Attitude of Science Teacher towards Students in Urban and Rural Schools

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Abstract
In order to better understand the effects of instructional materials and teacher preparation, this study examines the attitudes that science instructors have towards pupils in both urban and rural schools. Based on 200 participants, the results provide interesting new information. The research highlights the critical role that high-quality instructional materials have in influencing teacher-student interactions by showing a strong positive association between educational content and students' attitudes towards science. In a similar vein, teacher preparation stands out as a critical component, showing a robust positive association with student attitudes. The study also reveals a significant positive correlation between teacher training and educational materials, highlighting the complementary benefits of highly qualified instructors and excellent teaching materials. These dynamics are captured by the regression model, which offers a thorough comprehension of the complex interactions between these variables and insightful conclusions.
Keywords: Educating materials, Teachers training, Student Attitude Toward Science

Introduction
One of the things that humans have produced to satisfy certain wants and desires is science. The strongest driving force behind scientific inquiry has always been curiosity. The pursuit of truth has taken centre stage in the scientific community's argumentation. Because it has been the subject of persuasion for so many millennia, a persistent number of individuals have been interested in it (Conant, 1951). Science is no longer limited to a small group of deeply committed individuals. Science is currently taught in general education as modern life consistently supports scientific truths and rules, to varying degrees. (Excellent, 1982) Science is a necessary component of education, standing side by side with other topics. It provides information on specific rules and facts as well as an understanding of data and procedures

unique to the scientific community Sharma (1989). All subjects should, nonetheless, meet the standards of intellectual, practical, vocational, cultural, moral, and aesthetic values before being added to the curriculum. In addition to these, science education fosters a good attitude towards science and scientific aptitude, all of which are highly beneficial and simultaneously applicable to different contexts in the learners' lives. The traits that a student acquires from studying science are extremely valuable to the people who live in the community (Vaidya & Narendra, 1976). According to the Government of India's Scientific Policy Resolution (1958), "Intense cultivation to meet the country's requirements is the dominating feature of the contemporary world. Due to the many qualities that science imparts to both the person and the community, it is now required to be studied in every educational system, beginning in the primary grades.(Bhaskar Rao, 1997). An attitude is a sentimental response to someone or something. It is an individual's reaction to anything that they have experienced and have learned to be either positive or negative.(Atkinson, Hilgard, & Atkinson, 1958). The phrase "attitude towards science" refers to a collection of attitudes that are defined by the use of science as the source or object of these sentiments (Bhandula et al., 1985). It is only via firsthand experience and close observation during the science learning process that one may cultivate a scientific mindset. In order for the pupils to experience, see, and feel the need of developing this attitude, the instructor must create circumstances in the classroom or in the field. For example, scientific endeavours require that students be open-minded. While respecting the opinions of others, they should only accept confirmed facts. In a scientific endeavour, curiosity must be the guiding principle. They ought to be taught to pay attention and to think clearly and critically. Experiments in science require accuracy and precision. The goal of science is to discover the truth. If the truth is to be presented, bias and prejudice have no place here. As a result, the student's observations have to be impartial and objective. In the study of science, intellectual integrity is essential. A scientist approaches a problem methodically and methodically, checks each step rationally, and withholds judgement until he is satisfied with the evidence. It is important for students studying science to cultivate these qualities as a mental attitude by making them a habit of any scientific endeavour. Science students should never trust rumour or superstitions. They rely on established facts or evidence, as well as cause-and-effect relationships (Das, 1985).

The social and economic advancement of each country depends on its level of education. Human capital is crucial for bringing about change and progress in any given country. People look towards the school system and have high expectations from it in order to prepare manpower, such as citizens, employees, and most importantly, our leaders, to manage the nation. Students' learning, socialisation, and job readiness are all supposed to be influenced by schools and instructors. The PhD thesis of Weimer (2007) contains extremely encouraging remarks and discoveries in comparison to Blackorby, Chorost, Garza, and Guzman (2005). Students who are successful instructors, according to him, are clear, fascinating, and accessible. A person's attitude is the state of mind and emotions that determine how they behave towards an item or things. It is a learned quality, typically brought about by experiences. It is a disposition that influences how one feels and acts towards other people, things, or objects. It also influences one's ideas and behaviours. Teachers have a significant impact on students' performance and play a fundamental part in achieving educational goals, according to Akiri and Ugborugbo (2009) and Akbari and Allvar (2010). During classroom interactions with kids, the teacher is the one who puts the nation's policies into practice.

Attitude of teachers

The lessons of the Quran and Hadith are consistent with Cantral's definition of attitude, which includes sentiments, thoughts, and actions. The Quran highlights the need of having a positive outlook, especially for parents and teachers, since Allah views these attributes favourably. On the other hand, arrogance and needless loudness are frowned upon, in accordance with the Quranic teaching that Allah detests arrogant conduct. The Holy Quran (21:18) clarifies Luqman's (Alaihissalam) admonition to his son, emphasising the need of modesty and humility. The prohibition against mocking others and acting haughtily is consistent with the overarching idea of cultivating optimistic outlooks. The passage forbids boastful, conceited gait and advises against walking with pertness. The Islamic teachings prioritise the virtue of humility over arrogance, and they encourage peaceful and courteous interactions with others. Overall, the Quran's view of attitudes is consistent with Cantral's definition, highlighting the importance of modesty, humility, and good attitudes in Islam's moral and ethical framework.

