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# A Study of the Scientific Attitude of Adolescents in Relation to Their Gender and Types of School

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#### ABSTRACT

Scientific attitude refers to a mindset that values evidence-based reasoning, objectivity, curiosity, openmindedness, and a readiness to question assumptions. It includes traits such as critical thinking, rational inquiry, skepticism, and a desire to seek the truth. Developing a scientific attitude among adolescents is crucial, as it not only enhances their academic performance in science but also equips them with life skills necessary for informed decision-making in a modern, technology-driven world. This study investigates the Scientific Attitude of adolescents in relation to their Gender and types of School. The present research was followed by a descriptive survey method. The sample of 444 students studying in class IX of High School / Higher Secondary School (Govt. and Private) located in District Kathua. For the present research, the standardized tool i.e. Attitude towards science developed by Dr. Savita Mishra in 2017 have been employed for the collection of the requisite data. The findings of the study indicate that there is no significant difference in the Scientific Attitude of Male and Female adolescents studying in IX class. Therefore, it can be revealed that there is significant difference in the Scientific Attitude of adolescents studying in Govt. and Private schools studying in class IX. It also revealed that the scientific attitude of the students studying in class IX in Govt. High/Higher Secondary Schools is significantly higher in comparison to those studying in Private Schools.

Keywords: Scientific Attitude, Adolescents, gender, Descriptive survey method

#### 1. INTRODUCTION

Science plays a fundamental role in shaping modern society and enhancing the quality of human life. From the technology we use daily to the medical advancements that extend life expectancy, science has become deeply embedded in every facet of our existence. It provides systematic knowledge based on observation, experimentation, and logical reasoning, enabling us to understand natural phenomena and solve complex problems (National Research Council, 2012). In today's rapidly changing world, science is more than a field of study, it is a driving force for progress, innovation, and sustainable development. Science, as both a body of knowledge and a method of inquiry, has significantly shaped modern civilization by fostering innovation, improving living standards, and solving complex global challenges. However, the impact of science extends beyond tangible technologies and discoveries, it also influences how individuals think and approach problems. Central to this intellectual influence is the development of a Scientific attitude, which



includes traits such as curiosity, open-mindedness, objectivity, skepticism, and a reliance on empirical evidence (Yadav & Mishra, 2013). Cultivating a scientific attitude is not only essential for scientists but also for students, educators, and informed citizens in a democratic society.

In an era marked by rapid scientific advancement and technological innovation, the cultivation of a scientific attitude has become increasingly vital for individuals and societies alike. A scientific attitude refers to a set of mental dispositions that include curiosity, objectivity, rationality, open-mindedness, and a readiness to suspend judgment until reliable evidence is obtained (Yadav & Mishra, 2013). These attributes are essential not only for practicing scientists but also for students, educators, and citizens who must navigate an increasingly complex and data-driven world. A person with a scientific attitude does not accept claims blindly but rather questions assumptions, evaluates evidence critically, and seeks logical explanations based on observable phenomena (Lederman et al., 2014). Scientific attitude also plays a pivotal role in education, particularly in the context of science learning. It encourages learners to engage in inquiry-based learning, where they actively construct knowledge through exploration, experimentation, and reflection (Miri et al., 2007). This fosters higher-order thinking skills, such as analysis, synthesis, and evaluation, which are crucial for academic success and informed decision-making. Moreover, a strong scientific attitude helps learners resist misinformation, develop problem-solving competencies, and participate meaningfully in discussions on socio-scientific issues, such as climate change, public health, and ethical technology use (McComas, 2020).

The development of a scientific attitude does not occur in isolation but is influenced by various factors including teaching methods, curriculum design, cultural context, and parental and peer attitudes. Educators play a key role in modelling and reinforcing these traits by creating learning environments that value questioning, evidence-based reasoning, and critical discussion (Abd-El-Khalick & Lederman, 2000). Therefore, understanding the nature and significance of scientific attitude is crucial for designing educational practices that foster scientific literacy and prepare learners for active participation in a knowledge-based society.

# 2. REVIEW OF RELATED LITERATURE

**Paul and Kumari (2020)** investigated the scientific attitude of high school students in relation to gender, locality, and school management type. The study found that most students demonstrated a moderate level of scientific attitude. Additionally, the results showed no significant differences in scientific attitude based on gender or the type of school management.

