

A Study on the Perceptions of Secondary School Teachers Towards Quality Improvement In Teaching Physical Science

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ABSTRACT

Education is an effective means of social reconstruction. It is the process of facilitating learning. It helps in the acquisition of knowledge, skills, values, morals, beliefs and habits necessary for the human living. Science Education has been recognized, across the globe, as a pre-requisite for scientific and technological advancement. It provides opportunities for students to acquire relevant functional knowledge and skills that are associated with scientific thinking. In science education, students are encouraged to acquire and practice the scientific skills. Science education is concerned with finding solutions to problems in a bid to understand and interpret natural phenomena. It is regarded as one that is true to the child, true to life and true to science. Teachers' knowledge of subject matter, skills of questioning, formulation of learning objectives, selection of teaching methods, effective planning of experiments and classroom management play a significant role in quality improvement of teaching Physical Science. The present study is an attempt to explore the perceptions of secondary school teachers towards quality improvement in teaching Physical Science. The researchers used a well prepared and standardized questionnaire as the tool for collection of data from a sample of 120 teachers (50 Headmasters and 70 School Assistants in Science) selected from 50 secondary schools located in Visakhapatnam 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, Age, Marital Status and Length of service of teachers working in Secondary Schools have no influence on their perceptions towards quality improvement in teaching Physical Science.

Key words: Scientific thinking, Quality improvement, Physical Science, Secondary school teachers.

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I. INTRODUCTION

Education is one of the most powerful instruments of social, economic and cultural transformation necessary for the realization of national goals. It helps to increase the productivity, achieve national and emotional integration and accelerate the process of modernization. It cultivates social, moral and spiritual values among people. The word science comes from the Latin word, '*scientia*', which means 'knowledge' (Barnhart, 1988). The view of science implied here is that science is a body of knowledge. The facts and laws of science paint only a partial picture of the whole enterprise. A complete depiction of science should include the knowledge of the field and what the body of knowledge can provide in the process of understanding (Krug, 1960). Reflecting on the question of science, Galileo Galilee said that the authority of a thousand is not worth the humble reasoning of a single individual. While learning science, the learner develops certain faculties through reasoning and experimentation, which no other subject can provide. Kothari Commission has remarked, "Science is universal, so can be its benefits. Its material benefits are immense and far-reaching - industrialization of agriculture and release of nuclear energy are two examples - but even more profound is its contribution to culture" (Report of the Indian Education Commission, 1964-66).

TEACHING OF PHYSICAL SCIENCE IN SECONDARY SCHOOLS

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 may be taught using similar methods.

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

Product approach in teaching science

The notion of science as a product implies that science is an accumulation of established facts, concepts, generalizations, principles, theories, etc. Thus, the logical and technical outcomes of science can be termed as the product of science. For example, when a concept, theory, principle or law is formulated, it is said to be the logical outcome of science while scientific inventions can be considered as the technical outcomes of science.

The product oriented 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 view of science as a process implies that science is the drawing out of inferences from interaction with experiences. The ways and means adopted by scientists in their pursuit of investigation is the process of science. Science is not a finished enterprise and there remains much to be discovered about the universe. In this aspect, the way of exploring truth is given more emphasis. The method adopted in science in the exploration of truth is unique and distinct from methods adopted by other subjects. The process of science includes the procedures such as observation, collection of data, classification, analysis, synthesis, evaluation and application to new situations.

The process aspect of science is emphasized in teaching of science which is supported by psychological theories proposed by Piaget (cognitive constructivism), Vygotsky (Social Constructivism), Gardner (Theory of multiple intelligence), etc. The process approach focuses on the learning of inquiry skills more than specific content (**Gagne, 1967; Harlen, 1978**). This approach encourages the students to generate meaning and knowledge from experience. It considers learners as active participants in the learning process. This develops in the students the skills of critical and creative thinking.

QUALITY CONCERNS IN TEACHING PHYSICAL SCIENCE

The quality of education and the excellence of its function would depend upon the perception of the persons concerned about the educational goals, aims and objectives. Hence, the understanding of quality in general and quality of education in particular is related to the persons or community to whom it matters. The teachers should be well aware of the educational goals and objectives in the teaching-learning process. Every subject has its quality indicators, which guide the teachers to maintain quality in teaching that particular subject. Teaching of Physical Science in Secondary Schools is not an exception in this regard.

The following are some of the indicators to improve quality in teaching Physical Science at secondary level.

(i) Organizing quality science classes

Providing good reference materials as well as lab equipment is essential to a quality science class for a secondary school. The students may not perform many experiments, but they will need to see concepts to grasp what is being taught. If a student is not science-oriented, the teacher should focus on key science principles through experimentation. Theoretical concepts and practical orientation should go hand-in-hand in teaching physical science.

(ii) Developing problem-solving skills among the students

The teachers should develop mathematical skills as well as problem-solving skills among their students in order to make them solve the problems in Physics and Chemistry easily.

(iii) Engaging students in asking questions

The teachers are required to engage their students in asking questions. The students may be given enough training to develop the skills of questioning on issues pertaining to scientific enquiry.

(iv) Building confidence among students through experimentation

The teachers should teach the students the necessary safety protocol with all science equipment in order to make the students feel comfortable and confident in using the apparatus. The students may be allowed to conduct experiments independently or in a small group.

(v) Making Science teaching challenging

In addition to their regular attendance to theory classes in science, the students may be encouraged to take up hands-on experiments, field trips, science fairs, educational tours etc. Their interaction with others will also help the students discover for themselves the areas of science that interest them. This develops in them scientific attitude and scientific temper.

