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5C Competencies and Attitude toward Science in Relation to Academic Achievement among Senior Secondary School Student

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ABSTRACT

The significance of the 5C competencies in achieving success in science education and other domains is increasingly acknowledged. Effective communication, collaborative skills , critical thinking ,creativity ,and curiosity are essential attributes for conducting scientific research, addressing problems, and generating novel ideas. The acquisition of the 5C competencies is essential for students to develop their critical thinking skills, enhance their communication skills, foster effective collaboration with peers, and generate innovative solutions to complex challenges. The attitudes towards science plays a significant role in their academic achievement and learning outcomes in science courses. A positive attitudes towards science has the potential to motivate students to pursue careers in science and engage in scientific inquiry. Conversely, a negative attitude towards science may lead to disinterest in science education and a lack of motivation to learn about the subject. It is imperative that secondary school students comprehend the correlation between attitudes towards science, 5C Competencies, and their academic performance in the domain of science.

Keywords: 5C Competencies , Attitude, Science, Academic, Achievement

INTRODUCTION

The inclusion of science education in secondary school curricula is a crucial component of academic programmers' world wide. The objective of science education is to equip students with the necessary knowledge, competencies, and dispositions to engage in scientific inquiry, comprehend scientific concepts and occurrences, and apply scientific knowledge to address real-world issues. In recent years, there has been an increased emphasis on the cultivation of the 5C Competencies, asset of skills considered crucial for achievement in science education and other domains. The aforementioned skills encompass communication, collaboration, critical thinking, creativity, and curiosity.

The field of education has undergone a significant transformation in the past few years, characterized by the implementation of innovative teaching methodologies and the integration of novel competencies into the curriculum. The 5C competencies have emerged as a prominent set of skills that have gained substantial relevance in today's world. The study of a set of five competencies referred to as the 5C competencies, namely Communication skill in science, Collaboration skill in science, Critical Thinking skill in science, Creativity skill in science, and Curiosity skill in science, is considered critical for students to achieve success in the contemporary era. The 5C competencies have gained considerable importance in the discipline of science education due to their ability to enhance students' comprehension of scientific concepts and promote their aptitude for scientific thinking and behavior. The aforementioned competencies are imperative for students to thrive in the ever-evolving scientific landscape, which necessitates innovative resolutions to complex challenges

The development of the 5C competences can be linked to the domain of education and has undergone evolution over time in response to changing educational and societal requisites. The following information presents a brief summary of the progression of specific skills throughout the course of history.

The development of the 5C competencies can be traced back to the early 1900s, and each of these proficiencies has a profound historical background in the field of scientific education. The educators have recognized the importance of 5C competencies in the recent years, as they play a crucial role in providing students with essential skills required for achieving success in the contemporary era.

Statement Of The Proposed Study:
"5C Competencies And Attitude Toward Science In Relation To Academic Achievement Among Senior Secondary School Student".

1. Ahuja , A. (2024) conducted a research on "Study of Scientific Attitude in a relation to Science Achievement score among Secondary School student". Objective to investigate gender disparities in scientific attitudes among secondary school boys and girls. To investigate the relationship between a scientific mindset and Science achievement in secondary school pupils Methodology In this study descriptive survey method had been used.Sample and sampling :- 422 students word chosen from the secondary school the current study used at random sample strategy together analyze and interpret data. Tools and technique :-Scientific attitude scale developed by Bajwa and Mahajan was used. The statistical method used ANOVA, t- t test, and karlPearson 's product movement coefficient of correlation (r). Finding :- The main finding of this study showed that girls had better scientific attitude than boys while scientific attitude and science Achievement of secondary school students were significantly positive correlated.

2. Sharma S. (2023). conducted a study on "A *Co-relational Study of Scientific Attitude Creativity and Scholastic Achievement of Secondary School Students.*" Objectives To examine the scientific attitude and creativity of the secondary school students. To find out the correlation between scientific attitude, creativity and scholastic achievement of the secondary school students. Methodology The researcher had adopted survey method for research.Sample and Sampling :-300 students as a sample and Stratified random sampling method was used. Tools and Techniques:- Creativity was measured by using the Creativity Test (TCW) by Dr. Baquer Mehdi), to measure the scientific attitude Scientific attitude Scale (SAS) by Avinashgrewal) was used, cumulative Record Card was used as Scholastic achievement.Findings :- Scientific attitude and creativity had low positive correlation. Negative correlation was found between scientific attitude and scholastic achievement of secondary school student.The creativity of girls is comparatively more than that of boys while the scientific attitude of boys is comparatively more than that of girls

