1] study about the extent of Oman teachers' understanding of science nature in the light of (gender, experience) variables, [2] study on (the effectiveness of negotiation approach on science nature development), the study of [3] on the opinions physics, chemistry and astronomy teachers about science nature, [5] study on the (aspects of analysis of science nature in science curriculums in Portugal's intermediate schools) and [4] study on investigating teaching committees opinions at the colleges of educational sciences - Jordanian universities about the scientific knowledge and its impact on the educational behavior and beliefs of students. Also the following studies discuss teaching methods and their skills: [6] study on (the actual situation of teaching methods used at the College of Education – Oman and the reason behind their usage) since this study aims to identify the utilized methods (lecturing & discussion and asking questions along with lecturing), [7] study on (*physics teacher* beliefs about *physics* and learning *physics*), [8]

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study on (assessing the performance of natural sciences in the intermediate stage in the light of general standards of general education) and [9] study on (*Jordanian physics teacher* beliefs about teaching strategies and assessment included in science curriculums).

METHODOLOGY

The researcher followed the descriptive method since it is the proper one for the aim of the research which can be summed up in identifying the relation level between the understanding nature of physics and science teaching methods for preparatory grades physics teachers. The research sample includes (140 physics teachers of both genders) of preparatory stages; sample method has been used for the random layer which represents a proportion of (32%) of research population. Preparing this research requires the preparation of the two research tools that must include standards by which the relation level between physics and science teaching methods is identified and therefore, the researcher has followed the following steps to develop these tools: reviewing previous studies and seeking the views of experts and specialists in the fields of psychology and science teaching methods; in the light of these steps, the two research tools have been developed and the first tool which is the nature of physics by the aspects of (aims, characteristics, processes, ethics and the interaction between physics and technology) has been tested. First tool test is a multiple choice question that consists of (20) items and testing teaching methods in the fields of scientific knowledge levels, teaching methods and assessment is also a multiple choice question that consists of (20) items. The statistical means used in the research are percentage, arithmetic average, Pearson correlation coefficient and (T-test) for one sample and two independent samples.

RESULTS AND DISCUSSION

The results show that applying physics nature test on teachers sample indicates that the arithmetic average has reached (18.87) which is equal to (60.04%); percentage method has been adopted in order to explain the results since (80%) represents very high understanding level, (79.70%) represents high understanding level, (69.60%) represents medium understanding level and less than (60%) represents low understanding level. We notice from table (4) that percentage of choices for three aspects is (60.04%) and this percentage indicates a medium level of understanding of physics nature; this result complies with (Hussam Al-Deen & Schwartz, 2008) research results. The results in table (5) have been reached by using (T-test) method in testing physics nature understanding according to (gender) variable. We notice from table (5) that the calculated significance level reached (0.79%) which is more than significance level amounting to (0.5%) that conforms with null hypothesis which provides that there are no differences in understanding physics nature according to gender variable and this can be attributed to the mutual interest in searching for different references whether within the specialty, modern or classic. Arithmetic averages and standard deviations for teachers according to (years of experience variable) have been calculated as in table (6). We notice from table (6) that teachers with experience years less than (5) have an arithmetic average of (38.73) and a standard deviation of (7.03), teachers with experience 5-10 years have an arithmetic average of (34.8) and a standard deviation of (9.89); teachers with more than 10 years of experience have an arithmetic average of (37.76) and a standard deviation of (7.78). Table (7) shows the results of teaching methods test which has been applied on the same sample of teachers. We notice from table (7) that the total arithmetic average is (9.223) which is equal to (28.197%) and this does not rise to the educational acceptance level of (60%). Table (8) shows the results of teaching methods test which has been applied on physics teachers according to years of experience variable. Arithmetic averages and standard deviations for physics teachers' grades in teaching methods test according to teaching experience have been extracted as teachers with less than 5 years of experience have an arithmetic average of (28.66), teachers with 5-10 years of experience have an arithmetic average of (28.76) and teachers with more than 10 years of experience have an arithmetic average of (28.12). As for the range of relation between physics nature test and methods of teaching test, teachers' answers on both tests show that correlation coefficient between the tests' grades has reached (0.38) which is considered to be poor and indicates a poor correlation. In the light of the results presented by the researcher, she reached the following conclusions: the necessity to assess physics books in order to check on the inclusion of the physics nature fields since they have an impact on teachers' educational practices through using teaching methods, certain questions patterns and students education assessment in manner that achieves scientific progress; the necessity to

