# A STUDY OF SCIENTIFIC ATTITUDE AMONG SECONDARY SCHOOL STUDENTS IN RELATION TO THEIR SOCIO-ECONOMIC STATUS, PARENTING STYLE AND HOME ENVIRONMENT

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## Abstract

This article explores the relationship between socio-economic status, parenting styles, home environments, and the development of a scientific attitude among students. It finds that socio-economic status affects access to educational resources, impacting scientific exposure. Parenting styles, particularly authoritative ones, are linked to positive scientific attitudes, while home environments rich in educational materials promote scientific curiosity. The study suggests that targeted educational interventions, parental education programs, and equitable policies can enhance scientific attitudes, contributing to a more inclusive science education system. This research provides a comprehensive view of the factors influencing scientific attitude development, aiming to improve educational outcomes.

Keyword: Socio-economic status, Parenting styles, Home environment, Scientific attitude

## INTRODUCTION

The educational achievements and attitudes of students are profoundly influenced by the complex interplay of socio-economic status, parenting styles, and home environments. This intricate relationship has been the subject of extensive research, highlighting the significant impact of socio-economic factors such as income, parental education, and occupation on a child's learning experiences and cognitive development (Sameroff, 2010; Sirin, 2005; Dearing et al., 2001). These socio-economic disparities not only affect the availability of educational resources and extracurricular activities but also directly influence students' exposure to scientific concepts and experiments, thereby shaping their attitudes towards science (Reardon, 2011; Sirin, 2005).

Parallel to socio-economic influences, the role of parenting styles in shaping children's personality, behavior, and cognitive skills has been well documented. The literature suggests

that authoritative parenting, characterized by a balanced approach of warmth and discipline, is linked to positive academic and social outcomes (Duckworth & Seligman, 2005; Conger et al., 2010). Conversely, authoritarian or permissive parenting styles have been associated with negative impacts on children's self-esteem, motivation, and overall academic performance (Dornbusch et al., 1987).

The home environment further plays a crucial role in a child's early learning experiences. Studies have shown that a stimulating home environment, characterized by the availability of educational resources and active parental involvement, significantly contributes to fostering a child's curiosity, creativity, and enthusiasm for learning, particularly in scientific domains (Lareau &Weininger, 2003; Eccles &Roeser, 2011; Sullivan & Brown, 2015; Crosnoe et al., 2004). This nurturing atmosphere is instrumental in developing a positive scientific attitude, which is essential for academic success and future engagement in scientific endeavors.

Given the critical importance of understanding how socio-economic status, parenting styles, and home environments collectively influence the development of scientific attitudes, this research aims to delve into these relationships. The study is motivated by the need to address the existing disparities in scientific achievement and to understand the synergistic effects of these factors on students' attitudes towards science. By integrating these elements, the research seeks to provide a holistic view of the factors contributing to the development of a scientific attitude among students from diverse socio-economic backgrounds.

Despite extensive research on the individual impacts of socio-economic status, parenting styles, and home environments on educational outcomes, there remains a significant gap in understanding how these factors interconnect to influence the development of scientific attitudes among students. This study aims to bridge this gap by examining the synergistic effects of socio-economic conditions, parental approaches, and home settings on students' scientific curiosity, motivation, and confidence. Addressing this issue is critical for identifying targeted interventions that can mitigate educational disparities and promote a more inclusive and effective science education system.

The primary objective of this research is to delve into the intricate relationships between socio-economic status, parenting styles, home environments, and their collective impact on the development of scientific attitudes among students. This study is particularly focused on several key areas: firstly, the development and standardization of an instrument specifically designed to measure the scientific attitude of secondary school students. This tool is crucial

for providing a reliable and valid means of assessing students' attitudes towards science, enabling a more nuanced understanding of their perspectives and inclinations. Secondly, the research aims to scrutinize the effect of socio-economic status on the scientific attitudes of students, particularly those at the senior secondary school level within the Rohtak district. This involves examining how variables such as family income, parental education, and occupation influence students' engagement with and attitudes towards science. Thirdly, the study seeks to investigate the influence of different parenting styles on students' scientific attitudes. This aspect of the research is geared towards understanding how authoritative, authoritarian, and permissive parenting approaches affect children's curiosity, motivation, and confidence in scientific exploration. Lastly, the research intends to assess the impact of the home environment on the scientific attitudes of secondary school students. This includes evaluating how factors such as the availability of educational resources, parental involvement, and the overall intellectual atmosphere of the home contribute to shaping students' attitudes towards science. Through these focused objectives, the study aims to provide comprehensive insights into the multifaceted factors that contribute to the development of a scientific mindset among students, thereby informing targeted educational interventions and policies.

