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# Perceptions Of Teachers Towards Teaching Physical Science In The Secondary Schools Of Vizianagaram District

**Dr. D.Nagaraja Kumari** Principal I/C, IASE & Chairperson, BOS in Education (PG), Department of Education, Andhra University, Visakhapatnam, A.P, India.

**Dr. K.V.Ratna Kumari** Principal, Sri Venkata Sandhya College of Education, Madhurawada, Visakhapatnam, Andhra Pradesh, India

**Kasi Seshagiri Rao** Research Scholar, Department of Education, Andhra University, Visakhapatnam, Andhra Pradesh, India.

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## Abstract

Science, as an intellectual activity, is a systematic and organized way of acquiring knowledge of the world around us through observation, experimentation and reasoning. Science education helps individuals to achieve higher mental faculties such as critical thinking, creative thinking, analysis and interpretation. It is essential for preparing individuals to address the global challenges taking place in the ever changing world. Teaching Physical Science in secondary schools helps students understand the natural world, including matter, energy and their interactions. It provides insights into the fundamental principles governing our universe. The teachers of Physical Science in secondary schools should develop among their students the skills of inquiry, curiosity, creativity, scientific thinking and reasoning. For this purpose, the teachers should possess right perceptions towards teaching Physical Science for the benefit of their students. The present study is an attempt to explore the perceptions of teachers towards teaching Physical Science at secondary level. The researchers used a self-developed questionnaire to collect data from a sample of 120 teachers (60 Headmasters and 60 School Assistants in Physical Science) from 60 selected secondary schools located in Vizianagaram district of Andhra Pradesh using Stratified Random Sampling method. 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, age and teaching experience have no influence on the perceptions of teachers towards teaching Physical Science in secondary schools. The study suggested that the teachers should use new strategies and techniques in teaching Physical Science at secondary level in order to develop in their students the skills of enquiry and scientific temper. The study also suggested that a congenial learning environment is to be created in secondary schools to make Physical Science teaching more meaningful and purposeful.

**Key Words:** Global Challenges, Physical Science, Perceptions, Scientific thinking, teacher.

## Introduction

Education is the transformative process of imparting knowledge, skills, values and attitudes among individuals, empowering them to navigate life successfully and

contribute meaningfully to society. The concept of education is multi-faceted, encompassing a broad range of principles, practices and philosophies to facilitate the growth and development of individuals and society. It illuminates the path of knowledge, leading individuals to discover the world's wonders and unlock their vast potential.

Science is regarded as an organized system of knowledge which is based on inquiry born out of natural curiosity, logical reasoning and experimentation. It is 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. Facts alone find a place in the body of scientific information. According to A. Gilbert, science becomes a human activity, an attitude and an exercise of the mind that puts us as it were in a state of familiarity with nature **(Narendra Vaidya, 1971, p.57)**. Science enhances the quality of our life; and is visible in all walks of life. Since science has been developed by people who are part of a social group, it is expected that their social, psychological, political and economic perceptions could change the course of development of science.

### **THE CONCEPT OF 'SCIENCE EDUCATION'**

Science Education has been recognized, across the globe, as a prerequisite for scientific and technological development. It provides opportunities for students to acquire relevant functional knowledge and skills that are associated with scientific processes needed for advancement in science and technology. In science education, students are encouraged to acquire and practice the scientific skills. Science education is concerned with finding answers to problems in a bid to understand and interpret natural phenomena **(Eze and Akubue, 2007)**.

Science education is concerned with the teaching and learning of concepts, methods and principles relating to science. It aims at developing 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. 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.

### **MEANING AND NATURE OF 'PHYSICAL SCIENCE'**

Physical science is a branch of natural science that studies non-living systems, in contrast to life sciences. It encompasses a variety of fields that explore the fundamental principles governing the physical universe. Physical science seeks to understand the laws and principles that govern the physical world. It involves the study of matter, energy, and the interactions between them. This field uses empirical evidence and scientific methods to develop theories and models that explain natural phenomenon.

Physical Science includes several disciplines such as physics, chemistry, astronomy and earth sciences. Each of these disciplines focuses on different aspects of the physical universe. 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.

### **TEACHING OF PHYSICAL SCIENCE AT SECONDARY LEVEL**

Today science in general and physical science in particular has a prime place in secondary school curriculum as a compulsory subject due to its diverse functions. 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. This is called 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 their structure. 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.