activate the role of teachers by training them before and during service through including plans which aim to make them qualified to link between physics and science teaching methods.

Table 1. Shows some of the items for choosing teaching methods

No.	Item	A	B	C
1	A Scientific output that proves its validity in certain times and conditions is considered a:	Scientific fact	Scientific concept	Scientific theory
2	one the reasons that call for using different methods and means in teaching science is:	Increase in number of students	Scientific variety	There are no specific reasons
3	Teacher's movements, students responses and teaching aims of study subject represent:	Teaching method	Teaching style	Teaching strategy
4	Using certain skills to identify problems such as explanation or prediction is called:	Social skill	Motor skill	Scientific thinking
5	The skills that science teaching is trying provide for students are:	Academic personal skills such as thinking and manual skills	Student appreciating the importance of science in his daily life	Discussing scientific topics and their effects

Table 2. Shows preparatory stage physics teachers' understanding level of physics nature

Aspect	Grade	Arithmetic average	Standard deviation	%
Aims and characteristics	12	8.14	1.48	68
Nature and ethics of science	13	6.48	1.44	72
Interaction between technology and physics and the society	18	4.25	1.25	75
Aspects together	37	18.78	4.17	60.04

Table 3. Shows the arithmetic averages and standard deviations of teachers understanding of physics nature test according to years of experience variable

Field	Gender	Number	Arithmetic average	Standard deviation	(T-test)	Significance
Total grade	Males	70	37.77	6.36	0.22	0.79
	Females	70	36.65	6.77		

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Table 4. Arithmetic averages and standard deviations for teachers according to (years of experience variable)

Field	Years of experience	Number	Arithmetic average	Standard deviation
Total grade	Less than (5) years	30	38.73	7.03
	5-10 years	36	34.8	9.89
	More than 10 years	74	37.76	7.78

Table 5. Arithmetic averages and standard deviations of teaching methods test for physics teachers according to gender variable

Gender	Members of sample	Arithmetic average	Standard deviation	Percentage of mediums %
Males	70	8.871	2.539	27.722
Females	70	9.107	2.227	2,459
Total	140	9.223	2.362	28.197

Table 6. Arithmetic averages and standard deviations according to teaching experience

Experience	Members of sample	Arithmetic average	Standard deviation	Percentage of mediums %
Less than 5 years	30	9.1	2.310	28.66
5-10 years	36	8.94	2.42	28.76
More than 10 years	74	7.55	2.01	28.12

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CONCLUSION

It is clear from the presented results that the percentage of physics nature test has reached (60.40%) which indicates a medium level for physics teachers; the researcher attributed this matter to their lack of employing intellectual fields through different scientific processes in their teaching methods, since it would deviate them from their main teaching task, and focusing only on the curriculum in addition to the reason of failure of developing their trends and beliefs to search for everything new in the different education stages. The results showed that teaching methods test has reached (28.197%) and this percentage does not rise to the acceptance level due to the teachers' unfamiliarity with science teaching methods and their only concern is to complete the curriculum whatever the teaching methods. The results also show that the relation between physics nature test and methods of teaching test is poor according the teachers grades in both tests and this matter refers to the poor correlation between them and the importance of variety in employing teaching methods to understand the nature of physics.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of Basic Education, University of Babylon, Iraq and all experiments were carried out in accordance with approved guidelines.

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