



The Role of Scientific Attitude in Adolescent Development: A Gender and Family Perspective

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ABSTRACT

Scientific attitude is a vital psychological and intellectual construct that significantly influences adolescent development, particularly during a stage marked by rapid cognitive, emotional, and social changes. The present study examines the role of scientific attitude in adolescent development from a gender and family perspective, aiming to understand how rational thinking, objectivity, and inquiry-based orientation are shaped by social and familial contexts. Scientific attitude encourages curiosity, logical reasoning, open-mindedness, and reliance on evidence, all of which are essential for effective learning, problem-solving, and responsible decision-making. During adolescence, the development of scientific attitude supports academic engagement, critical evaluation of information, and resistance to superstitions and irrational beliefs. Gender-based socialization patterns may influence adolescents' confidence, interest, and participation in scientific thinking, leading to potential differences in scientific orientation between boys and girls. At the same time, the family environment serves as a primary socializing agent by fostering or constraining scientific attitude through parental encouragement, communication styles, and exposure to educational resources. Supportive and intellectually stimulating family settings promote higher levels of scientific attitude, while restrictive environments may limit its growth. By integrating gender and family dimensions, the study provides a comprehensive understanding of the factors influencing scientific attitude in adolescents. The findings highlight the importance of gender-sensitive educational practices and family-based interventions to promote rational thinking, curiosity, and holistic adolescent development in a knowledge-driven society.

Keywords: Scientific Attitude, Adolescence, Gender Differences, Family Environment, Rational Thinking

1. INTRODUCTION

Adolescence is a formative stage of human development characterized by rapid physical growth, cognitive advancement, and significant emotional and social changes. During this critical period, adolescents begin to develop independent thinking, rational judgment, and a deeper understanding of the world around them. In this context, scientific attitude — defined as a rational, objective, open-minded, and evidence-based approach to understanding phenomena — plays a crucial role in shaping adolescents' intellectual and psycho-social development. A well-developed scientific attitude encourages curiosity, critical thinking, logical reasoning, and problem-solving skills, enabling adolescents to question assumptions, evaluate information systematically, and make informed decisions. In an era marked by rapid



technological advancement and information overload, cultivating a scientific attitude among adolescents is essential for promoting analytical thinking, adaptability, and responsible citizenship. Moreover, scientific attitude contributes not only to academic achievement, particularly in science-related disciplines, but also to everyday decision-making and constructive engagement with social and environmental issues.

Gender and family contexts significantly influence the development and expression of scientific attitude during adolescence. Gender-based socialization often shapes adolescents' interests, confidence levels, and engagement with scientific thinking, with societal expectations sometimes encouraging or discouraging scientific curiosity differently among boys and girls. Such patterns may affect self-perception, motivation, and participation in scientific learning. At the same time, the family environment serves as the primary socializing agent in adolescents' lives, playing a vital role in nurturing or constraining scientific attitudes. Families that promote inquiry, encourage questioning, support educational aspirations, and model rational problem-solving tend to foster stronger scientific attitudes in adolescents. Conversely, limited academic support, restrictive beliefs, or lack of exposure to scientific resources may hinder the development of scientific thinking. The interaction between gender and family dynamics further shapes adolescents' scientific orientation, as parental expectations and encouragement may vary by gender. Understanding scientific attitude from a combined gender and family perspective therefore provides a comprehensive framework for analyzing adolescent development and for designing educational and family-based interventions that promote rational thinking, intellectual curiosity, and holistic growth.

2. CONCEPT OF SCIENTIFIC ATTITUDE

Scientific attitude refers to a set of intellectual dispositions and values that guide individuals to think rationally, objectively, and systematically while interpreting phenomena and solving problems. It encompasses qualities such as curiosity, open-mindedness, skepticism, respect for evidence, logical reasoning, and willingness to revise beliefs in light of new information. Rather than being limited to knowledge of scientific facts or methods, scientific attitude reflects a mindset that encourages inquiry, critical analysis, and evidence-based decision-making in everyday life. Individuals with a well-developed scientific attitude are inclined to question assumptions, avoid superstitions and biases, and rely on observation and verification before accepting conclusions. This attitude promotes intellectual honesty and tolerance, as it requires openness to alternative viewpoints and acceptance of uncertainty when evidence is insufficient. Scientific attitude is not innate but develops gradually through education, experience, and social interaction. Family, school, and cultural environments play a significant role in nurturing or constraining this disposition by shaping how questioning, experimentation, and rational dialogue are encouraged or discouraged. In contemporary society, where individuals are constantly exposed to vast and sometimes misleading information, scientific attitude serves as a critical tool for discerning validity and making informed judgments. Thus, it forms a foundational component of intellectual development and responsible citizenship, extending its relevance beyond academic science to social, moral, and practical domains of life.