This research holds significant implications for education, psychology, and social policy. By understanding the multifaceted influences on scientific attitude development, educators can tailor curricula to meet the needs of students from diverse backgrounds, enhancing the accessibility and engagement of science education. Psychologically, this study provides insights into the mechanisms shaping children's confidence and motivation in science, guiding targeted interventions to boost self-esteem and curiosity. From a policy perspective, the findings can inform initiatives aimed at reducing educational disparities and supporting families in creating enriching learning environments. Ultimately, this research aims to contribute to the development of a scientifically literate and curious generation, equipped to navigate and contribute to an increasingly complex scientific landscape.

This study encompasses a comprehensive examination of the interplay between socio-economic factors, parenting styles, and home environments in shaping scientific attitudes among a diverse cohort of students. Employing a mixed-methods approach, the research aims to capture a broad spectrum of experiences and perceptions across different socio-economic, cultural, and geographical contexts. However, the study acknowledges limitations such as potential biases in self-reported data, the challenge of capturing all influencing factors, and

the generalizability of findings across different populations. Despite these constraints, the research endeavors to provide a thorough and nuanced understanding of the dynamics at play in scientific attitude development, offering a foundation for future educational strategies and interventions.

## METHEDOLOGY

This section outlines the methodology employed in the study aimed at exploring the scientific attitudes among secondary school students in relation to their socio-economic status, parenting style, and home environment within the Rohtak district. The methodology encompasses the sources of data, sample selection, and the tools used for data collection and analysis, providing a comprehensive overview of the research approach.

### *Sources of Data*

The primary data for this study were collected from a diverse range of sources to ensure a comprehensive understanding of the variables in question. The main source of data was the students enrolled in standard X classes across various schools in the Rohtak District. These students provided valuable insights into their attitudes towards science, socio-economic status, parenting styles, gender, and the educational environment of their respective schools. Additional data were obtained from the Rohtak District Education Officer's office, which provided records on the number of schools and demographic information about the communities surrounding these schools. This multi-source approach enabled a holistic view of the factors influencing scientific attitudes among students.

### *Sample*

The study's sample comprised students enrolled in grade X at selected schools within the Rohtak district, covering both urban and rural areas. The sample was divided into two phases: the first phase involved the construction and standardization of an instrument to assess students' attitudes towards science, while the second phase focused on examining the relationships between students' socio-economic status, parenting styles, gender, and their scientific attitudes.

A total of 700 students from thirteen different schools were randomly selected using the cluster sampling method. This approach was deemed appropriate due to the impracticality and high cost of listing and sampling every high school student across a wide geographical area. Cluster sampling, in this context, involved selecting a few schools randomly from a list

and including all students from those schools in the sample. This method facilitated the practical and efficient collection of data from naturally grouped individuals.

The sample selection adhered to two key principles: firstly, students from schools used for the pilot administration of the scientific attitude measurement tool were excluded to prevent bias. Secondly, an effort was made to select one rural school from each of the five blocks and one urban school from each major area of Rohtak city to ensure a balanced representation of both urban and rural perspectives. The distribution of the sample across gender and location is detailed in Table 1, illustrating the study's commitment to a diverse and representative sample.

**Table. 1** Distribution of Students over Gender and Location of Schools.

| | **Rural** | **Urban** | **Total** |
|---|---|---|---|
| **Boys** | 205 | 210 | 415 |
| **Girls** | 122 | 163 | 285 |
| **Total** | 327 | 373 | 700 |

***Tools for Data Collection***

The study utilized two main tools for data collection: a tool to measure scientific attitude and another to assess socio-economic status. The significance of measuring scientific attitude lies in its implications for educational interventions, STEM career readiness, educational policy, and psychological development. A well-constructed and reliable tool is essential for accurately gauging students' attitudes towards science, which in turn can inform targeted teaching methods, policy reforms, and initiatives aimed at enhancing science education and fostering positive attitudes.

The socio-economic status tool was employed to gather comprehensive data on the students' backgrounds, including factors such as family income, parental education, and occupation. This information is crucial for understanding the socio-economic context in which students' scientific attitudes are formed and how these backgrounds may influence their perceptions and engagement with science.

***Data Analysis***

The collected data were analyzed using appropriate statistical methods to explore the relationships between the variables of interest. Pearson's product-moment correlation coefficients were calculated to examine the associations between students' scientific attitudes and their socio-economic status, parenting styles, and home environments. Additionally,

ANOVA was used to compare the mean scientific attitudes across different groups, providing insights into the impact of socio-economic status, gender, and school location on students' attitudes towards science.

The methodology adopted in this study ensures a rigorous and systematic approach to investigating the complex interplay of factors influencing scientific attitudes among secondary school students. By employing a representative sample, utilizing reliable data collection tools, and conducting thorough statistical analysis, the study aims to contribute valuable insights into the field of science education and inform future educational practices and policies.