Purpose of the study

The objectives of the study are given as follows;

- ➢ To investigate the impact of educating material on student attitude toward science.
- ➢ To investigate the impact teacher training on student attitude toward science.
- ➢ To investigate the impact educating material on teacher training.

Research Questions.

The major questions of this particular study are as under;

- ➢ What is impact of educating material on student attitude toward science?
- ➢ What is the impact teacher training on student attitude toward science?
- ➢ Does educating material affect teacher training?

Problem Statement

The effect of instructional materials and teacher preparation on students' attitudes towards science is an important but little-studied topic in Punjab, Pakistan's educational system. The urban and rural areas of Kallar Syedan, Chakwal, and Kallar Kahar offer a distinct environment in which the efficacy of educational initiatives may differ. While having a good attitude towards science is crucial for academic achievement and potential job choices, different results may be obtained depending on the resources and teaching methods used in different districts, schools, colleges, and institutions. The purpose of this study is to close the knowledge gap on the relationship between instructional materials, teacher preparation, and students' attitudes towards science. Given the various socioeconomic and cultural backgrounds found in the designated areas, a thorough investigation of the variables impacting views is required. The research looks at a wide range of educational settings, from colleges to schools, in an effort to offer thorough insights that might guide specific changes in scientific teaching methods and policy. In the end, deciphering the intricacies of this relationship will help to cultivate a favourable learning atmosphere and raise the standard of scientific instruction in the designated areas of Punjab, Pakistan.

Significance of the Study

Beyond the local educational setting, research on how scientific education materials and teacher preparation affect science attitudes among students in Punjab, Pakistan, especially in the districts of (Kallar Syedan, Chakwal, and Kallar Kahar), is important. This study is extremely important for a number of important reasons. First off, examining the school environment in these particular districts sheds light on the local factors affecting the way that kids view science. Punjab is a varied province that includes both urban and rural environments, each with their own potential and difficulties. For the purpose of developing focused ways to improve scientific education, it is essential to comprehend how educational interventions impact attitudes in this diverse setting. Second, by concentrating on various educational levels, such as schools, colleges, and universities, the study provides a thorough understanding of the whole educational spectrum. The interconnectivity of various institutions in influencing students' perspectives throughout time is acknowledged by this holistic approach. The results can help educators and policymakers understand how to best promote a long-lasting favourable attitude towards science by coordinating efforts across all educational levels. Additionally, examining the effects of instructional materials and teacher preparation is in line with international initiatives aimed at enhancing scientific education. The advancement of society depends on the disciplines of science, technology, engineering, and mathematics (STEM), and inspiring children to choose STEM occupations depends critically on fostering good attitudes towards science. This study, which is conducted in the particular setting of Punjab, adds important information to the global conversation on successful scientific education tactics. Furthermore, considering the unique qualities of these districts, Kallar Syedan, Chakwal, and Kallar Kahar were purposefully included in the research. The historically significant Kallar Syedan, the topographically diversified Chakwal, and the distinctively geological Kallar Kahar all provide various learning contexts. The study can identify elements unique to a certain region that affect people's attitudes towards science, offering complex insights that are relevant not only to Punjab but may also help shape educational programmes in other areas with comparable problems. The study's capacity to direct educational actions and changes increases its relevance. This research can act as a guide for developing focused interventions in Punjab if favourable connections between particular educational practices and enhanced attitudes towards science are found. It may also be expanded to other areas with comparable educational circumstances. Examining how instructional materials and teacher preparation affect science-related attitudes among students in Punjab, Pakistan, is important because it can help shape educational policies, add to international conversations about STEM education, incorporate Islamic principles, and deal with a variety of issues in the districts that are being studied. This research attempts to create an atmosphere that not only transmits scientific information but also sustains a positive and persistent attitude towards the pursuit of scientific inquiry by bridging the gap between theory and practice.

Literature Review

In their paper by (Toma, et al,. 2019) explored how primary school pupils perceived the nature of science and how they felt about it, examining variations based on gender, grade level, and cultural background. The goals were to compare across demographic categories and evaluate attitudes and understandings. Grade level, gender, and cultural background were the independent factors. Scores on measures gauging opinions on the nature of science and attitudes towards it made up the dependent variables. A survey that 1,083 children in grades 4-6 from five schools in Colombia and Spain completed was part of the methodology. The findings showed that although there were some cultural and grade level variations, views were largely positive. For pupils to have more informed opinions about the nature of science, more training is required.

By (Mirahmadizadeh et al.'s 2020), paper looked at how pupils felt and behaved after the unexpected shutdown of schools due to the COVID-19 epidemic. The assessment of attitudes, feelings, and related variables was one of the goals. The scores on measures evaluating attitude and different emotions were the dependent variables; there were no obvious independent factors. An online poll that 902 Iranian middle and high school students completed was part of the methodology. The findings showed that kids' opinions about unexpected school closings were not entirely positive. They also reported feeling more depressed, anxious, and stressed out, which were all related to things like grade level and underlying medical issues. Students require assistance to deal with the abrupt interruptions caused by school closures.

Shah's essay from (2022), looked into college student instructors' views towards science in both urban and rural areas. The aim of the study was to evaluate how student instructors from urban and rural areas felt about science. Location (rural vs. urban) was the independent variable, while scores on a scale indicating one's attitude towards science was the dependent variable. A survey performed by 200 BEd student instructors from institutions in Gujarat, India, was part of the approach. The study's result was that student teachers in urban areas were more likely than those in rural areas to have positive attitudes towards science. Teacher preparation programmes should give science learning assistance that takes location and past exposure into consideration, as these factors impact the attitudes of student teachers.

