

## A STUDY OF FACTORS AFFECTING THE ATTITUDE OF TEACHERS TOWARDS TEACHING PHYSICAL SCIENCE AT SECONDARY LEVEL

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### Abstract

Science education refers to the teaching and learning of scientific concepts, principles, methods and processes. It is essential for preparing individuals to understand and address global challenges, participate in technological advancements and make informed decisions in a scientifically driven world. Physical Science teaching involves educating students about the fundamental principles and concepts of physical science, which include the study of non-living systems. This field encompasses various disciplines such as physics, chemistry, astronomy and earth sciences. It is the responsibility of Physical Science teachers working in secondary schools to develop among their students the skills of curiosity, creativity, critical thinking, scientific thinking and reasoning. This is possible when the teachers possess a positive attitude and right perceptions towards teaching Physical Science. The present study is an attempt to understand the attitude of secondary school teachers towards teaching Physical Science at secondary level. The researchers used a well developed and standardized questionnaire as the tool for collection of data from a sample of 100 teachers (40 Headmasters and 60 School Assistants in Physical Science) selected from 40 secondary schools located in the north coastal districts of Andhra Pradesh using Stratified Random Sampling technique. Mean score values, standard deviations and independent t-tests were used for analysis of data. The findings of the study revealed that the demographic variables – Gender and Teaching Experience have no influence on the attitude of teachers towards teaching Physical Science at secondary level. However, the location of the school has a significant positive influence on their attitude towards teaching Physical Science. The study suggested that the Physical Science teachers should develop a positive attitude towards teaching Physical Science at secondary level.

**Key Words:** attitude, creativity, physics, reasoning, school, Scientific thinking, teachers

### Introduction

Education is the process of facilitating learning. It is the cornerstone of human development and progress, an enduring journey that empowers individuals with knowledge, skills and wisdom to navigate life's challenges and opportunities. It equips us with the tools to understand the world, fostering critical thinking, creativity and a sense of curiosity that fuels continuous growth. From early childhood to adulthood, pursuing knowledge enriches lives, ignites aspirations and lays the foundation for a brighter and more enlightened future for individuals and society. Science is often defined as a body of knowledge as well as a process of acquiring and refining knowledge. The search for truth becomes the dominant motive in the prosecution of science. In the words of **Good (1945)**, "Science is an activity by means of which a person seeks to relate his current sense experience to his total structure of understanding in a manner that is in agreement with all his pertinent observations of properties and behavior". In our contemporary civilization and culture, science has become a part and parcel of our life. In the advanced countries, science has entered the very fabric of life. Today, science dominates such a wide area of human activity that it is no longer the concern of a select group of people in a society; but has become a part of the everyday job of almost everybody. The modern world itself is made and maintained by science. Science enhances the quality of our life and it is visible in all walks of life. Since science has been developed by people who are part of a group,

society or a country, it is expected that their social, psychological, political, economic perceptions could change the course of development of science.

### **SCIENCE EDUCATION: MEANING AND NATURE**

Science education is the process of teaching and learning science concepts, methods and principles. It aims to develop scientific literacy, enabling individuals to understand and apply scientific knowledge in everyday life. Effective science education often involves hands-on experiments, interactive activities and real world applications. Inquiry-based Science Education (IBSE) is a popular approach where students investigate problems, ask questions and test ideas. Teaching strategies include guided discovery, collaborative learning and the use of technology to enhance understanding. Educators aim to make science accessible and engaging for all students. The curriculum is designed to build a strong foundation in scientific concepts and processes. The goal of science education is to produce scientifically literate individuals who can make informed decisions, understand scientific issues and contribute to society's technological and scientific advancements. It covers various disciplines such as biology, physics, chemistry, environmental science and earth science.

### **THE CONCEPT OF 'PHYSICAL SCIENCE'**

Physical science is the systematic study of the inorganic world, distinct from the study of the organic world. It encompasses four major areas, viz., physics, chemistry, astronomy and earth sciences. Physics is the study of matter, energy and fundamental forces of nature. It includes concepts like motion, force, energy and the laws governing the physical universe. On the other hand, chemistry is the science of matter, particularly its properties, composition and reactions. It explores how substances interact, combine and change to form new substances. Astronomy is the study of celestial objects and phenomenon beyond Earth's atmosphere. It covers the origin, evolution and properties of planets, stars, galaxies and the universe as a whole. Earth sciences cover the study of Earth and its components, including geology, meteorology, oceanography and environmental science. It examines the physical processes and materials that shape our planet. These branches help us understand the natural world and the principles governing it. Thus, physical science provides us a thorough understanding of the physical world around us. Physical science, by advancing our knowledge and capabilities, helps us to improve the quality of our life and address global challenges.

