

ATTITUDE OF TEACHERS TOWARDS METHODS AND APPROACHES OF TEACHING SCIENCE IN THE SECONDARY SCHOOLS OF VISAKHAPATNAM DISTRICT IN ANDHRA PRADESH

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ABSTRACT

Science is an organized system of knowledge that is based on 'inquiry' born out of natural curiosity, logical reasoning and experimentation. Science education refers to the teaching and learning of scientific principles, concepts, methods and approaches. 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. It is the responsibility of Science teachers to develop among their students the skills of creativity, critical thinking, scientific thinking and reasoning during the crucial period of their growth and development. This is possible when the science teachers possess a positive attitude and right perceptions towards teaching science. They have to adopt right methods and approaches of teaching science in their classroom teaching. The present study is an attempt to explore the attitude of teachers towards Methods and Approaches of teaching Science in secondary schools. The researchers used a well developed and standardized questionnaire as the tool for collection of data from a sample of 150 teachers (30 Headmasters and 120 School Assistants in Science) from 30 selected secondary schools located in Visakhapatnam district 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 Location of the school have no influence on the attitude of teachers towards Methods and Approaches of Teaching Science at secondary level. However, the teaching experience has a significant positive influence on their attitude towards Methods and Approaches of Teaching Science. The study suggested that the Science teachers should develop a positive attitude towards teaching Science at secondary level; and employ suitable methods and approaches in teaching science in order to develop scientific thinking among their students.

Key Words: Scientific thinking, Teaching Science, Secondary school teachers, Attitude, Creativity, Reasoning.

INTRODUCTION

The purpose of education in any society is to provide a person with the necessary experiences which would enable him/her to live an individually satisfying and socially meaningful life. Education is the process of facilitating learning. It is essential for an individual to lead a happy and peaceful life. 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 people with the tools to understand the world around, 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 the society.

THE CONCEPT OF 'SCIENCE'

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". Science is a dynamic and ever changing body of knowledge that covers new realms of experience. It is an organized system of knowledge which is based on inquiry turned out of inquisitiveness, critical thinking, logical reasoning and experimentation. 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. Science helps us understand the fundamental principles governing the natural world, fostering a deeper appreciation for the complexity and interconnectedness of life.

SCIENCE EDUCATION: MEANING AND NATURE

Science education refers to the teaching and learning of scientific principles, concepts, methods and approaches. It is a cornerstone for fostering innovation, critical thinking and problem-solving skills among students. 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. 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. To achieve these goals, educators need to adopt effective approaches and methods of teaching science. By selecting strategies that align with students' needs and learning objectives, science instruction can become engaging, impactful and transformative. 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 understand scientific issues and contribute to society's technological and scientific advancements. It covers various disciplines such as biology, physics, chemistry, environmental science, earth science and so on.

TEACHING OF SCIENCE IN SECONDARY SCHOOLS

Science education is crucial for a nation's development because progress of a nation depends on the advancements in science and technology. At the secondary stage, students learn basic science, which forms the foundation for their future studies. If students find science interesting and enjoyable at this stage, they must be more interested in studying it in higher education. The National Education Policy (NEP)-2020 of India emphasizes the importance of science education and the growing demand for various approaches in teaching science. These approaches include: STEM (Science, Technology, Engineering, and Mathematics) approach, Inquiry-Based Learning (IBL), Project-Based Learning (PBL) and Experiential Learning.

APPROACHES IN TEACHING SCIENCE

The following are different approaches being followed by teachers in teaching science in secondary schools.

(i) STEM (Science, Technology, Engineering and Mathematics) Approach

STEM approach aims to provide instructional environments for blended learning and is committed to enlighten students how the scientific method can be applied in an every day context. Indeed, STEM is a teaching and learning approach that is a unique

combination of Science, Technology, Engineering and Mathematics. It is not the teaching of one subject; but it is the amalgamation of all four subjects as a comprehensive one through an interdisciplinary curriculum. This approach focuses on the practical application of problem-solving in the real-world situations. This approach favors the development of a student profile that is flexible, determined and motivated, which allows students to apply their learning to new situations and relevant contexts.

(ii) Inquiry-Based Learning (IBL)

Inquiry-based learning places students at the center of the learning process, encouraging them to ask questions, conduct experiments, and draw conclusions. This approach mirrors the scientific method, fostering critical thinking and curiosity. It encourages students to investigate and explore. This approach promotes active learning and collaboration; and develops higher order thinking skills among the students.