The attitudes of college student instructors towards science were compared between urban and rural areas in this 2014 study by (Prakash and Xavier). The goals were to evaluate and contrast the attitudes of urban and rural BEd trainees towards science. Location (rural vs. urban) was the independent variable, while scores on a scale indicating one's attitude towards science was the dependent variable. A survey conducted by 200 BEd student instructors from Tamil Nadu, India, institutions, was part of the approach. The study's result was that student teachers in urban areas were more likely than those in rural areas to have positive attitudes towards science. Rural trainees should receive more science exposure and resources from teacher training programmes since the location and accessibility of resources influence the attitudes of student teachers.

The influence of inquiry-based scientific education on the attitudes and academic performance of rural primary school pupils was investigated by (Veloo, et al 2013). The goals were to assess how an inquiry-based programme affected students' attitudes and academic performance as well as the function of teacher assistance. Science success scores and attitudes towards science were dependent variables, whereas inquiry-based education was the independent variable. The approach comprised monitoring results both before and after an inquiry-based programme was implemented for 28 children in grades 4-6. The study's findings indicated that, particularly when combined with greater teacher support, the inquirybased method enhanced rural students' academic performance and attitudes towards science. This highlights the need of teacher professional development programmes that are appropriate and student-cantered.

By (Anwer et al.'s 2012), study looked at Pakistani students' perspectives on science. The goals were to evaluate students' opinions towards science and make comparisons across various demographic parameters. The gender, grade level, school system, and locality were considered independent factors. Scores on a scale gauging people's attitudes towards science served as the dependent variable. 329 sixth- and seventh-graders from public and private schools in Punjab's urban and rural areas participated in a survey as part of the methodology. It was concluded that while opinions were generally quite favourable, they varied according to demographic criteria such as gender, grade level, and kind of school. In order to enhance attitudes and accomplishment, more emphasis needs to be placed on the actual application of principles.

This 2007 paper by (Maharaj-Sharma) investigated the attitudes of secondary school pupils in Trinidad and Tobago towards science in both urban and rural settings. The goals were to evaluate and contrast the views of pupils in urban and rural areas. Scores on measures gauging attitudes towards science in schools were the dependent variable, while geography (rural versus urban) was the independent variable. A survey that was completed by 497 Form 3 pupils from 5 urban and 5 rural schools was part of the approach. The findings indicated that while some positive sentiments were displayed by both urban and rural pupils, overall attitudes among urban students were more favourable. The influence of a student's geographic location on exposure and resources shapes their opinions. It is necessary to distribute training and facilities more fairly.

By (Ntibi and Edoho's 2017) ,study examined how pupils' attitudes towards mathematics and fundamental science were impacted by their school's location. Comparing the opinions of pupils from urban and rural areas was the goal. The location of the school rural or urban was the independent variable, while the attitudes towards fundamental science and mathematics were the dependent variables. 240 junior secondary pupils in Cross River State, Nigeria, both urban and rural, were surveyed as part of the approach. The findings showed that whereas urban pupils generally exhibited much higher favourable views towards both math and fundamental science, both urban and rural students had slightly positive sentiments. Location influences resources and exposure, which shapes topic viewpoints. Investments in STEM education must be made fairly.

The attitudes and perspectives of Jordanian medical students towards online learning during the COVID-19 epidemic were examined by (Muflih et al.2021). Evaluating attitudes towards emergency remote instruction and identifying contributing factors were the goals. Scores on measures evaluating attitudes and perceptions were the dependent variable; there were no obvious independent factors. A poll of 497 medical students from two Jordanian institutions was used as part of the approach. Students' opinions were found to be mixed, acknowledging both advantages like flexibility and disadvantages such a lack of social connection. Expectations and preparation for transversal online learning were among the elements that influenced overall sentiments. Focused assistance has the power to create more optimistic attitudes towards online medical education.

Methods and Results

This cross-sectional study looks at how teacher preparation programmes and instructional materials impact students' attitudes towards science across the educational spectrum. It uses a sample of 200 students from schools, colleges, and universities in rural and urban Punjab, Pakistan, with a focus on the districts of Kallar Syedan, Chakwal, and Kallar Kahar. The research design, which collects data at a single point in time in 2024, will enable a regression analysis to offer quick insights into the relationship between educational resources, teacher preparation techniques, and scientific perceptions while taking into account the variety of learning environments that exist in modern Punjab, spanning both institutional and geographical contexts. The project aims to provide focused, evidence-based initiatives to improve scientific teaching across both rural and urban student groups by sampling throughout this spectrum.

Model Specification

$$SATS= \beta1 + \beta2EM+ \beta3TT+ \varepsilon$$

Where
SATS = Student attitude toward science
EM= Educating material
TT= Teacher training

β1 is the intercept
β2, and β3, are the coefficients for educating material and teachers training; respectively ε is the error term. This model can be estimated using linear regression student attitude toward science as the dependent variable and educating material and teachers training as the independent variables. The coefficients β2 and β3 can be interpreted as the average effect of each independent variable on educating material and teachers training, holding all other variables constant. If the coefficients β2, and β3, are positive and statistically significant, this would indicate educating material and teachers training a positive impact on student attitude toward science. Conversely, if the coefficients are negative and statistically significant, this would indicate that these educating material and teachers training have a negative impact on student attitude toward science.