### **TEACHING OF PHYSICAL SCIENCE IN SECONDARY SCHOOLS**

Today science in general and physical science in particular has a prime place in secondary school curriculum as a compulsory subject in almost all nations due to its multifarious values and functions to the individual and to the society. Physics and Chemistry are the two core subjects that are taught in secondary schools under 'physical science curriculum'. Physics attempts to describe the process of nature through observation and experimentation, coupled with reflective reasoning, which we call the scientific method. Theories are tested and natural laws are formulated to describe what appears to be an invariant order in nature. Physics deals both the macroscopic and the microscopic state of matter. Chemistry is the science of molecular behavior of substances. Chemists specialize in interpreting observations on large amounts of material in terms of the properties and interactions of individual molecules and atoms. Physics and Chemistry have some similarities in the structures of knowledge. Therefore, these two science subjects are combined to form Physical Science. The description and characteristics of physics and chemistry have common strands; and hence they are taught using similar methods.

There are two major approaches in teaching physical science – the product approach and the process approach.

#### **Product approach in teaching physical science**

The product approach focuses on the outcomes of learning. In teaching physical science, the product approach believes in the acquisition of factual knowledge and application of principles and theories in real life situations.

The following are the salient features of Product approach in teaching physical science:

- (i) **Mastery of content:** The product approach makes the students understand the core concepts and make them recall important information.
- (ii) **Assessment:** The product approach believes in evaluating student performance through tests, quiz programmes and examinations; and to measure their knowledge retention and levels of understanding.
- (iii) **Goal orientation:** The approach is goal oriented. It aims for students to achieve specific learning objectives and demonstrate their knowledge through tangible results.

The product approach to science teaching makes the assumption that mind is a 'blank slate' and the student is a passive receiver of information, an empty vessel waiting to be filled with scientific facts (**Driver & Bell, 1986; Cleminson, 1990**). Consequently, much of traditional science teaching consists of textbook instruction in which rote memorization is generally encouraged. It has been well-established that students taught with this approach to science education tend to view scientific knowledge as finite, isolated bit of information (**White, 1988; Hewitt, 1990**), where many students fail to develop scientific reasoning skills.

### **Process approach in teaching science**

The process approach, on the other hand, emphasizes the methods and skills used to acquire knowledge.

The following are some of the important characteristics of Process approach in teaching Physical science:

- (i) **Scientific inquiry:** The process approach encourages students to engage in experimentation, observation and testing of hypotheses.
- (ii) **Critical thinking:** The process approach develops in the students abilities to analyze, evaluate and synthesize information.
- (iii) **Skill development:** This approach focuses on the processes of learning such as problem solving, experimentation and data analysis.
- (iv) **Balanced curriculum:** The approach combines factual knowledge with hands-on experiments and inquiry-based learning.

Using both product-oriented assessments (like examinations) and process-oriented assessments (like lab reports and projects), there is every possibility of conducting holistic assessment of student performance comprehensively. The combination of these approaches ensures students not only learn scientific facts but also understand how to apply scientific methods and think critically about scientific problems. By blending these approaches in teaching Physical science, teachers can provide a more comprehensive and engaging learning experiences that prepares students for both academic success and practical application in the real world.

### **NEED FOR THE PRESENT INVESTIGATION**

The existing methods and techniques of teaching Physical Science provide a lacuna in the teaching learning process in secondary schools. Even today, majority of teachers are following the traditional methods of teaching Physical Science in the classroom. There is a big gap between theory and practice in science teaching in schools. Most of the schools do not have science laboratories. There are some schools which have laboratories; but they do not have necessary equipment to conduct experiments. Most of the Science Teachers do not find an opportunity to update their knowledge and pedagogical skills through Professional Development Programmes. The current trend in science education world-wide focuses on inquiry-based instruction. The students should be encouraged to develop certain skills such as observing, inferring, classifying, predicting, measuring, questioning, interpreting and analyzing data. It is the responsibility of the science teachers working in secondary schools to develop these skills among their students.

The Physical Science teachers working in secondary schools should have a positive attitude towards teaching physical science. It would certainly help them in the transaction of Physical Science curriculum in the schools effectively and efficiently. It is felt by the researchers to conduct a study to

explore the attitude of secondary school teachers towards teaching Physical Science at secondary level. The present investigation is an attempt in this direction.

### **OBJECTIVES OF THE STUDY**

The main objective of the present study is to study the attitude of secondary school teachers towards teaching Physical Science.

The study also aims at finding out the influence of certain demographic variables – gender, teaching experience and location of the school on the attitude of teachers towards teaching Physical Science at secondary level.