**Sinha and Suman (2022)** carried out a study examining the scientific attitude of secondary school students, considering gender, type of school, and school locality. The study included a sample of 130 students. The findings indicated no significant difference in scientific attitude between male and female students. However, students from private and urban schools demonstrated higher levels of scientific attitude compared to those from government and rural schools, respectively.

**Nisha K. and Prema (2022)** conducted a study to assess the level of scientific attitude among school students and to examine whether there were significant differences based on gender and age. Using a survey method, the research involved a sample of 227 students. The findings revealed that there were no significant differences in scientific attitude between male and female students, nor among students of different age groups.

Victoria (2022) examined the scientific attitude of secondary school students based on factors such as locality, gender, and type of school management. The study involved a sample of 100 Class 9 students



from both government and private schools in Telangana. The findings showed that students from private schools exhibited a significantly higher level of scientific attitude compared to their counterparts in government schools.

**Bssattaswamy and Kumar (2022).** studied the relationship between Scientific Attitude and Achievement in Science among Secondary School Students in relation to gender in Mysore City Karnataka. The study revealed that there is no significant difference between Boys and Girls Achievement in Science and Scientific Attitude.

**Sharma and Yadav (2023)** explored the influence of gender, school type, and students' scientific attitudes on their performance in science. The study found that female students significantly more positive scientific attitude than male students. Additionally, the type of institution played a key role, with students from private schools showing higher levels of scientific attitude compared to those from government schools.

**Dr. M. Shankar (2023)** conducted a study on Scientific Attitude of Secondary School students to compare the Gender Difference. The results of this study showed that there is significant difference between Scientific Attitude of Girls and Boys of Govt. and Private Schools of Chickballapur District of Karnataka State.

**Aggarwal (2024)** aimed to compare the scientific attitude and problem-solving abilities of adolescent boys and girls. The study involved a sample of 200 Grade 11 students from government schools in the Jawali Tehsil of Kangra District, Himachal Pradesh. The findings indicated a significant difference in both scientific attitude and problem-solving ability among the adolescent students.

# 3. SIGNIFICANCE OF THE STUDY

One of the significant contributions of science to daily life is its ability to provide logical explanations for various phenomena and processes. Cultivating a scientific attitude from early childhood is essential, as it forms the foundation for rational thinking and inquiry-based learning. Children who develop strong scientific attitudes are more likely to think critically, collaborate effectively with others, and act responsibly within their communities (Halim et al., 2018). Therefore, fostering such attitudes from an early age should be a central objective of science education. Encouraging the development of a scientific outlook can fundamentally transform a child's perspective, enabling them to approach problems analytically and with an open mind. Learners who exhibit positive scientific attitudes are likely to derive greater educational and practical benefits from science compared to those who lack such a disposition.

Given the vital role scientific attitude plays in everyday life and its significant contribution to the development of rational thinking, the present study seeks to explore the scientific attitude of adolescents. Numerous studies have been conducted in this area. For instance, Kavode et al. (2014) examined the scientific attitude, attitude towards science, and science achievement of senior secondary school students in Katsina State, Nigeria, with a specific focus on gender differences. Employing a descriptive survey research design, the study revealed that there was no significant difference between male and female students in terms of scientific attitude, attitude, attitude towards science, and science, and science achievement when analysed based on gender.

Although some studies have been reported concerning Scientific Attitude and Independent variables like Gender, Locale, Type of institution. This study will try to look at various dimensions of Scientific Attitude and its influence on Gender, Type of School. Also, no study has been reported from District Kathua where Scientific Attitude is being studied either alone or in combination with certain variables.

In light of the aforementioned research gaps, the present study has been undertaken to investigate scientific



attitude among secondary school students, with particular reference to variables such as gender and type of institution.

The findings of this study are anticipated to be valuable for educators, as they will offer insights into students' individual scientific attitudes, thereby enabling teachers to more effectively support students' academic growth and personal development. Additionally, the results may inform curriculum designers and educational planners in formulating strategies that enhance learning experiences and foster scientific attitudes among school students. The study may also prove beneficial to science educators, guidance counsellors, and academic researchers. Curriculum specialists may utilize the outcomes to evaluate the effectiveness of science instruction, while students of psychology and education may reference the findings to examine the progression of attitudinal development.