3. Shrivastav, B. *(2022)*. had undertaken a study entitled *"Scientific Attitude of Secondary School Students of Sivasagar district in relation to their Achievement in Science* Objectives :- 1.To determine the extent to which achievement in science can determine scientific attitude of students.To investigate the relationship between secondary school students' scientific attitudes and scientific achievement.Methodology :- Normative survey method was used .Sample and Sampling :- The population of the present study comprised of all the 10^{th} Class secondary school students. Sample of the present study constituted of 404 10^{th} Class students selected purposively from the secondary schools.Tools and techniques A Likert Type Scientific Attitude Scale was used. And 10^{th} class annual marks used as a academic achievement.Findings :- The study revealed that higher the achievement in science higher the scientific attitude of secondary school students. It also revealed that there was a significant relationship between scientific attitude and achievement in science of students studying in secondary schools.

4.Goyal, A., & Mehta, S. (2021). conducted a study on "A comparative study of academic achievement of secondary school students in science : A gender perspective.". Objective :- To compare the academic achievement of male and female secondary school students in science.Methodology: quantitative research design.Sample and Sampling: The study sample comprised 200 secondary school students, 100 males and 100 females, selected from government schools in Chandigarh, India, using a convenience sampling technique.Tools and Techniques: The study utilized a questionnaire to collect data from the students. The questionnaire was developed by the researchers and consisted of questions related to academic achievement in science subjects.Findings :-The study found that female students had a higher academic achievement in science subjects compared to male students at the secondary school level. This finding was consistent with previous research studies conducted in India.

5. Herianto,H., Wilujeng, I.(2020) conducted a study entitled " the correlation between students' curiosity and generic science skills in science learning". Objectives :To study the curiosity skills of students.To find out the correlation between students' generic science skills and curiosity.To study the impact of curiosity on generic science skills of students.Methodology :descriptive quantitative type of research methodSample and Sampling : 64 students and cluster random sampling techniqueTools and techniques : curiosity questionnaire , a generic science skill test was used in this study.Correlation coefficient , ANOVAs and simple linear regression were used.Finding :Finding showed that there is a significant linear relationship between curiosity and generic science skill (r= .389) and influence of the independent variable (curiosity) on the dependent variable (generic science skills) is 15.1% , while other variables influence the rest .

OBJECTIVES OF THE STUDY

1. To study the communication skill in science students at senior secondary level.
2. To study the collaboration skill in science students at senior secondary level.
3. To study the critical thinking skill in science students at senior secondary level.

HYPOTHESIS OF THE STUDY

1. There is no significant difference between male and female sr. secondary school students in their communication skill in science.
2. There is no significant difference between male and female sr. secondary school students in their collaboration skill in science.
3. There is no significant difference between male and female sr. secondary school students in their critical thinking skill in science.

RESEARCH METHOD

Survey research has been used. This method involves collecting data from a sample of participant using surveys of self –made questionnaire to describe the current state of 5c competences among target population.

RESEARCH VARIABLE

- **IndependentVariable :** communication, collaboration, critical thinking ,curiosity and critical thinking skills
- **Dependent Variables :** schoolstudents
- **ControlVariable :** age,gender

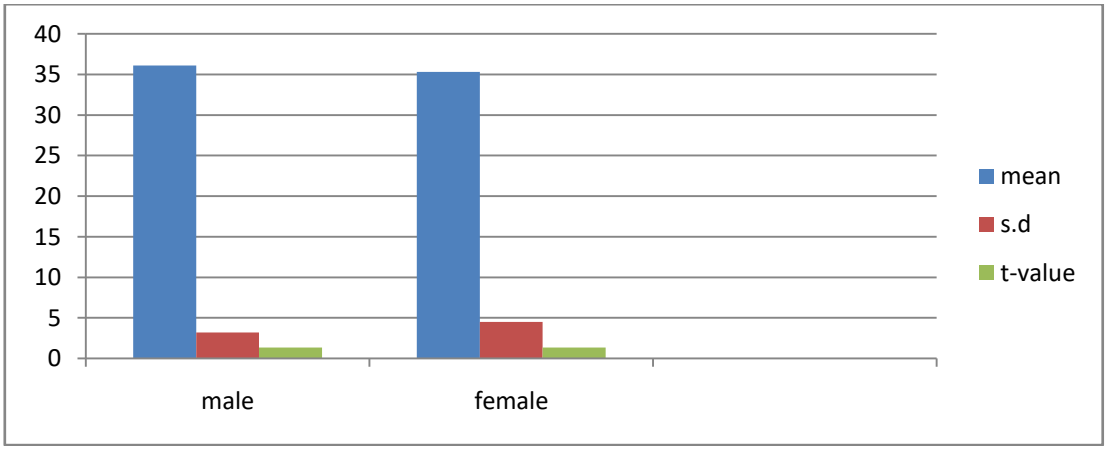
Sample Of The Research Problem :-
For this research, 5 sr. secondary school student from the Jaipur district.