### **HYPOTHESES OF THE STUDY**

The following hypotheses have been formulated for the present investigation:

- (i) There is no significant difference in the attitude of male and female teachers towards teaching Physical Science at secondary level.
- (ii) There is no significant difference in the attitude of teachers with an experience of less than 10 years and those with 10 years and above towards teaching Physical Science at secondary level.
- (iii) There is no significant difference in the attitude of teachers working in rural and urban schools towards teaching Physical Science at secondary level.

### **LIMITATIONS OF THE STUDY**

The study is limited to find out the influence of three demographic variables, viz., gender, teaching experience and location of the school on the attitude of teachers working in secondary schools towards teaching Physical Science. Further, the study is confined to 100 secondary school teachers (40 Headmasters and 60 School Assistants in Physical Science) working in 40 secondary schools located in the three north coastal districts, viz., Srikakulam, Vizianagaram and Visakhapatnam in Andhra Pradesh.

### **METHODOLOGY**

#### **(a) Method of Research**

Since the present study involves collecting data with the help of survey, the investigators used 'Descriptive survey' method for the present investigation.

#### **(b) Sample**

The sample of the study consisting of 100 teachers (40 Headmasters and 60 School Assistants in Physical Science) working in 40 secondary schools located in Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh using 'Stratified Random Sampling technique'.

#### **(c) .Research Tool**

The researchers used a well developed questionnaire consisting of 33 items as the tool of research for the present investigation.

#### **(d) Administration of the Tool**

The tool was initially administered to 15 teachers (5 Headmasters and 10 School Assistants in Physical Science) working in 5 (five) secondary schools in and around Visakhapatnam city under Pilot study. The measures of reliability, validity and objectivity of the tool have been calculated. Further, the researchers conducted item analysis for the items included in the tool. Out of 33 items selected for the tool, the discriminating power of 30 items has been found positive and is negative in respect of 3 items. The items whose discriminating power is negative have been removed; and the final tool consists of 30 items, which are pool proof in all respects. The final tool has been administered to 100 teachers (40 Headmasters and 60 School Assistants in Physical Science) working in 40 secondary schools located in Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh.

### **STATISTICAL INTERPRETATION OF DATA**

The duly filled-in questionnaires have been collected from 100 respondents – both the Headmasters and the School Assistants in Physical Science for purpose of tabulation of data.

The data collected has been analyzed and interpreted using different statistical techniques such as Mean score values, Standard Deviations and t-ratios; and are presented in the following table.

**Table showing t-values of different variables relating to the attitude of teachers towards teaching Physical Science at secondary level**

S. No.	Variable		N	Mean	S.D.	t-ratio	Result
1	Gender	Male	60	99.83	29.05	0.50*	*Not Significant at 0.05 and 0.01 levels
		Female	40	97.00	26.79		
2	Teaching Experience	Less than 10 yrs	70	100.07	26.61	0.31*	*Not Significant at 0.05 and 0.01 levels
		10 yrs. & above	30	101.83	25.26		
3	Location of the school	Rural	50	91.30	26.29	2.25*	*Significant at 0.05 level
		Urban	50	103.30	27.13		

### FINDINGS OF THE STUDY

On the basis of the analysis and interpretation of data, the researchers have arrived at the following findings and drawn the conclusions.

1. There is no significant difference in the attitude of male and female teachers towards teaching Physical Science at secondary level.
2. There is no significant difference in the attitude of teachers with an experience of less than 10 years and those with 10 years and above towards teaching Physical Science at secondary level.
3. There is significant difference in the attitude of teachers working in rural and urban schools towards teaching Physical science at secondary level.

Teachers working in urban schools exhibited better attitude towards teaching Physical science at secondary level as compared to their counterparts working in rural schools.

### CONCLUSIONS

From the findings of the study, it is concluded that gender and teaching experience have no influence on the attitude of teachers towards teaching Physical science at secondary level. However, teachers working in urban schools have exhibited better attitude towards teaching Physical Science at secondary level as compared to their rural counterparts.

### EDUCATIONAL IMPLICATIONS

- (i) The study helps Physical science teachers identify the difficulties, if any faced by their students in learning Physical Science; and find out remedial measures to overcome the difficulties.
- (ii) The present study helps the Physical science teachers to bring about the necessary changes in the Pedagogy with regard to the teaching of Physical Science in secondary schools.
- (iii) The study helps Physical Science teachers to select different methods and approaches in teaching Physical Science in secondary schools.
- (iv) The study would help the teachers to take necessary steps for improving quality in teaching Physical Science in secondary schools.
- (v) The study would help Physical Science teachers take up innovative practices in teaching Physical Science in Secondary Schools.
- (vi) The study would help the Academic Organizations like SCERTs, IASEs and the State Departments of Education to take necessary steps for planning and implementing training programmes for Physical science teachers to enhance their skills in teaching Physical Science.

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