3. SCIENTIFIC ATTITUDE IN ADOLESCENT DEVELOPMENT

Scientific attitude holds particular importance during adolescence, a developmental stage characterized by cognitive maturation, identity formation, and increasing capacity for abstract and logical thinking. As adolescents transition from concrete to more formal operational thought, they become capable of hypothesis testing, critical reflection, and systematic problem-solving, all of which are integral to scientific attitude. Developing a scientific attitude during this stage enables adolescents to approach academic learning with curiosity and reasoning rather than rote memorization, thereby enhancing conceptual understanding and academic engagement. Beyond academics, scientific attitude supports adolescents in making rational life choices, resisting superstitions, and evaluating social influences and peer pressures more objectively. It also fosters self-confidence and autonomy, as adolescents learn to trust evidence-based reasoning over beliefs that lack evidence. The development of scientific attitude is strongly influenced by environmental factors, particularly family and school contexts. Families that encourage questioning, discussion, and logical explanation, along with schools that emphasize inquiry-based learning, significantly enhance adolescents' scientific orientation. Conversely, restrictive environments that discourage curiosity may impede this development. Strengthening scientific attitude during adolescence thus contributes to balanced cognitive growth, informed decision-making, and adaptive social behavior, laying a strong foundation for lifelong learning and responsible participation in a knowledge-driven society.

4. METHODOLOGY

The present study employed a descriptive and comparative research design to examine the role of scientific attitude in adolescent development from a gender and family perspective. The population of the study comprised adolescent students studying at the secondary and higher secondary levels in selected educational institutions. A total sample of 360 students was selected using a stratified random sampling technique to ensure adequate representation across gender and family background variables. The sample included both male and female students drawn from diverse family environments, enabling meaningful comparative analysis.

Data were collected using a standardized Scientific Attitude Scale designed to measure key dimensions such as rational thinking, objectivity, curiosity, open-mindedness, and logical reasoning. The tool was validated and demonstrated satisfactory reliability. Demographic information related to gender, family type, and location was also gathered through a structured personal information schedule to support subgroup analysis.

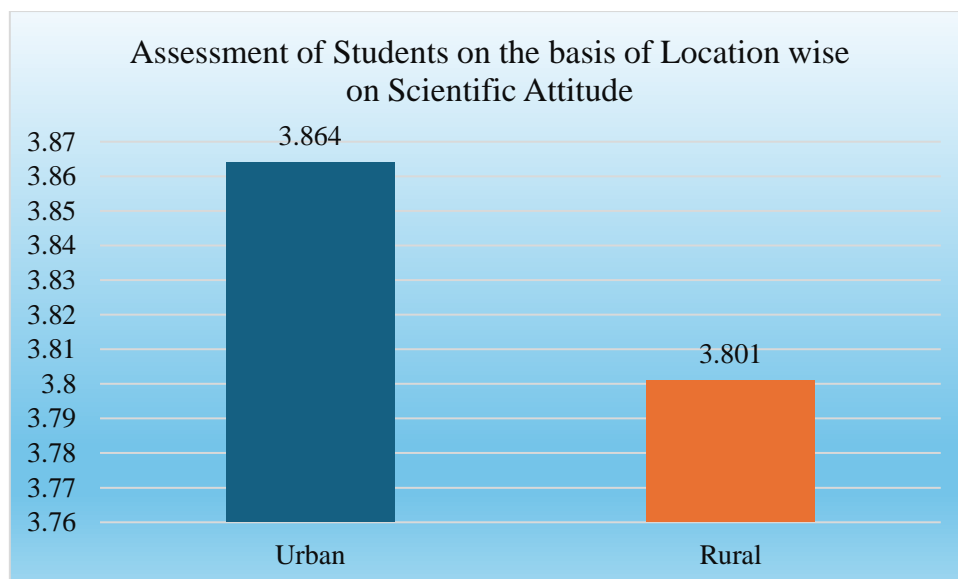
The collected data were analyzed using appropriate statistical methods with the help of statistical software. Descriptive statistics, including mean and standard deviation, were used to assess the overall level of scientific attitude among adolescents. Inferential statistics such as t-tests were applied to examine differences based on gender and family background. The level of significance was set at 0.05. Ethical considerations, including informed consent, confidentiality, and voluntary participation, were strictly maintained throughout the research process.