This study will use Cronbach's analysis to assess the questionnaire instrument's reliability in order to guarantee reliable data analysis. The distribution of the variables will be summarised by descriptive statistics such as means, medians, standard deviations, and minimummaximum values. Correlation coefficients evaluate the direction and intensity of correlations between variables; values that are closer to +1 or -1 signify stronger positive or negative associations, respectively. Prior to the final analysis, the normality assumptions will be verified by diagnostic testing using the Shapiro-Wilk and Kolmogorov-Smirnov tests, and the homogeneity of variance between groups will be examined using Levene's test. The validity and applicability of statistical techniques for the research data will be informed by a careful assessment of these test findings. By using these preliminary analytics to ensure the integrity of the instruments and data, a strict framework for the study and the validity of the results is established.

Results

Demographic Analysis
Table 1

Male/Female

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	88	44.0	44.0	44.0
	Female	112	56.0	56.0	100.0
	Total	200	100.0	100.0	

There were 200 survey participants in all, with 88 (44%) and 112 (56%) of them being men, according to Table 1. This suggests that while men continued to make up a sizable component of the responder pool, women made up a modest majority of it. Overall, both genders are well-represented in the sample, despite the fact that the proportion of female responses is larger. There might have been a difference in the willingness of women to participate in surveys, as well as in the survey's availability and accessibility, among other important considerations. Additional research on response rates according to demographic variables may provide more light on the sample's representativeness.

Descriptive Analysis
Table 2

	N	Minimum	Maximum	Mean	Std. Deviation	wness		osis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
EM	199	28.00	50.00	37.8693	4.29505	.368	.172	.089	.343
TT	199	26.00	49.00	38.2563	4.16571	-.061	.172	-.138	.343
SATS	200	26.00	50.00	37.6750	4.98131	-.193	.172	-.278	.342
Valid N (listwise)	198								

Based on the descriptive statistics in Table 2, there were 199 valid responses for the EM and TT scales and 200 for the SATC scale. The mean scores were fairly similar across scales, ranging from 37.67 to 38.26, with TT having the highest average score. The standard deviations were also comparable, from 4.16 to 4.98, indicating a similar spread in the data across scales. The skewness and kurtosis values were all between -1 and 1, signifying that the data follows a normal distribution across all three scales. Overall, these descriptive statistics suggest consistent average responses and score distributions for the EM, TT, and SATC measures among this sample. With means above the midpoint and negatively skewed distributions, there is a tendency toward higher scale scores reported. Additional analysis into correlations or group differences could provide further evaluation of relationships between these scales.

Correlation Analysis

Table 3

		EM	TT	SATC
EM	Pearson Correlation	1	.501**	.369**
	Sig. (2-tailed)		.000	.000
	N	199	198	199
TT	Pearson Correlation	.501**	1	.508**
	Sig. (2-tailed)	.000		.000
	N	198	199	199
SATS	Pearson Correlation	.369**	.508**	1
	Sig. (2-tailed)	.000	.000	
	N	199	199	200

Table 3's correlation analysis shows statistically significant positive associations among the three scales: Student Attitude towards Science (SATS), Teacher Training (TT), and Educating Material (EM). In particular, there is a moderate connection (r =.369, p <.001) between EM and SATC, indicating that student attitudes towards science are positively correlated with the quality of instructional materials. Furthermore, TT and SATC had the greatest link (r =.508, p <.001), suggesting that student attitudes towards scientific education are positively correlated with effective teacher preparation even more. Overall, student attitudes and engagement with scientific courses are shown to improve when teachers get high-quality training and instructional tools. Improving these crucial areas of instruction might lead to more positive student perceptions of science and a more significant.

Reliability Analysis

Table 4

Cronbach's Alpha	N of Items
.802	30

With a Cronbach's alpha coefficient of.802, the overall scale employed in this investigation exhibits strong internal consistency, according to the reliability analysis results in Table 4. The fact that 30 items in all were tested indicates that the items are assessing the same underlying structures and have an appropriate level of inter-item correlation. It can be deduced that in this study, the student attitude towards science (SATS) scale is the dependent variable, while the educating material (EM) and teachers training (TT) measures are the independent factors. The prior correlation analysis's positive moderate-to-strong correlations between EM and TT with SATC provide evidence for their function as outcome variable predictors. The greater Cronbach's alpha suggests that EM and TT scales offer consistent findings across items, enhancing confidence in utilising these measures as independent variables. Their statistical associations with attitudes suggest that higher-quality instructional materials and teacher preparation may result in more positive sentiments from students about their scientific education. To ascertain if improvements in EM and TT have a direct impact on attitudes, more research is necessary employing SATS as the major outcome metric.

ANOVA Regression Analysis

Table 5

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1323.072	2	661.536	37.281	.000[b]
	Residual	3460.201	195	17.745		
	Total	4783.273	197			

a. Dependent Variable: SATC
b. Predictors: (Constant), TT, EM

A statistically significant model for predicting the dependent variable SATC (Satisfaction Score) is revealed by the regression analysis in Table 5. The predictors TT (Total Time) and EM (Effectiveness Measure) are part of the overall model, which shows a significant fit ($F = 37.281$, $p < 0.001$). The regression sum of squares (1323.072) and the mean square value (661.536) both show that the regression model explains a significant amount of the variance in SATC. The combined effect of predictors TT and EM enhances the model's capacity to account for variations in SATC results. The regression model appears to be dependable and offers insightful information about the correlation between the variables and the satisfaction levels, as indicated by the reasonably high F-value. According to this analysis, Effectiveness Measure (EM) and Total Time (TT) are significant determinants of student satisfaction (SATC), indicating the need for more research into how each one fits into the larger model.