# 4. OBJECTIVES OF THE STUDY

- 1. To study the extent of Scientific Attitude among adolescents.
- 2. To compare the Scientific Attitude of Male and Female adolescents.
- **3.** To compare the Scientific Attitude of Male and Female with respect following dimensions of Scientific Attitude.
- Elimination of Beliefs in Superstition
- Curiosity to know
- Open Mindedness
- Facts with Proofs
- Critical Evaluation
- Change of Opinion after getting Evidence
- Attitude to Discover
- Respect for Other Views
- To compare the Scientific Attitude of adolescents studying in Govt. and Private schools.
- To compare the Scientific Attitude of adolescents studying in Govt. and Private schools with respect to following dimensions.
- Elimination of Beliefs in Superstition
- Curiosity to know
- Open Mindedness
- Facts with Proofs
- Critical Evaluation
- Change of Opinion after getting Evidence
- Attitude to Discover
- Respect for Other Views

# 5. HYPOTHESES OF THE STUDY

- 1. There will be no significant difference in the Scientific Attitude of Male and Female adolescents.
- 2. There will be no significant difference in the Scientific Attitude of Male and Female adolescents with respect to following dimensions:
- Elimination of Beliefs in Superstition
- Curiosity to know



- Open Mindedness
- Facts with Proofs
- Critical Evaluation
- Change of Opinion after getting Evidence
- Attitude to Discover
- Respect for Other Views
- **3.** There will be no significant difference in the Scientific Attitude of adolescents studying in Govt. and Private schools.
- There will be no significant difference in the Scientific Attitude of adolescents studying in Govt. and Private schools with respect to following dimensions;
- Elimination of Beliefs in Superstition
- Curiosity to know
- Open Mindedness
- Facts with Proofs
- Critical Evaluation
- Change of Opinion after getting Evidence
- Attitude to Discover
- Respect for Other Views

# 6. DELIMITATIONS OF THE STUDY

- 1. The present study was delimited to the students of District Kathua.
- 2. The Study was delimited to the use of multistage sampling under probability sampling technique.
- 3. The study was confined to the use of Survey as a method of research.
- **4.** The study was confined to Scientific Attitude as Dependent Variable, Type of school, and Gender as Independent Variable.

# 7. METHODOLOGY OF THE STUDY

The survey method under descriptive method of research is used for the present investigation.

# **POPULATION OF THE STUDY**

In present investigations, the students studying in class IX of High School / Higher Secondary School (Govt. and Private) located in District Kathua constituted the population.

# SAMPLE OF THE STUDY

Multistage random sampling technique was used to select the class IX of High School / Higher Secondary School (Govt. and Private). For this purpose, a list of all High/Higher (Govt.& Private schools) was procured from the authentic source. There is total no. of 161 Govt. and 143 Private High/Higher Secondary Schools in District Kathua. Out of these, 5% of the school, were selected randomly (by using lottery method technique) both in case of Private and Govt. schools. In this way a total of 8 Govt. and 7 Private schools were randomly selected. Out of these selected schools, 50% of the students were randomly selected by using lottery method technique. The detailed description of the selected sample is as under.

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#### Table 1 Sample of Students drawn from Govt. High School / Higher Secondary Schools of District Kathua.

S. No.	Name of the Schools	Total No. of Students (9 <sup>th</sup> standard)	Approx. 50% of the total Population
1	Govt. Girls Higher Secondary School Kathua	61	31
2	Govt. Higher Secondary School (boys) Kathua	83	41
3	Govt. High School Parliwand (Kathua)	57	29
4	Govt. Higher Secondary School kharote	71	36
5	Higher Secondary School Nagri Prole	70	35
6	Higher Secondary School Basantpur	62	31
7	Higher Secondary Forelain	61	30
8	High School Chadwal	77	38
	Total	542	271

# Table 2 Sample of Students drawn from High / Higher Secondary (Private) Schools of District Kathua

S. No.	Name of the School	Total No. Students (9 <sup>th</sup> standard)	Approx. 50% of the total Population
1	Nav Adarsh Academy Kathua	29	15
2	Little Angle Higher Secondary School	51	25
	Kathua		
3	Minerva Public School Kathua	36	18



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4	DAV Higher Secondary School Kathua	61	31
5	RS Jagriti Niketan School Kathua	49	24
6	RS Golden Academy khrote	59	30
7	Shivalik Balniketan Kharote	61	30
	Total	346	173

#### 8. VARIABLES OF THE STUDY

• Independent Variable:

Type of School and Gender

• Dependent Variable:

Scientific Attitude

#### 9. STATISTICAL TECHNIQUES USED

- Percentage (%)
- Mean (M)
- Standard Deviations (SD)
- t-test/Critical Ratio

# 10. DATA ANALYSIS AND INTERPRETATION

#### 1. LEVEL OF SCIENTIFIC ATTITUDE AMONG ADOLESCENTS

The level of Scientific Attitude among Government and Private school (9<sup>th</sup>) grade students is shown in the table below:

S.no.	LEVELS	Ν	PERCENTAGE (%)
1	Above Average	116	26.07
2	Average	172	38.65
3	Below Average	157	35.28
	Total	445	

#### Table: 2 LEVEL OF SCIENTIFIC ATTITUDE AMONG 9th GRADE STUDENTS

From the above table it can be interpreted that the majority (38.65%) of 9th grade students are having average Scientific Attitude. On the other hand (35.28%) of 9th grade students possess below average Scientific Attitude and (26.07%) students are having above average of Scientific Attitude.

#### 2. TESTING OF HYPOTHESIS-1

The information related to the testing of Hypothesis 1 has been given as below:

#### Table:3 Difference in the Scientific Attitude of Male and Female Adolescents

S.NO.	Independent	Ν	Mean	SD	C.R	Result:
	Variable					Not
1	Male	245	265.4	19.636	0.96	Significant
2	Female	200	263.7	17.998		at 0.05 level



# 3. TESTING OF HYPTHESIS- 2

The information related to the testing of Hypothesis 2 has been indicated below:

S.no.	Dimensions	Indepen dent Variable	N	Mean	SD	CR	Result
1.Elimination of beliefs in superstition		Male	245	12.99	2.91	0.72	Not Significant
		Female	200	12.79	2.90		at 0.05 level
2.Curiosity to know		Male	245	60.35	8.34	0.21	Not Significant
		Female	200	60.18	7.94		at 0.05 level
3.Open r	nindedness	Male	245	48.8	7.88	0.82	Not Significant
	Female	200	48.18	7.96		at 0.05 level	
4.Facts with Proofs	Male	245	63.59	9.45	0.21	Not Significant	
		Female	200	63.64	9.10		at 0.05 level
5.Critica	l Evaluation	Male	245	33.49	5.31	0.60	Not Significant at 0.05 level
		Female	200	33.17	5.90		
6.Chang after Evi	e of Opinion idence	Male	245	28.87	6.98	0.56	Not Significant
		Female	200	28.51	6.44		at 0.05 level
7 1 ++:+	la ta disaawar	Male	245	11.11	2.49	0.43	Not
7.Attitude to	ie to discover	Female	200	10.88	3.39		at 0.05 level
8.Respec	et for other views	Male	245	6.41	1.81	0.17	Not Significant at 0.05 level

#### Table :4 Dimension-wise Difference in the Scientific Attitude of Male and Female Adolescents

# 4. TESTING OF HYOTHESIS- 3

The information related to the testing of Hypothesis 3 has been given below:



S.NO.	Independent Variable	N	Mean	SD	C.R.	Result
1	Govt.	271	262.50	18.29	3.03	Significant at 0.01 level
2	Private	174	268.09	19.41		

#### Table: 5 Difference in the Scientific Attitude of Adolescents studying in Govt. and Private Schools

#### 5. TESTING OF HYPOTHESIS- 4

The information related to the testing of Hypothesis 4 has been given below:

# Table: 6 Dimension-wise Difference in the Scientific Attitude of adolescents studying in Govt. and Private school

S.no.	Dimensions	Independent Variable	Ν	Mean	SD	CR	Result
1.El Beliefs	imination of in superstition	Govt. Private	271 174	12.405 13.701	2.87 2.81	4.72	Significant at 0.01 level
2.Curio	osity to know	Govt. Private	271 174	59.867 61.011	8.03 8.28	1.82	Not Significant at 0.05 level
3.Ope	en Mindedness	Govt. Private	271 174	48.416 48.718	8.59 6.76	0.41	Not Significant at 0.05 level
4.Fac	ts with Proofs	Govt. Private	271 174	62.627 65.097	9.82 8.19	2.86	Significant at 0.01 level
5.Criti	cal Evaluation	Govt. Private	271 174	33.726 32.793	5.39 5.82	1.69	Not Significant at 0.05 level
6.Cha afte	nge of opinion er Evidence	Govt. Private	271 174	27.249 30.195	6.54 6.80	4.53	Significant at 0.01 level