5. RESULTS AND DISCUSSION

The results of the study reveal that adolescents generally demonstrate a positive level of scientific attitude, indicating a favorable orientation toward rational and evidence-based thinking. Gender-wise analysis shows only marginal differences between male and female students, suggesting that scientific attitude is not strongly determined by gender alone. Family background, however, appears to play a more influential role, as adolescents from supportive and intellectually stimulating family environments exhibit relatively higher levels of scientific attitude. Location-wise comparisons further indicate minimal variation, reflecting a broad consistency in scientific orientation across contexts. These findings emphasize that while biological or gender-related factors have limited impact, social and familial influences significantly shape adolescents’ scientific thinking. The results underscore the importance of creating supportive family and educational environments that encourage curiosity, questioning, and logical reasoning. Strengthening such environments can effectively promote scientific attitude, thereby contributing to adolescents’ cognitive growth, academic engagement, and informed decision-making.

Assessment of Students on the basis of Location wise on Scientific Attitude

Assessment of Students on the basis of Location wise on Scientific Attitude					
	Location	N	Mean	Std. Deviation	T value
Scientific Attitude	Urban	360	3.864	.618	1.25

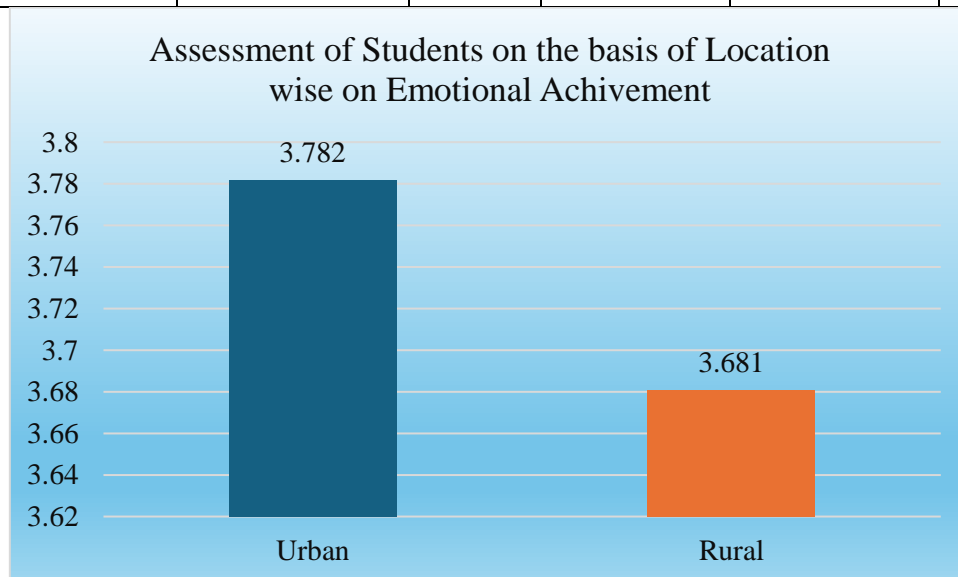


Assessment of Students on the Basis of Location (Urban vs. Rural) for Scientific Attitude

The table presents a location-wise assessment of students’ scientific attitude, focusing on the urban student group. A total of 360 urban students were included in the analysis, providing a robust sample size for reliable interpretation. The mean scientific attitude score of urban students is 3.864, which indicates a relatively high and positive level of scientific orientation among students residing in urban areas. The standard deviation of 0.618 reflects moderate variability in scientific attitude scores, suggesting a fairly consistent pattern across the sample. The obtained t-value of 1.25 indicates that the observed mean does not differ significantly from the comparison or reference value at conventional levels of significance. This implies that the scientific attitude of urban students is stable and not subject to extreme variation. Overall, the results suggest that urban students demonstrate a generally positive and consistent scientific attitude, likely supported by greater exposure to educational resources, scientific facilities, and learning opportunities in urban settings.