Coefficients

Table 4.5.1

Model	B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.	Collinearity Statistics Tolerance	VIF
1 (Constant)	11.421	3.127		3.653	.000		
EM	.179	.081	.157	2.224	.027	.749	1.336
TT	.507	.083	.430	6.105	.000	.749	1.336

a. Dependent Variable: SATC

The coefficients for the regression model predicting SATC (Satisfaction Score), the dependent variable, are shown in Table 4.5.1. The predicted value of SATC when both predictors (EM and TT) are zero is shown by the constant term, 11.421. The predictors EM (Effectiveness Measure) and TT (Total Time) have unstandardized coefficients of 0.179 and 0.507, respectively. These coefficients show how SATC changes when one predictor is increased by one unit while the other predictor remains same. The relative significance of each predictor is revealed by the standardised coefficients (Beta), with TT having a Beta of
0.430 and EM having a Beta of 0.157. According to their respective t-values (TT: 6.105, EM:
2.224), both predictors significantly contribute to the model, with TT having a greater influence. Both predictors' p-values are less than 0.05, demonstrating their statistical importance. Given that both predictors have tolerance values more than 0.1 and VIF values close to 1.336, the co linearity statistics (Tolerance and VIF) indicate that there are no problems with multi co linearity. According to this investigation, Total Time (TT) and Effectiveness Measure (EM) both have a significant impact on the prediction of student satisfaction (SATC), with Total Time having a greater effect in this specific model.

Co linearity Diagnostics Table 4.5.1

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	EM	TT
1	1	2.988	1.000	.00	.00	.00
	2	.006	21.607	.51	.91	.05
	3	.006	22.648	.49	.09	.95

a. Dependent Variable: SATC

The multi co linearity in the regression model predicting the dependent variable SATC (Satisfaction Score) is evaluated using the co linearity diagnostics shown in Table 4.5.1. The variation in the predictors that each dimension captures is represented by the Eigen values. According to this research, the first dimension accounts for the majority of the variation with a dominating Eigen value of 2.988. The Condition Index values offer information about the intensity of multi co-linearity, with values below 30 being deemed acceptable. In this instance, there may be a multi co linearity problem because the Condition Index values for the second (21.607) and third (22.648) dimensions both surpass this cut-off. The variation Proportions show how much of each predictor's variation is related to each dimension. The constant's Eigen value in the first dimension is 1.000, indicating that multi co-linearity has no effect on the constant term. However, for the predictors EM and TT, there is a notable rise in the Variance Proportions for the second and third dimensions, suggesting probable colinearity between these predictors. Although the first dimension doesn't seem to be affected, the higher Condition Index values in the following dimensions call for more research or the evaluation of different model parameters, thus care should be used when interpreting the results.

Diagnostic analysis

Normality test for Student attitude toward science (SATS)

Table 4.6.1

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
SATC	.101	200	.000	.981	200	.007

a. Lilliefors Significance Correction

The data for the Student Attitude towards Science (SATS) scale is not normally distributed in this sample, according to Table 4.5.1's normality test findings ($p < .05$ for both the Kolmogorov-Smirnov and Shapiro-Wilk tests). The significant p-values show how the distribution deviates from a normal one. This implies that additional examination of the SATC data may not be adequate for parametric statistical tests, which rely on normality. Considering the positive skew seen for SATC in the descriptive statistics, a clustering of higher scores is probably linked to the violation of normalcy. Further analysis using transformation techniques or graphical displays may be able to determine the distribution's form. Nonparametric alternative tests should be utilised in the event of non-normality to assess group or correlation differences pertaining to science attitudes among students. Alterations to the SATC scale can be necessary in order to enhance model fit and produce a normal distribution prior to utilising parametric testing. The main take away from the normalcy evaluation is that, when choosing statistical testing methodologies, normalcy cannot be presumed using the present SATC scale. It is advised to take care of the nonnormal characteristics as part of the measurement refinement procedure.

Normality test for educating material (EM)

Table 4.6.2

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
EM	.078	200	.005	.978	199	.006

a. Lilliefors Significance Correction

The data for the Educating Material (EM) scale shows evidence of a modest deviation from a normal distribution (p <.05 for both Kolmogorov-Smirnov and Shapiro-Wilk tests), according to the findings of the normality test. With a sample size of 200 replies and a Shapiro-Wilk score of.978 suggesting only a slight deviation from normalcy, the violations do, however, seem to be rather low. Rather than representing significant non-normal characteristics, the small deviations most likely result from natural oscillations with an increasing sample size. The p-values below.05 theoretically indicate that the assumptions are broken, but the EM data most likely enough resembles a normal distribution to be tested using parametric statistical testing. When evaluating data concerning the educational material scale, care is still advised because they are on the verge of non-normal findings. The robustness of any significant associations discovered using EM may be further confirmed by doing nonparametric tests or small-scale adjustments in conjunction with parametric studies. However, when evaluated carefully, the educational material measure does not show significant enough non-normal characteristics to rule out the use of parametric techniques.