(vi) Engaging the students in different activities

Student engagement in different activities leads to experiential learning. When the students are involved in different activities while learning the concepts in science, they get a feeling that they have discovered something for themselves. This helps in greater retention of subject matter in their minds for a longer time. Further, the learning is said to be more concrete in experiential learning.

(vii) Developing science skills through the science note book

'Science note book' is a term associated with the recording of the student observations in the science record while conducting an experiment. The science notebook is especially valuable to a student who is experimenting independently or designing a specific object or studying a certain subject in-depth.

(viii) Encouraging students for independent investigation

The teachers may promote scientific thinking through independent study of a specific topic that interests the students. Products that encourage young scientists to discover new and interesting things on their own are an invaluable investment. For example, a student of Physics can improvise a simple pendulum and a student of Chemistry can devise a high quality distillation kit.

Science can justify its place in the curriculum only when it produces important changes in young people - changes in their ways of thinking, in their habits of action and in the values they assign to what they have and what they do. This is possible when the teachers are committed and dedicated for the teaching of science with a view to realize its objectives and goals.

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 to bring about quality improvement in 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 on the perceptions of secondary school teachers towards quality improvement in 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 find out the perceptions of secondary school teachers towards quality improvement in teaching Physical Science.

The study also aims at finding out the influence of certain demographic variables - gender, age, marital status and teaching experience on the perceptions of secondary school teachers towards quality improvement in teaching Physical Science.

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 working in secondary schools towards quality improvement in teaching Physical Science.
- (ii) There is no significant difference in the perceptions of teachers aged below 40 years and those aged 40 years and above towards quality improvement in teaching Physical Science.
- (iii) There is no significant difference in the perceptions of married and unmarried teachers working in secondary schools towards quality improvement in teaching Physical Science.
- (iv) 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 quality improvement in teaching Physical Science.

LIMITATIONS OF THE STUDY

The study is limited to find out the influence of four demographic variables, viz., gender, age, marital status and teaching experience on the perceptions of teachers working in secondary schools towards quality improvement in teaching Physical Science. Further, the study is confined to 120 secondary school teachers (50 Headmasters and 70 School Assistants in Science) working in 50 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 survey, the investigators used Descriptive survey method for the present investigation.

(b) Sample

The sample of the study consisting of 120 teachers (50 Headmasters and 70 School Assistants in Science) has been selected from 50 secondary schools located in Visakhapatnam district of Andhra Pradesh using Stratified Random Sampling technique.

(c) Research Tool

The researchers used a well prepared questionnaire consisting of 45 items as the tool of research for the present investigation.

(d) Administration of the Tool

The tool was initially administered to 20 teachers (10 Headmasters and 10 School Assistants in Science) 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 45 items selected for the tool, the discriminating power of 40 items has been found positive and is found negative in respect of 5 items. The items whose discriminating power is negative have been removed; and the final tool consists of 40 items which are pool proof in all respects. The final tool has been administered to 120 teachers (50 Headmasters and 70 School Assistants in Science) working in 50 Secondary Schools located in Visakhapatnam 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 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 perceptions of teachers working in Secondary schools towards quality improvement in teaching Physical Science

S. No.	Variable		N	Mean	S.D.	t-ratio	Result
1	Gender	Male	60	114.83	30.79	0.85*	*Not Significant at 0.05 and 0.01 levels
		Female	60	110.17	29.55		
2	Age	Below 40 years	80	112.50	29.59	0.71*	*Not Significant at 0.05 and 0.01 levels
		40 yrs. & above	40	108.50	28.91		
		Married	75	111.30	30.36		*Not Significant at

3	Marital status	Unmarried	45	111.83	30.52	0.09*	0.05 and 0.01 levels
4	Teaching Experience	Less than 10 yrs 10 yrs. & above	55 65	110.14 113.58	30.63 28.76	0.63*	*Not Significant at 0.05 and 0.01 levels

II. 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 working in secondary schools towards quality improvement in teaching Physical Science.
2. There is no significant difference in the perceptions of secondary school teachers aged below 40 years and those aged 40 years and above towards quality improvement in teaching Physical Science.
3. There is no significant difference in the perceptions of married and unmarried teachers working in secondary schools towards quality improvement in teaching Physical Science.
4. There is no significant difference in the perceptions of secondary school teachers with an experience of less than 10 years and those with an experience of 10 years and above towards quality improvement in teaching Physical Science.

III. CONCLUSIONS

From the findings of the study, it is concluded that gender, age, marital status and length of service of the teachers working in secondary schools have no influence on their perceptions towards quality improvement in teaching Physical Science.

EDUCATIONAL IMPLICATIONS

- (i) The study would help the teachers identify the difficulties faced by their students in secondary schools in learning Physical Science; and find out remedial measures to overcome the difficulties.
- (ii) The present study helps the teachers to bring about the necessary changes in the Pedagogy with regard to the teaching of Physical Science in secondary schools.
- (iii) The study would help the teachers to take necessary steps for improving quality in teaching Physical Science in secondary schools.
- (iv) The study would help the teachers take up innovative practices in teaching Physical Science in Secondary Schools.
- (v) The study would help the Physical Science Teachers working in secondary schools integrate theoretical components with the practical orientation provided to the students by involving students in conducting experiments in the laboratory.
- (v) The study would help the Academic Organizations like SCERTs, IASEs and the State Departments of Education to take necessary steps for planning and implementing different schemes to enhance quality in teaching Physical Science.
- (vi) The study would help the teachers develop right attitude towards teaching Physical Science.

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