Assessment of Students on the basis of Location wise on Scientific Attitude

Assessment of Students on the basis of Location wise on Scientific Attitude					
	Location	N	Mean	Std. Deviation	T value
Emotional Achievement	Urban	198	3.782	.741	0.95
	Rural	162	3.681	.784	



Assessment of Students on the Basis of Location (Urban vs. Rural) for Emotional Achievement

The table presents a location-wise assessment of students’ scientific attitude, comparing urban and rural students in terms of mean scores and variability. The sample includes 198 urban and 162 rural students, ensuring adequate representation from both locations. The mean scientific attitude score of urban students (Mean = 3.782) is slightly higher than that of rural students (Mean = 3.681), suggesting a marginal advantage for students from urban areas. The standard deviation values for urban (0.741) and rural (0.784) students are relatively similar, indicating

comparable variability in scientific attitude within both groups. The calculated t-value of 0.95 suggests that the difference between urban and rural students is not statistically significant at conventional levels. This indicates that location does not play a decisive role in shaping students' scientific attitude. Overall, the findings suggest that students from both urban and rural backgrounds exhibit similar levels of scientific attitude, reflecting a broadly comparable orientation toward scientific thinking irrespective of location.

Hypothesis

There is no significant difference in the scientific attitude of higher secondary students with reference to gender (Male/Female).

Test:

- **One Samples t-test:** This test is used to compare the mean scores of scientific attitude between two independent groups (Male and Female).

One-Sample Test

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Scientific Attitude	117.033	359	.000	3.836	3.771	3.900

The one-sample t-test results clearly demonstrate a statistically significant outcome for students' scientific attitude scores. The obtained t-value of 117.033 is exceptionally high, indicating that the sample mean differs substantially from the hypothetical test value of zero. With 359 degrees of freedom, calculated from the total sample size of 360 students, the t-distribution used for analysis is appropriate and reliable. The significance level ($p = 0.000$, two-tailed) is far below the conventional threshold of 0.05, leading to the rejection of the null hypothesis. This confirms that the observed scientific attitude scores are not due to chance and significantly deviate from the neutral test value.

The mean difference of 3.836 indicates that students, on average, possess a considerably positive scientific attitude. This finding is further reinforced by the 95% confidence interval, which ranges from 3.771 to 3.900 and does not include zero, confirming both statistical and practical significance. The narrow confidence interval reflects consistency and precision in the results, suggesting high reliability. The findings indicate that the students demonstrate a strong and favorable scientific attitude, highlighting positive engagement with scientific thinking and inquiry.

6. CONCLUSION

The present study underscores the significant role of scientific attitude in adolescent development, particularly when examined through the combined lenses of gender and family context. Adolescence is a critical phase in which individuals develop higher-order thinking skills, independence of thought, and rational judgment, all of which are closely associated with

scientific attitude. The findings indicate that adolescents generally possess a positive scientific orientation, reflecting an inclination toward logical reasoning, objectivity, and evidence-based understanding. Gender-wise analysis reveals only marginal differences, suggesting that scientific attitude is not inherently gender-specific but is largely shaped by environmental and social influences. In contrast, the family environment emerges as a crucial determinant, as adolescents from supportive, communicative, and intellectually encouraging families demonstrate stronger scientific attitudes. Parental encouragement, open discussion, and exposure to learning resources significantly enhance adolescents' curiosity and rational thinking. The study also highlights that a positive scientific attitude contributes to better academic engagement, informed decision-making, and resistance to irrational beliefs. These outcomes emphasize the need for educational systems and families to collaboratively foster inquiry-based learning and critical thinking practices. Integrating scientific attitude development into school curricula, teacher practices, and family interactions can support adolescents' cognitive maturity and social responsibility. Overall, nurturing scientific attitude during adolescence not only strengthens intellectual growth but also prepares young individuals to function effectively in a knowledge-based and rapidly changing society, thereby contributing to their holistic and sustainable development.

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