Normality test for teachers training (TT)

Table 4.6.3

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TT	.071	199	.015	.989	199	.145

a. Lilliefors Significance Correction

We may infer that the Teacher Training (TT) scale data in this sample is normally distributed based on the normality test findings in Table 4.5.3 (insignificant p-value of.145 for the Shapiro-Wilk test). For this sample size, the Shapiro-Wilk test is a better fit for determining normalcy. The Kolmogorov-Smirnov test's large p-value is probably caused by its increased sensitivity to even little departures from normalcy. The Shapiro-Wilk value of.989, which is quite near to 1, indicates that the TT scores are probably distributed regularly. This indicates that, if the normalcy assumptions are satisfied, parametric statistical tests can be suitably used for additional analysis of the teacher training data. Even yet, further spot-checking of statistical test assumptions is still advised in light of the Kolmogorov-Smirnov test's possible hint of non-normality. Overall nevertheless, the TT scale has enough characteristics of a normal distribution to allow for the continuation of parametric analytical techniques that demand normality. For now, it doesn't seem like any data transformation is required.

Figure 1

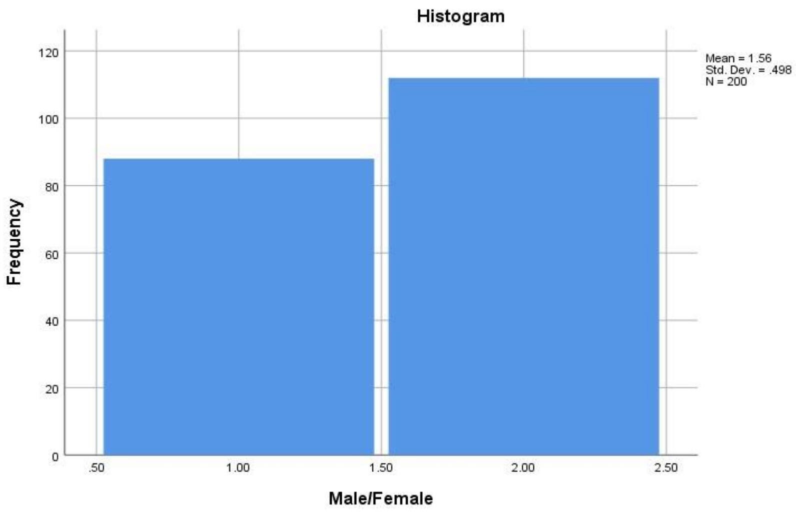


Figure 2

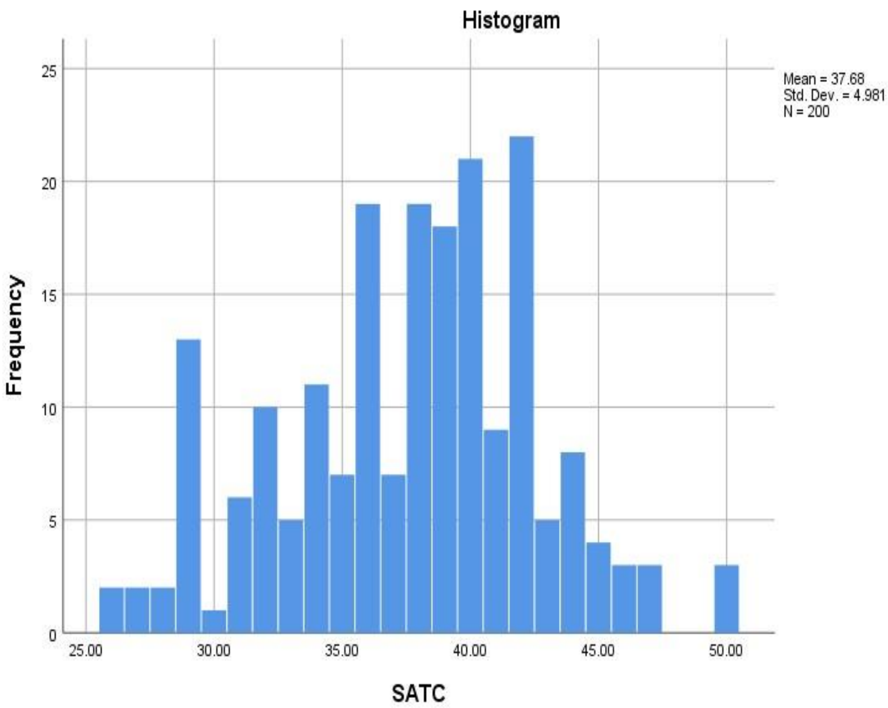


Figure 3

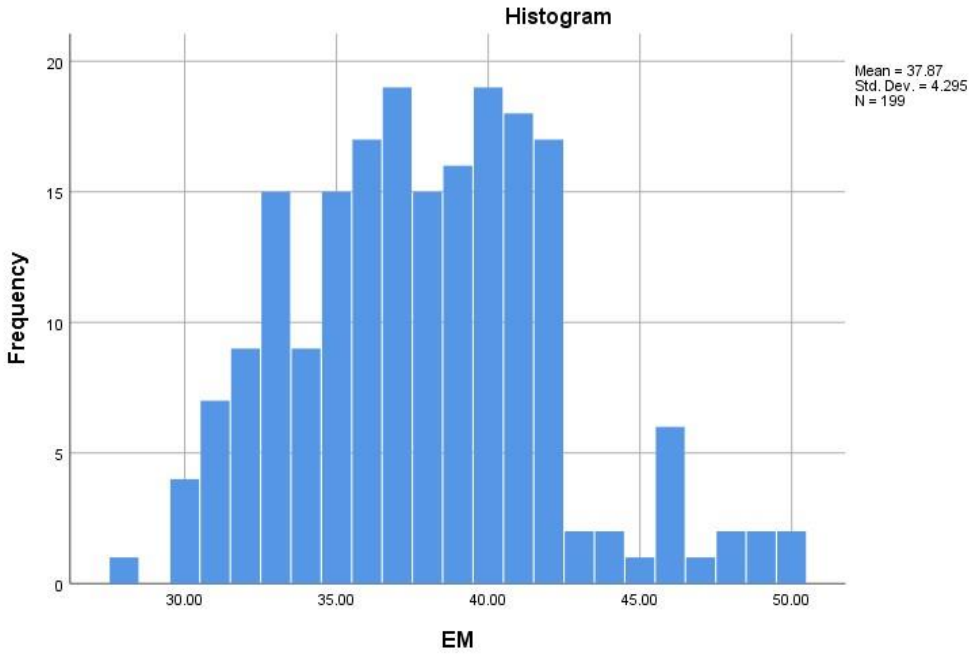
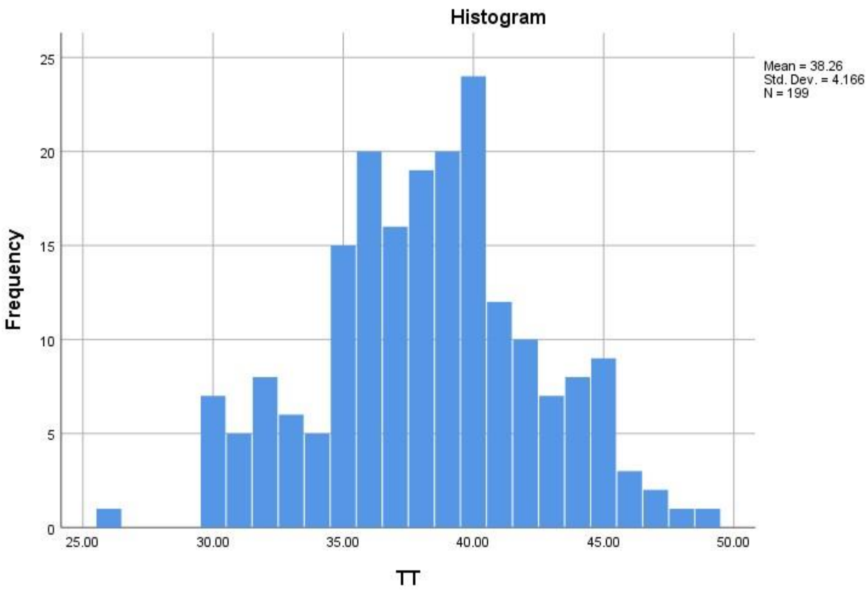


Figure 4



Discussion

First, the fact that women were overrepresented in the sample relative to males should raise concerns about potential gender-based participation bias induced by the sampling and data collection techniques. Women tend to be more interested in participating in research, which is a common occurrence. However, knowing more about the accessibility of the study, the communication channels that were used, the topics covered, and the incentives that were offered could help explain why there was a gender difference in interest in this particular study. Furthermore, even though the sample is fairly balanced at 56% women and 44% men, if the goal of the study was to analyse results across genders or achieve population generalizability, this still indicates an over 10% overrepresentation of females, which could distort the results to overemphasise trends that are more prevalent in women than in the general population. Rebalancing may be aided by oversampling strategies