(iii) Project-Based Learning (PBL)

In project-based learning, students work on a project over an extended period, solving real-world problems or answering complex questions. This approach integrates multiple disciplines and emphasizes hands-on learning. It encourages team-work and problem-solving skills.

(iv) Lecture-Based Approach (LBA)

Lectures remain a popular method for introducing foundational knowledge and theoretical concepts in science. While traditional, this method can be effective when combined with interactive elements. This approach is for large groups of students. It allows teachers to cover a wide range of content quickly. It can be extended with multimedia tools and demonstrations.

(v) Experiential Learning

Experiential learning emphasizes learning through experience. Students engage in activities such as experiments, field trips, and simulations to deepen their understanding of scientific concepts. This approach involves hands-on activities. It connects classroom learning to real-life experiences. It encourages reflective thinking.

METHODS OF TEACHING SCIENCE

A method consists of procedures that the teacher follows, steps the teacher takes to present a concept and the outline of activities that the teacher uses in the classroom.

Davis (1997) suggests that the design and selection of teaching methods should take into account not only the nature of the subject matter; but also the aspects on how pupils learn. For this purpose, the teachers should take into account the ability of the learner, time-frame, context and content.

The following are some of the important methods of teaching science in secondary schools.

(i) Demonstration Method

The demonstration method involves the teacher showing a scientific experiment or concept in action while explaining it to students. This method helps in visualizing abstract concepts. It engages students with real-time interactions.

(ii) Problem-solving Method

This method involves presenting students with a scientific problem and guiding them to find solutions through analysis, experimentation and reasoning. This method develops critical thinking and analytical skills. It encourages independent and collaborative learning. It is applicable to real-life situations.

(iii) Co-operative Learning

Co-operative learning involves students working in small groups to achieve common learning goals. This method fosters teamwork and communication skills. It promotes peer-to-peer learning. This method encourages collaboration and mutual respect. It helps to build social and interpersonal skills.

(iv) Flipped Classroom Method

In a flipped classroom, students learn basic concepts through pre-class materials such as videos or readings. Class time is then used for interactive discussions, experiments, and problem-solving activities. This method maximizes in-class engagement. It encourages self-paced learning and supports personalized instruction.

Approaches and methods of teaching science play a pivotal role in shaping the future of learners. By adopting diverse strategies such as inquiry-based learning, project-based learning, and experiential learning, educators can create an engaging and impactful learning environment. Effective science teaching not only imparts knowledge but also inspires students to become critical thinkers and problem solvers who contribute meaningfully to society.

With the right blend of approaches, methods and tools, science education can empower students to explore, innovate and make a difference in the world. The science teachers are expected to choose the right approaches and methods suitable to the content and context under which the process of teaching-learning takes place in the classroom. However, the choice of an approach or a method depends on various factors such as the needs of the learner, learning objectives, availability of resources, subject matter to be taught and the learning environment that influences the teaching-learning process.

THE ROLE OF A SCIENCE TEACHER

Science teachers play a crucial role in educating students about different scientific phenomena and principles, fostering a love for science and developing scientific thinking. The role of a science teacher has evolved in recent years from that of transmitter of knowledge to one of facilitator of knowledge. The teacher is also expected to be a participant in the construction of knowledge and to develop in students an understanding of the nature of science. The teacher should structure the learning experiences in such a way that the nature of science becomes an inherent part of all teaching-learning situations.

The teachers of science should use blended learning approach, combining different methods and approaches in teaching science. They can incorporate technology using digital tools like simulations, virtual labs and interactive apps to enhance student engagement. The teachers should encourage reflection by fostering critical thinking skills among students, asking them to explain what they have learnt and how it is related to real-life situations. The teachers need to refine teaching strategies at regular intervals of time based on student feedback and learning outcomes. The teachers should ensure that all students, regardless of learning style or background, can engage meaningfully with the content.

NEED FOR THE PRESENT INVESTIGATION

The existing methods and approaches of teaching science provide a lacuna in the teaching learning process in secondary schools. Even today, majority of teachers are following the traditional methods of teaching science in the classroom. There is a big gap between theory and practice in science teaching at secondary level. 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 the science teachers do not find an opportunity to update their knowledge and pedagogical skills through Faculty Development

Programmes (FDPs). 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 information. It is the responsibility of the science teachers working in secondary schools to develop these skills among their students.