The following are some of the important objectives of teaching Physical Science at secondary level:

Teaching of Physical Science at secondary level aims at making the students:

- a) understand the nature of science
- b) understand the basic principles, concepts and laws of science
- c) apply basic scientific principles in finding solutions to problems related to agriculture, energy, health, nutrition etc.
- d) develop problem-solving and decision-making skills
- e) include values underlying scientific principles
- f) develop rich and satisfying views of the universe
- g) develop an understanding of various processes of environment and concern for its preservation and conservation
- h) understand and appreciate the joint enterprise of science, technology and society
- i) develop an attitude that would equip them to continue science education throughout their lives
- j) acquire process skills, which form part of the attitude for developing a scientific temper
- k) develop certain manipulative skills which are required in their day-to-day life situations

### **ROLE OF A SCIENCE TEACHER**

The role of the science teacher is vital in the development of scientific temper among students. It goes without saying that the science teachers should be competent in the areas they teach. The teachers should be familiar with all the aspects of the nature of science; and they must have imbibed scientific temper themselves. Only such teachers can exemplify the content of scientific temper from their everyday conduct. From time to time, they can engage their students in discussions to develop in them scientific

temper; and foster the values such as truth, honesty and open-mindedness hidden in scientific method. They can help their students develop the sense of inquiry by allowing them to explore their environment and by encouraging them to ask questions, even if sometimes these questions appear trivial. The teachers themselves should have developed enthusiasm for science; and could have transmitted the excitement of doing science. During the process of teaching-learning, the teachers can convey that science is tentative and nothing is fixed or final; and the quest for progressive refinement of theories and explanations continues in which the students can participate at that time and also at a later date **(NCERT: Pedagogy of Science, 2013)**.

Activities such as projects, field work, paper reading along with laboratory work and discussions would encourage students to study science. This in turn, would help them to learn the skills associated with the inquiry and processes of science such as observing, measuring, hypothesizing, predicting, analyzing and communicating.

## **REVIEW OF RELATED LITERATURE**

The studies carried out earlier by the other researchers that aim at finding out the perceptions of teachers towards teaching Physical Science in secondary schools have been examined; and a brief review of the same is provided in the following paragraphs.

**Kamizi, W. and Iksan, Z. (2021)** conducted a study to identify the perceptions and attitudes towards Science, Technology and Society (STS) approaches among science teachers. This study used survey method of research. The data were collected from the respondents using a questionnaire. The results of the inferential analysis showed that there were significant differences based on gender for the teachers' perceptions for technology and community. There was also a strong positive relationship between perceptions and teachers' attitudes towards the STS approach in Science teaching. From the results of the study, it is concluded that teachers had a positive perception and attitude towards science teaching based on the use of technology and real problems. Teachers also agreed that science teaching was more meaningful by using examples from the real-life situations that occur in everyday life. The study suggested for the increase in the number of courses and partnership activities among teachers to enable them to exchange opinions on the best methods of teaching science for students in accordance with online learning.

**Ramdas, B. & Yashoda, G. (2020)** conducted a study on the problems of teaching and learning physics in secondary and post-secondary schools in Wolayita and Dawuro in South West Region of Ethiopia. The study dealt with the problems of teaching and studying physics. The researchers used the Descriptive Survey method for the investigation. Stratified and basic random sampling techniques have been employed to establish the data sources of the analysis. The study focused on educational managers, physics instructors, students and supervisors at Zonal levels. The research explored learning challenges faced in the learning of physical science by grade 12 learners. In order to recognize common problems faced by learners, diagnostic and assessment studies for five previous years have been scrutinized. The research showed that most of the learning challenges faced by learners were linked to language proficiency, logical comprehension, questions requiring explanations and higher order thinking skills, issues concerning comprehension and analysis difficulty and mathematical abilities. In order to overcome these obstacles, the study suggests that suitable pedagogical methods and strategies are to be developed.

**Bikash Barai (2018)** conducted a study to find out the effectiveness of teaching Physical Science through Activity Based Methods of Learning (ABML) over the traditional methods at secondary level Hindi medium Government schools in Alipurduar district of West Bengal. The study revealed that various low cost teaching aids and experiments can be developed by the teachers for activity based methods of learning and proper utilization of the material leads to the improvement of achievement level in Physical Science in both the genders of students. The study is based on the researcher's experimentation and experience in teaching Physical Science at secondary level in Government Hindi medium schools and participation in various state and district level workshops on ABML.

**Amarnath Das (2014)** conducted a study on the effective teaching learning system in Physical Science at Secondary level schools in West Bengal. The study is a survey type descriptive research. Ninth grade students of some selected schools of Bankura district in West Bengal were selected as sample for the study using purposive sampling technique. Two hundred samples were taken randomly for conducting the t-test; and 90 samples were taken for Chi Square Test. The study revealed that Effective Teaching Learning System requires multiple dimensions involving a holistic approach for Teaching Learning System in a better way. From Chi Square values, different aspects of Teaching Learning System were found for productive education. From t-test, it was identified that Teaching Learning System can vary with respect to gender and locality.