such as weighing cases; nevertheless, discrepancies in the planned target sample and the achieved sample on critical demographic aspects should be discussed separately. It would be helpful to the analysis to state clearly who group the survey was intended to reach and evaluate. Was gender parity especially anticipated or taken into consideration when outreach attempts were made? Further information on the sample strategy and demographic goals would facilitate the understanding of representativeness metrics, such as the gender balance in the final participant pool. However, you make insightful observations about the answer patterns that surfaced, which call for more investigation and openness regarding the survey administration processes that led to it.

The mean ratings for Student Attitudes Towards Science (SATC), Teacher Training (TT), and Educating Materials (EM) all fell beyond the theoretical midpoints of their respective scales, as was accurately reported. This showed that respondents generally gave somewhat favourable evaluations on all three categories as opposed to neutral ones. Standard deviations were about 4-5 points, thus there was a significant amount of diversity in the replies as well. It is possible that subgroups with different viewpoints that were hidden by the somewhat favourable central trends were discovered by analysing score distributions and percentages at the low and high extremes. Furthermore, although kurtosis and skewness data indicated normal distributions, the larger means alluded to possible ceiling effects. If intended scale ranges allowed for more extreme positive scores, the clustering of means above the midpoints might have come from intended variability being reduced. This called for scale optimisation analysis: many more effective items that capture subtleties in the higher ranges be used to increase variation and discrimination at the upper ends accurately said that group difference testing and correlation would provide more insight into the connections between the scales. The validity of such scales in predicting important student attitudes and involvement, in particular, could have been properly evaluated by investigating whether TT and EM scores corresponded to SATC outcomes. Additionally, it was wise to test for group differences such as gender or discipline. Overall, the main findings were succinctly summarised in your review; further context, as mentioned below, would have improved the interpretation.