The researchers felt that science teachers working in secondary schools should have a positive attitude towards teaching science with a view to develop in their students the skills such as critical thinking, creativity and problem-solving. It is felt by the researchers to conduct a study to explore the attitude of teachers towards the methods and approaches of teaching science in secondary schools. Further, the study is intended to know the influence of gender, teaching experience and location of the school on their attitude towards Methods and Approaches of teaching 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 explore the attitude of teachers towards Methods and Approaches of teaching science in secondary schools.

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 Methods and Approaches of teaching science in secondary schools.

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 Methods and Approaches of teaching science in secondary schools.
- (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 Methods and Approaches of teaching science in secondary schools.
- (iii) There is no significant difference in the attitude of teachers working in rural and urban schools towards Methods and Approaches of teaching science in secondary schools.

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 towards Methods and Approaches of teaching science in secondary schools.

DELIMITATIONS OF THE STUDY

The study is confined to explore the attitude of 150 teachers (30 Headmasters and 120 School Assistants in Science) working in 30 secondary schools located in Visakhapatnam District of Andhra Pradesh.

METHODOLOGY

(a) Method of Research

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

(b) Sample

The sample of the study consisting of 150 teachers (30 Headmasters and 120 School Assistants in Science) working in 30 secondary schools located in Visakhapatnam district of Andhra Pradesh using ‘Stratified Random Sampling method’. In this method, in addition to randomness, stratification introduces a secondary element of control as a means of increasing precision and representativeness.

(c) .Research Tool

The researchers used a well developed questionnaire consisting of 33 items as the tool of research for the present investigation under pilot study. The researchers have verified whether the tool prepared is in conformity with the conditions required by a standard tool. The researchers have conducted item analysis as a process of standardization of the research tool.

(d) Administration of the Tool

The tool was initially administered to 20 teachers (5 Headmasters and 15 School Assistants in 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 150 teachers (30 Headmasters and 120 School Assistants in Science) working in 30 secondary schools located in Visakhapatnam district of Andhra Pradesh.

STATISTICAL INTERPRETATION OF DATA

The duly filled-in questionnaires have been collected from 150 respondents – both the Headmasters and the School Assistants in Science for purpose of tabulation of data.

The data collected has been analyzed and interpreted using different statistical techniques such as Mean scores,, 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 Female	70 80	112.50 109.25	26.00 26.33	0.76*	*Not Significant at 0.05 and 0.01 levels
2	Teaching Experience	Less than 10 yrs 10 yrs. & above	100 50	112.10 103.70	27.81 22.49	1.99*	* Significant at 0.05 level

3	Location of the school	Rural Urban	90 60	101.39 102.50	22.69 24.14	0.28*	*Not Significant at 0.05 and 0.01 levels
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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 Methods and Approaches of teaching science in secondary schools.
2. There is significant difference in the attitude of teachers with an experience of less than 10 years and those with 10 years and above towards Methods and Approaches of teaching science in secondary schools.

Teachers with an experience of less than 10 years have exhibited better attitude towards Methods and Approaches of teaching science in secondary schools as compared to their senior counterparts with an experience of 10 years and above.

3. There is no significant difference in the attitude of teachers working in rural and urban schools towards Methods and Approaches of teaching science in secondary schools.

CONCLUSION

From the findings of the study, it is concluded that gender and Location of the school have no influence on the attitude of teachers towards Methods and Approaches of teaching science in secondary schools. However, teaching experience has a significant positive influence on their attitude towards Methods and Approaches of teaching science in secondary schools.

EDUCATIONAL IMPLICATIONS

- (i) The study helps science teachers identify the right methods and approaches of teaching science in secondary schools basing on the felt needs of the students.
- (ii) The present study helps the science teachers to bring about necessary changes in their Pedagogy with regard to the teaching of science in secondary schools to equip the students with the necessary skills of 21st century.
- (iii) The study helps science teachers use different strategies in order to develop scientific attitude among their students.
- (iv) The study would help the science teachers to take necessary steps for improving quality in teaching science in secondary schools.
- (v) The study would help science teachers use innovative practices in teaching science in their classrooms.
- (vi) The study would help the Academic Organizations like SCERTs, IASEs and the State Departments of Education to take necessary steps to organize Faculty Development Programmes (FDPs) periodically for the benefit of science teachers in enhancing their skills in teaching science.

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