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Evaluating Science Academic Achievement of Secondary School Students: A Study on Subject-Wise Performance and Gender Differences

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ABSTRACT:

Innovative techniques and tools need to be developed for the sustainable development of society, which is possible only when students are provided with quality science education. One way to ensure that school students are experiencing quality science education is to study students' academic achievement in science. The present study used a standardised tool – the Science Achievement Test (by Ali Imam, Gyan Pratap Singh and Shiventra Pratap Singh, 2017) published by the National Psychological Corporation, Agra, to measure science academic achievement. The secondary-level students of Thoubal District, Manipur, constituted the targeted population. A sample of 387 students was selected using Simple Random Sampling Technique. It was found that secondary school students have average academic achievement in science and that female students score higher than male students. Therefore, different innovative ways of teaching science are required to improve the quality of education for a particular area.

KEYWORDS: Quality Education, Science Academic Achievement, Secondary School Students, Sustainable Development.

INTRODUCTION:

The demand of today's society is development in every sphere of life to meet the needs of the ever-increasing population. This development must be carried out sustainably; otherwise, future generations will run out of all the resources they need for survival. Again, sustainable development is ensured only through quality education. Therefore, quality education must be made available to each and every member of the society. One of the ways to measure quality education is through students' achievement in their school subjects. Since the development of society is totally dependent on the development of science and technology, it is very important to examine students' academic achievement in science so as to ensure the development of science and technology. From this examination, experts can suggest and carry out the required steps to bring quality education, which in turn helps in sustainable development.

For the present study, quality education refers to the type of education which meets the needs of society and which level of achievement is at par with some ideal standard of education, and science academic achievement refers to the students' marks scored in their examination of the science subject.

Some reviewed studies in chronological order are as follows:
Males tend to perform slightly better in Science than females (Steinkamp & Maeher, 1983). Even after controlling for personal traits, familial history, and educational context, significant gender differences in science success were seen (Young & Fraser, 1993). In the study on the effect of school location on science students' academic achievement in senior secondary school certificate exams, there was no statistically significant difference in the achievement mean scores of male and female students in rural school areas or in the achievement mean scores of male and female students in urban school areas (Agbaja et al., 2014). In the Punjab State district of Sangrur, the science performance of senior secondary school students was investigated. There were no appreciable differences between male and female pupils' performance in science (Kaur et al., 2015). According to the National Assessment of Student Performance (NAS) 2015, which NCERT administered to Class X students, Mizoram pupils' average performance in the science subject was much worse than the national average.

Regarding science disciplines, the average performance of girls in the state is similar to that of boys. Therefore, there is room for development in the Science subject of 64.8%. No students receive a science grade of 75% or above. The science accomplishments of students are good, yet there are gender differences in science achievement (Bichi et al., 2017). 95.64% of higher secondary pupils had achievement levels in science that were below average, and there were no appreciable differences in science achievement between male and female pupils (Lalrinmawia & Fanai, 2020).

The review of the related literature indicates that very few studies have been done regarding the present problem, especially in Manipur. Thus, the society's requirement and lack of research in the present area provoked the researcher to take up the present topic.

OBJECTIVES OF THE STUDY:

1. To measure the Science Academic Achievement of secondary school students.
2. To measure the Achievements of secondary school students in the Three Branches of Science (i.e., Physics, Chemistry and Biology).
3. To check whether the Science Academic Achievement of secondary school students differ with respect to their gender.

HYPOTHESES OF THE STUDY:

1. The Science Academic Achievement of secondary school students is low.
2. The achievement of secondary school students in Biology is the highest compared to that in Physics and Chemistry.
3. There is no significant difference in the Science Academic Achievement of secondary school students with respect to their gender.

METHOD AND PROCEDURE:

Type of the Study:
The present study has adopted the Descriptive Survey Method.

Population and Sample:
The population of the study consisted of students in classes IX and X studying at the secondary schools affiliated with BSEM in Thoubal District, Manipur. A representative sample of 387 students (206 male and 181 female students) was selected using the Simple Random Sampling Technique.

Description of the Tool:
For the present study, a standardised questionnaire has been used:– Science Achievement Test developed by Ali Imam, Gyan Pratap Singh and Shiventra Pratap Singh (2017), published by the National Psychological Corporation, Agra. The Science Achievement Test was constructed based on the major educational objectives like knowledge, comprehension and application. This test consisted of 75 objective-type questions (carrying one mark each) with four alternative answers, each with only one correct answer. Equal weightage was given to the different branches of science (i.e., Physics, Chemistry & Biology). The reliability of the test was computed by using the Test-Retest Method on a sample of 300 students after a gap of 15 days. The coefficient of correlation was +0.87, which is significant at a 0.01 level. Content validity is based on carefully comparing the items to the definition of the domain being measured (Allen & Reyan, 1979). The construct validity of the items of this test was ensured through rational, logical analysis of some science teachers and experts in test construction and item analysis.

Procedure of Data Collection:
The researcher visited 10 secondary schools (five government and five private schools) in different places in the Thoubal District, Manipur. The researcher requested permission from the respective authority of each school. Fortunately, the school authorities gave the required permission and cooperated fully with the researcher. All the students of the sample (387 students – 206 male and 181 female students) have interacted personally to obtain the answers to the items of the tools.