Tools Used :-
Research designed a self- made questionnaire based on scaling method that includes relevant questions related to 5C competencies .In this study, a closed – ended questionnaire is used to gather quantitative data.

Literary Analysis:
The comprehensive review of literature on science competencies, attitudes, and academic achievement reveals complex interconnections that significantly impact educational outcomes among senior secondary students. Previous research consistently demonstrates that positive attitudes toward science correlate with higher achievement levels, while the development of key competencies serves as a foundation for academic success. This literature review has illuminated important gaps in understanding how these factors interact within specific educational contexts and demographic groups. By building upon established theoretical frameworks and methodological approaches identified in the literature, this study is well-positioned to contribute meaningful insights to science education research and practice. The findings from this investigation will not only enhance our understanding of the factors influencing science achievement but also provide evidence-based recommendations for cultivating positive science attitudes and developing essential competencies among secondary school students.

Hypothesis : 1 There Is No Significant Difference Between Male And Female Secondary School Students In Their Communication Skill In Science

Variables	Group	No. of students	Mean	s.d	T -value	Result
Communication skill	male	100	38	2.392	1.265	Accepted
	female	100	37.48	3.32		

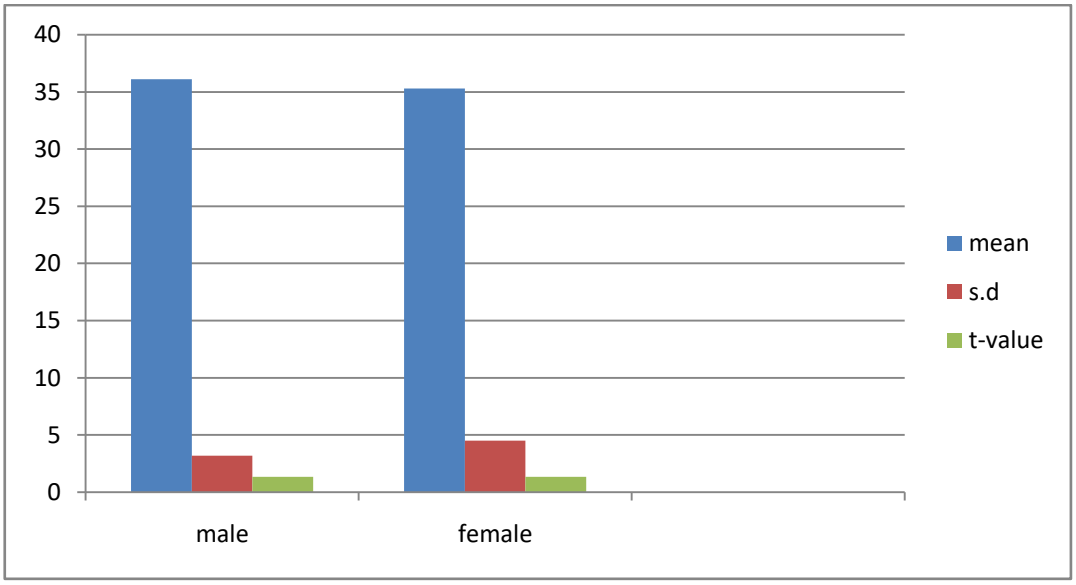


Intrepretation:
Table 1 present the data on communication skill among the secondary school student. The study reveal that the mean for male is 38 ,while for female student it is 37.48. The standard deviation for male student is 2.392 and for females students it is 3.32. To ascertain the significant difference in communication skill in science between the male and female students, a t- value was calculated. The calculated t- value is 1.265

At a significance level of 0.05, the critical t-value from the table is 1.972, and at a significance level of 0.01, it is 2.617 the obtained t-values is less than both the critical values. 1.972 at a 0.05 significance level and 2.617 at 0.01 significance level. Therefore, the null hypothesis is accepted, indicating that there is no significance difference in competencies level towards communication skill among male and female student.

Hypothesis : 2 There is no significant difference between male and female secondary school students in their collaboration skill in science .