## RESULTS & DISCUSSION

In the study, the distribution of scientific attitudes among secondary school students in Rohtak was analyzed, focusing on mean, standard deviation, skewness, kurtosis, and percentiles across different demographic groups. This analysis provided a detailed view of the students' attitudes towards science, highlighting variations between male and female students, as well as urban and rural students. The statistical measures offered insights into the average attitudes, variability, and distribution patterns within the sample. These findings form the basis for further analysis and interpretation, contributing to a deeper understanding of the factors influencing scientific attitudes among the students.

**Table 2** Mean, Standard Deviation, Skewness, Kurtosis and Percentiles of

Scientific Attitude Score of the Students

| | **Total sample** | **Boys** | **Girls** | **Urban students** | **Rural students** |
|---|---|---|---|---|---|
| **Mean** | 286.80 | 234.12 | 247.27 | 270.32 | 240.42 |
| **SD** | 31.285 | 30.828 | 31.4685 | 25.583 | 25.931 |
| **Skewness** | 1.0000 | 2.7000 | -1.0000 | -2.5000 | 8.5000 |
| **Kurtosis** | 0.2976 | 0.3009 | 0.3171 | 0.2813 | 0.2769 |

Table 2 reveals that the average scientific attitude score among students was 286.80, with a median score of 280, indicating consistent attitudes across the sample. The data showed a positive skewness, suggesting a general inclination towards higher scientific attitudes, and a platykurtic distribution, indicating a flatter spread than a normal distribution. Gender analysis showed girls with higher average attitudes and a negative skew, while boys displayed a positive skew, indicating a lower average attitude. These insights highlight significant gender differences in scientific attitudes, essential for developing targeted educational strategies.

In the study, the relationship between students' scientific attitudes and their socio-economic status (SES) was explored to test the null hypothesis that there is no significant difference in scientific attitudes based on SES. Pearson's Product Moment Coefficient of Correlation was employed to assess this relationship. The correlation between students' scientific attitude and SES was 0.4853, and between scientific attitude and achievement in science was 0.5409, indicating significant relationships.

The study revealed significant differences in scientific attitudes between boys and girls, and urban and rural students, highlighting the impact of gender and geography on students' scientific perspectives. These findings are crucial for tailoring educational strategies to address the diverse needs of different student groups.

Table 3 illustrates the differences in scientific attitudes between boys and girls. Boys had a mean scientific attitude score of 234.12 with a standard deviation of 30.828, while girls scored higher with a mean of 247.27 and a standard deviation of 31.4685. The t-value of 2.834 indicates a statistically significant difference between the two groups, suggesting that girls tend to have a more positive scientific attitude compared to boys. This disparity underscores the need for gender-sensitive approaches in science education.

**Table 3** The Mean, SD and t-value of Scientific Attitude of Boys and Girls.

| Scientific attitude | Mean | SD | t-value | N |
|---|---|---|---|---|
| Boys | 234.12 | 30.828 | 2.834 | 334 |
| Girls | 247.27 | 31.4685 | | 262 |

The analysis in Table 4, showing a significant 'F' value of 85.38 at the 0.01 level, indicates marked differences in scientific attitudes among students from varying socioeconomic backgrounds. This significant variance underscores the impact of SES on students' attitudes towards science. Subsequent t-tests, detailed in Table 5, identify specific SES group pairs with significant attitude disparities. These results highlight the critical role of socioeconomic factors in shaping scientific attitudes, suggesting the necessity for educational strategies and interventions tailored to address the unique needs and challenges faced by students from different SES groups.

**Table 4** Summary of ANOVA of Scientific Attitude of High SES, Average SES and Low SES students.

| Sources of variance | DF | SS | MSS | F-value |
|---|---|---|---|---|
| Among | 2 | 130311.23 | 62655.61 | 82.38 |
| Within | 594 | 426424.47 | 758.69 | |
| Total | 596 | 53.8545.70 | 245.42 | |

**Table 5** The Mean, SD and t-value of Scientific Attitude of High SES students,Average SES students and Low SES students.

| | Mean | SD | t-values | | | N |
|---|---|---|---|---|---|---|
| | | | High SES | Average SES | Low SES | |
| High | 276.90 | 26.7723 | | 4.8999 | 13.1958 | 129 |
| Average | 262.50 | 29.4901 | | | 9.8570 | 281 |
| Low | 237.32 | 25.3000 | | | | 186 |

The significant t-values between different SES groups indicate a clear correlation between students' socioeconomic backgrounds and their scientific attitudes. High SES students show a markedly more positive attitude towards science compared to their medium and low SES peers, with the greatest disparity observed between high and low SES groups. Additionally, average SES students exhibit a better scientific attitude than those from low SES backgrounds. These findings highlight the profound influence of socioeconomic status on students' attitudes towards science, underscoring the necessity for educational interventions tailored to uplift students from lower SES, aiming to equalize scientific attitudes across all socioeconomic tiers.