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

There is a big gap between theory and practice in physical 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. Majority of Science Teachers do not find an opportunity to update their knowledge and pedagogical skills through Professional Development Programmes. The students should be encouraged to develop certain skills such as observing, inferring, classifying, predicting, measuring, questioning, interpreting and analyzing through the teaching of physical science in secondary schools. The physical science teachers working in secondary schools should take the responsibility of developing these skills among their students. They should develop strategies to bridge the gap between theory and practice in teaching physical science.

It is felt by the researchers to conduct a study to explore the perceptions of 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 investigation is to study the perceptions of teachers towards teaching Physical Science at secondary level.

The study also aims at finding out the influence of three demographic variables – gender, age and teaching experience on the perceptions 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 perceptions of male and female teachers towards teaching Physical Science at secondary level.
- (ii) There is no significant difference in the perceptions of teachers aged below 10 years and those aged 10 years and above towards teaching Physical Science at secondary level.
- (iii) There is no significant difference in the perceptions of teachers with an experience of less than 10 years and those with 10 years and above 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, age and teaching experience on the perceptions of teachers towards teaching Physical Science at secondary level. Further, the study is confined to 120 secondary school teachers (60 Headmasters and 60 School Assistants in Physical Science) working in 60 secondary schools located in the rural as well as urban areas in Vizianagaram district of Andhra Pradesh. These schools are being managed by three different managements, viz., the Government, the Local Body and the Private.

### **METHODOLOGY**

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

The investigators used 'Descriptive survey' method of research for the present investigation, as it involves collecting data from the respondents using survey.

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

The sample of the study consists of 120 teachers (60 Headmasters and 60 School Assistants in Physical Science) working in 60 secondary schools located in the rural as well as urban areas in Vizianagaram district of Andhra Pradesh using 'Stratified Random Sampling technique'.

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

The researchers used a well-developed 'questionnaire' consisting of 35 items as the tool of research for the present investigation.

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

The tool was initially administered to 12 teachers (6 Headmasters and 6 School Assistants in Physical Science) working in 6 (six) secondary schools in and around Vizianagaram town 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 35 items selected for the tool, the discriminating power of 30 items has been found positive and is negative in respect of 5 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 120 teachers (70 Male and 50 Female) from 60 selected secondary schools located in the rural as well as urban areas in Vizianagaram district of Andhra Pradesh.

### **STATISTICAL INTERPRETATION OF DATA**

The duly filled-in questionnaires have been collected from 120 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 significance of difference in the perceptions of teachers towards teaching Physical Science in secondary schools with different variables**

. No.	Variable		N	Mean	S.D.	t-ratio	Result
1	Gender	Male	70	98.50	39.45	0.22*	*Not Significant at 0.05 and 0.01 levels
		Female	50	99.70	27.99		
2	Age	Below 40 years	80	100.00	28.28	0.28*	*Not Significant at 0.05 and 0.01 levels
		40 years & above	40	101.50	27.18		
3	Teaching Experience	Less than 10 years	90	99.28	28.98	0.57*	*Not Significant at 0.05 and 0.01 levels
		10 years & above	30	102.50	26.00		

### **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 perceptions of male and female teachers towards teaching Physical Science at secondary level.
2. There is no significant difference in the perceptions of teachers aged below 40 years and those aged 40 years and above towards teaching Physical Science at secondary level.
3. There is no significant difference in the perceptions of teachers with an experience of less than 10 years and those with 10 years and above towards teaching Physical Science at secondary level.

### **CONCLUSION**

From the findings of the study, it is concluded that gender, age and teaching experience have no influence on the perceptions of teachers towards teaching Physical science at secondary level.

### **EDUCATIONAL IMPLICATIONS**

- (i) The study helps to motivate physical science teachers towards teaching physical science at secondary level effectively and efficiently.
- (ii) The study helps Physical science teachers identify the difficulties, if any faced by their students in learning Physical Science; and find out solutions to overcome the difficulties.
- (iii) The present study prepares teachers to face the challenges in teaching Physical Science in secondary schools.

- (iv) The study helps Physical Science teachers to select suitable methods and approaches to teach Physical Science in secondary schools.
- (v) The study helps teachers to take necessary steps for improving quality in teaching Physical Science in secondary schools.
- (vi) The study helps Physical Science teachers take up innovative practices in teaching Physical Science at secondary level.

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