Statistical Techniques:
Statistical techniques like Mean, Standard Deviation, t-test and p-values have been used to analyse and interpret the data collected.

ANALYSIS AND INTERPRETATION:
1. First Hypothesis: The Science Academic Achievement of secondary school students is low.

TABLE-I: Table displaying Mean and Standard Deviation of Science Academic Achievement of Secondary School Students.

Sample Size (N)	Science Academic Achievement Score			
	Minimum	Maximum	Mean	Standard Deviation (SD)
387	18	69	49.37	9.120

Interpretation:
The minimum and maximum science achievement scores of secondary school students are 18 and 69, respectively. The secondary school students have a mean score of 49.37 marks (out of 75 marks), which means that they have average science academic achievement according to the Manual for Science Achievement Test developed by Ali Imam, Gyan Pratap Singh and Shiventra Pratap Singh (2017), published by National Psychological Corporation, Agra. Therefore, the first hypothesis – the science academic achievement of secondary school students is low – is rejected. Thus, secondary school students have average academic achievement in science.

2. Second Hypothesis: The Achievement of secondary school students in Biology is the highest as compared to that in Physics and Chemistry.

TABLE-II: Table displaying Mean and Standard Deviation of Academic Achievement of Secondary School Students in the Three Branches of Science (i.e., Physics, Chemistry, and Biology).

Sample Size (N)	Branch of Science	Science Academic Achievement Score			
		Minimum	Maximum	Mean	Standard Deviation (SD)
387	Physics	3	22	13.21	5.172
	Chemistry	7	22	15.49	4.876
	Biology	8	25	20.67	3.912

Interpretation:
Secondary school students' minimum and maximum physics achievement scores are 3 and 22, respectively. Secondary school students' minimum and maximum chemistry achievement scores are 7 and 22, respectively. Secondary school students' minimum and maximum biology achievement scores are 8 and 25, respectively. The secondary school students have a mean score of 13.21 marks (out of 25 marks), 15.49 marks (out of 25 marks), and 20.67 marks (out of 25 marks) in physics, chemistry, and biology, respectively. Therefore, the second hypothesis – the achievement of secondary school students in biology is the highest as compared to that in physics and chemistry – is accepted. Thus, the achievement of secondary school students is the highest in Biology as compared to that in Physics and Chemistry.

3. Third Hypothesis: There is no significant difference in the Science Academic Achievement of secondary school students with respect to their gender.

TABLE-III: Table displaying Mean, Standard Deviation, t-value and p-value of Academic Achievement in Science of Female and Male Secondary School Students.

Gender	Sample Size (N)	Mean	Standard Deviation (SD)	df	t-Value	p-Value	Remarks
Female	181	51.99	8.134	385	3.734	0.000	Since p-value < 0.05 (Significant)
Male	206	46.75	10.305				

Interpretation:
The mean science academic achievement for female students is 51.99, and that of male students is 46.75. This indicates that the mean score of female students is higher than that of male students. From the above table, it is clear that the p-value is less than 0.05, which means that the difference is significant. Therefore, the third hypothesis –no significant difference in the science academic achievement of secondary school students with respect to their gender – is rejected. Thus, the mean science academic achievement of female secondary school students is higher than that of male secondary school students.

MAJOR FINDINGS OF THE STUDY:

1. The secondary school students have a mean score of 49.37 marks (out of 75 marks), which means that they have average science academic achievement according to the Manual for Science Achievement Test developed by Ali Imam, Gyan Pratap Singh and Shiventra Pratap Singh (2017), published by National Psychological Corporation, Agra.
2. The secondary school students have a mean score of 13.21 marks (out of 25 marks), 15.49 marks (out of 25 marks), and 20.67 marks (out of 25 marks) in physics, chemistry, and biology, respectively. Thus, the achievement of secondary school students is the highest in Biology as compared to that in Physics and Chemistry.
3. The mean science academic achievement for female students is 51.99, and that of male students is 46.75. Thus, the science academic achievement of female secondary school students is higher than that of male secondary school students.

CONCLUSION AND RECOMMENDATIONS:

Since the science academic achievement of secondary students in a particular area of study is not high, there is a need to improve the quality of education for the particular area by adopting different innovative ways of teaching science. Science teachers should use social models and collaborative learning activities to encourage students' interest, ambition, and success in a science career. Science lab experiments and other learner-centred teaching and learning strategies like activity-based learning should be used to improve students' attitudes towards the subject. Teachers should encourage students to manage their own learning and engage in cooperative tasks in order to improve their academic achievement in sciences and minimise gender disparity in students' achievement. In addition to this, all the stakeholders in the field of science education should work collaboratively to increase students' science achievement.

SUGGESTIONS FOR FURTHER STUDY:

1. The present study can take a larger sample in a different district or state.
2. The present study is confined to only secondary school students, but similar studies can be conducted at other levels of school students and higher secondary levels.
3. The same study can be conducted among students from two states/countries.
4. The present study is only about science achievement, but further studies can be done based on other school subjects.

DECLARATION OF CONFLICT OF INTERESTS:

The Authors declare that there is no conflict of interest.

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