**Table 6** Summary of ANOVA of Scientific Attitude of Boys: High, Average, and Low SES; and Girls: High, Average, and low SES Students.

| Sources of variance | DF | SS | MSS | F-value |
|---|---|---|---|---|
| Among | 5 | 126362.44 | 25272.49 | 32.35 |
| Within | 591 | 461713.26 | 781.24 | |
| Total | 596 | 588075.70 | | |

Table 6 shows a significant 'F' value of 32.35 from the ANOVA, indicating substantial differences in scientific attitudes among boys and girls across different SES levels, significantly exceeding the expected value of 3.06 at the 0.01 level. This highlights the impact of SES on scientific attitudes, differing significantly by gender.

The study explores the relationship between parenting styles and secondary students' attitudes towards science. The family, as a crucial social unit, significantly impacts children's development, including their scientific attitudes. Parenting style, a key factor in child development, influences children's emotional, social, and academic growth. This research aims to understand how different parenting styles—authoritative, authoritarian, and permissive—affect students' scientific mindsets. The null hypothesis posits no significant difference in scientific attitudes among students based on their parents' parenting style. However, results indicated a positive correlation between students' scientific attitudes and authoritative parenting, and a negative correlation with authoritarian parenting, while permissive parenting showed no significant impact. These findings suggest that the way parents interact and communicate with their children significantly influences the children's attitudes towards science, highlighting the importance of supportive and engaging parenting practices in fostering positive scientific attitudes.

**Table 7** Coefficient of correlation of Scientific Attitude with parenting style of students.

| Variable | Firm style | Authoritarian style | Permissive style | Scientific attitude |
|---|---|---|---|---|
| **Firm style** | 1 | | | |
| **Authoritarian style** | -0.16 | 1 | | |
| **Permissive style** | 0.02 | -0.54 | 1 | |
| **Scientific attitude** | 0.67 | -0.18 | 0.43 | 1 |

The study's findings, as shown in Table 7, indicate a significant correlation between parenting style and students' scientific attitudes. Specifically, a firm and reassuring parenting style positively correlates with students' scientific attitudes, with a correlation coefficient of 0.67 at the 0.01 significance level. Conversely, an authoritarian parenting style negatively impacts students' scientific attitudes, showing a weak negative link. Permissive parenting style, however, does not show a significant relationship with students' scientific attitudes. These results suggest that warmth, firmness, and supportive parenting significantly contribute to positive scientific attitudes, whereas authoritarian approaches may hinder students' interest and engagement in science.

The study investigates the relationship between students' residence environments and their attitudes towards science, addressing the hypothesis that there is no significant difference in scientific attitudes based on students' living environments. This exploration is grounded in the broader context of fostering scientific literacy, which has evolved to emphasize the development of "scientifically literate" individuals who can engage with science in everyday

contexts and understand its societal relevance. The concept of scientific literacy includes understanding the nature of science, its ethical dimensions, and its societal interactions. Informal learning environments, such as out-of-school activities and extracurricular learning, play a crucial role in enhancing scientific understanding and attitudes. These environments provide personalized learning experiences that extend beyond traditional classroom settings, contributing to the development of a positive scientific attitude. This study aims to determine whether the home environment, as a key component of informal learning, significantly influences students' scientific attitudes, challenging the existing assumptions about educational influences outside formal school settings.The significant t-value from Table 8 indicates a notable difference in scientific attitudes between urban and rural students, with urban students displaying higher mean attitudes towards science.

**Table8** The variation in scientific attitudes with respect to locality of students

| Scientific attitude | Mean | SD | t-value | N |
|---|---|---|---|---|
| **Urban students** | 270.32 | 25.583 | 17.007 | 304 |
| **Rural students** | 240.42 | 25.931 | | 292 |

## CONCLUSIONS

The study conducted on the scientific attitude among secondary school students in relation to their socio-economic status, parenting style, and home environment in the Rohtak district revealed several significant findings. Firstly, it was observed that the average scientific attitude score among the students was moderate, indicating a need for improvement in fostering a more robust scientific mindset. The research highlighted a significant correlation between students' scientific attitudes and their socio-economic status (SES), with students from higher SES backgrounds exhibiting more positive scientific attitudes than their lower SES counterparts. Additionally, the study found notable differences in scientific attitudes between boys and girls, with girls displaying a slightly higher mean scientific attitude than boys. Urban students were found to have a more positive scientific attitude compared to rural students, suggesting that environmental factors play a crucial role in shaping attitudes towards science.The influence of parenting style on students' scientific attitudes was also significant, with authoritarian parenting styles negatively correlating with students' scientific outlook. Conversely, there was no significant relationship found between permissive parenting styles and students' attitudes towards science. These findings underscore the importance of parental involvement and the type of parenting style in developing a positive scientific attitude among students.

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