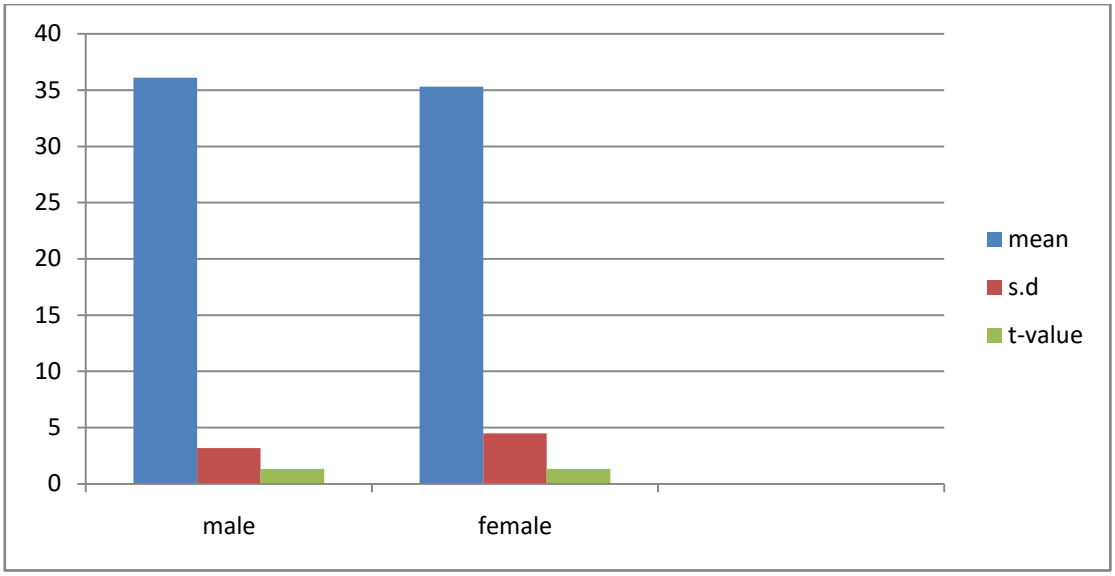
Variables	Group	No. of students	Mean	s.d	T -value	Result
Collaboration skill	male	100	35.12	3.37	1.641	Accepted
	female	100	35.9	3.89		



Intrepretation:
Table 2 presents data on collaboration skill among the secondary school student. The study indicates that the mean for male students is 35.12 ,while for female student it is 35.97. The standard deviation value formale student is 3.37 and for females students it is 3.89 respectively . The calculated t- value is 1.641 At a significance level of 0.05, the critical t-value from the table is 1.972, and at a significance level of 0.01, it is 2.617 The obtained t-values is less than both the critical values . 1.972at a 0.05 significance level and 2.617 at a 0.01 significance level . . Therefore, the null hypothesis is accepted, indicating that there is no significance difference in competencies level towards collaboration skill among male and female student.

Hypothesis : 3There is no significant difference between male and female secondary school students in their critical thinking skill in science .

Variables	Group	No. of students	Mean	s.d	T -value	Result
Critical thinking skill	male	100	36.1	3.19	1.338	Accepted
	female	100	35.3	4.5		



Intrepretation:
Table 3 presents data on critical thinking skill among the secondary school student. The study indicates that the mean for male students is 36.1 ,while for female student it is 35.36. The standard deviation value for male student is 3.190 and for females students it is 4.49 respectively . The calculated t- value is 1.338.

At a significance level of 0.05, the critical t-value from the table is 1.972, and at a significance level of 0.01, it is 2.617 The obtained t-values is less than both the critical values . 1.972 at a 0.05 significance level and 2.617 at a 0.01 significance level . . Therefore, the null hypothesis is accepted, indicating that there is no significance difference in competencies level towards critical thinking skill among male and female student.

CONCLUSIONS

There is always a need for more investigation and assessment after a study is completed. Based on the finding and limitations of the attitudes toward science in relation to academic achievement among senior secondary school students the following suggestions are proposed for future research Conduct longitudinal studies spanning multiple academic years to track the development of 5c competencies and attitudes toward science over time. Such research would provide deeper insights into how these factors evolve throughout the sr. sec. education phase and their long term impact on academic achievement and career choices. Design and implement targeted interventional studies to enhance specific 5c competencies and positive attitudes toward science. Experimental research comparing different pedagogical approaches could identify effective strategies for developing these competencies and improving science attitude among sr. sec. students

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