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	Govt.	271	11.214	2.49	2.43	Significant
7.Attitude to discover						at 0.05
	Private	174	10.649	2.33		level
	Govt.	271	6.498	1.87	1.69	Not
8.Respect for other						Significant
views	Private	174	6.201	1.77		at 0.05 level

# 6. FINDINGS OF THE STUDY

- 1. Majority (38.65%) of IX grade students are having average Scientific Attitude. On the other hand (35.28%) of 9th grade students possess below average Scientific Attitude and (26.07%) students are having above average of Scientific Attitude.
- 2. There is no significant difference in the Scientific Attitude of Male and Female Adolescents studying in class IX.
- **3.** There is no significant difference in the **Scientific Attitude of Male and Female Adolescents** with respect to "**Elimination of beliefs in superstition**" as its dimension.
- **4.** There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Curiosity to know** as its dimension.
- **5.** There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Open Mindedness** as its dimension.
- 6. There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to Facts with proofs as its dimension.
- 7. There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Critical Evaluation** as its dimension.
- **8.** There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Change of Opinion** after Evidence as its dimension.
- **9.** There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Attitude to discover** as its dimension.
- **10.** There is no significant difference in the Scientific Attitude of Male and Female Adolescents with respect to **Respect for other views** as its dimension.
- 11. The scientific attitude of the Students studying in class IX in **Private High/Higher Secondary schools** is significantly higher in comparison to those studying in Government Schools.
- 12. The scientific attitude of the students studying in class IX in Govt. High/Higher Schools is significantly higher in comparison to those studying in Private Schools in 'Elimination of Beliefs in superstition' as its dimension.
- **13.** There is no significant difference in the Scientific Attitude of Adolescents studying in Govt. and Private Schools with respect to **Curiosity to know** as its dimension.
- **14.** There is no significant difference in the Scientific Attitude of Adolescents studying in Govt. and Private Schools with respect to **Open Mindedness** as its dimension.
- 15. The Scientific Attitude of the students studying in class IX in Govt. High/ Higher Schools is significantly higher in comparison to those studying in Private Schools with 'Facts with Proofs'



#### as its dimension.

- **16.** There is no significant difference in the Scientific Attitude of Adolescents studying in Govt. and Private Schools with respect to **Critical Evaluation as its dimension**.
- 17. The scientific attitude of the Student studying in class IX in Private High/Higher Secondary Schools is significantly higher in comparison to those studying in Government Schools with 'Change of Opinion after Evidence' as its dimension.
- 18. The scientific attitude of the students studying in class IX in Govt. High/Higher Secondary Schools is significantly higher in comparison to those studying in Private Schools with respect to 'Attitude to discover' as its dimension.
- **19.** There is no significant difference in the Scientific Attitude of Adolescents studying in Govt. and Private Schools with respect to **Change of Opinion after Evidence as its dimension**.

#### 7. EDUCATIONAL IMPLICATIONS

- In science classroom, teachers should have concern with students in facilitating them in developing scientific attitude and students should participate in the learning process by questioning, self-questioning, cross questioning, reflecting at their own explanations.
- To improve the Scientific attitude of students, students must be given opportunities for practicals, experiments or activities. Over the time, such practices may facilitate the students to develop scientific attitude and score better in science.
- In science text books, at the end of a chapter there must be some open- ended questions to facilitate the diversification of students' thinking.
- The presentation of content, rather than being in heavily texted mode, should be enriched with what, why and how aspects related to it.
- There should be sufficient number of practical's, experiments, activities pertaining to a particular concept.
- From the findings it is reported that there exist significant differences in the Scientific Attitude of students studying in Government and Private schools, significant steps must be taken up by the concerned authorities to improve conditions in Private schools
- In this line, proper facilities must be provided by the authorities to improve conditions of learning by facilitating them with appropriate resources like laboratories, tools, appropriate teaching aids so as to develop the Scientific Attitude of students.
- Teachers should give importance for activity method, project method, and heuristic method, for developing scientific attitude among the students.
- Teachers should launch programmers' such as science exhibitions, educational tours, projects, workshops, science fair, organizing science club and science quiz etc. which help in developing scientific attitudes among students.
- Parents attitudes, beliefs, and behaviors significantly impact a child's scientific attitude. For instance, a parent who values science and encourages scientific inquiry is more likely to foster a positive attitude in their child.

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