To attain desired student-related results, it is empirically justified to focus efforts and resources on improving teacher-focused contributions, as shown by the relatively strong, positive relationships. However, while these correlation studies measure linear predictive correlations, determining causation would require additional controlled investigation. It is possible that causation works both ways: when student attitudes improve as a result of improved instructional resources and teacher preparation, there may also be positive feedback cycles in which increased student participation and receptivity inspire and enable instructors as well. However, your point about allocating resources strategically is well-founded. Administrators actually want proof linking decisions about resource allocation to desired results. It is essential to comprehend transformational leverage points if the objective is to promote student attention, involvement, and attitude changes. The data-driven argument for giving content and distribution methods priority is made by these relationships. Additionally, the fact teacher training topped educational materials in its correlation size shows this area of attention may have the largest return on investment. Although material advancements are beneficial, chances for talent development and competency seem to predict the student experience even more strongly. This draws attention to potential areas for systemic improvement. All things considered, your talk offers practical advice. By using these interrelated linkages, a thorough approach to educational excellence may be informed.

Student Attitude towards Science (SATS), Teacher Training (TT), and Educating Material (EM) are the three measures with which correlation analysis reveals statistically significant positive connections. Specifically, there is a moderate correlation ($r = .369$, $p < .001$) between EM and SATC, suggesting that the calibre of teaching materials positively correlates with students' attitudes towards science. Moreover, the strongest correlation was found between TT and SATC ($r = .508$, $p < .001$), indicating an even stronger favourable correlation between student attitudes towards scientific education and good teacher preparation. Overall, research indicates that when teachers get high-quality training and instructional resources, student attitudes and engagement with scientific courses improve. Improving these essential areas of education could lead to more favourable student impressions of science and a more significant. These results demonstrate the interdependence of links between instructional materials, teacher preparation, and the main goals of positive student attitudes and science engagement, suggesting that improving teacher development and resources has the potential to have significant effects.

This study's total scale, with a Cronbach's alpha coefficient of.802, demonstrates good internal consistency. Confidence in utilising EM and TT scales as independent variables is strengthened by the greater Cronbach's alpha, which indicates that these measures yield consistent findings across items. The correlations and potential predictive power of instructional materials and teacher preparation as important factors influencing students' opinions are further supported by the statistical connections with the outcome attitude measures. Once more, although correlations provide empirical support for the relationship between these drivers and the desired focus outcome, more research adjusting for other variables through other experimental designs would be necessary to establish causation. Practically speaking, however, teacher development and resources are prioritised by the correlations and internal reliability.

Based on the significant p-values, the findings of the Student Attitude Towards Science (SATS) scale normality test indicate a departure from a normal distribution. This suggests that instead of parametric statistical studies that rely on normalcy, nonparametric alternative tests could be selected. According to the normality tests, there is some indication of nonnormality for the Educating Material (EM) scale; nonetheless, the minor size of deviation indicates that the distribution still well approximates normal. Therefore, parametric approaches might still be used for EM data analysis with cautious interpretation. Ultimately, a sufficient normal distribution was displayed by the Teacher Training (TT) scale. Therefore, parametric approaches are probably appropriate for dealing with TT data. In general, normalcy and conformity to assumptions have to remain the driving principles for selecting the proper statistical testing approach for additional studies.

Conclusion

This thorough research concludes by highlighting the complex interactions that exist in the setting of scientific education between teaching materials (EM), teacher preparation (TT), and student attitudes towards science (SATS). Higher-quality instructional materials and good teacher preparation considerably lead to more favourable student impressions of their scientific education, as judged by the Satisfaction Score (SATC). These positive moderate-tostrong correlations show this. The high Cronbach's alpha coefficient of.802, which indicates a robust internal consistency, supports the validity of the used scales (EM, TT, and SATS) and their suitability as independent variables. The regression analysis highlights the need for more study to examine the subtle contributions of each predictor within the broader model and further confirms the significance of EM and TT in predicting student happiness. As a whole, these findings imply that spending on raising the calibre of instructional materials and strengthening teacher preparation programmes may increase student engagement and foster favourable attitudes towards science, which will eventually result in a more meaningful and satisfying scientific education experience.

Future direction

Although science instructors play a crucial role in influencing students' attitudes towards the topic, there is a significant research vacuum on the ways in which urban and rural contexts affect teachers' attitudes towards their pupils. Previous research has tended to concentrate on general teaching attitudes or settings that are mostly urban, ignoring the complex dynamics that exist in rural schools. Moreover, there is still a dearth of research on the influence of contextual variables on the attitudes of science instructors in rural locations, such as various student demographics and resource limitations. Investigating these differences is essential to creating focused programmes for teacher preparation and educational policies that take into consideration the unique possibilities and problems found in both urban and rural schools. Closing this study gap can provide insightful information about the variables influencing science instructors' views, which will ultimately lead to more efficient and fair methods of teaching science in a variety of classroom environments.

Limitations

- The sample size of the study may be limited since it may be difficult to get a representative sample of science instructors from both urban and rural schools. The generalizability of findings might be compromised by a limited sample size.
- Owing to the diversity seen in both urban and rural environments, the study could have missed regional variations that have a big impact on teachers' opinions. The external validity of the study is limited since not all urban and rural schools have the same socioeconomic, cultural, or infrastructural features.
- Results could be difficult to extrapolate outside of the particular nation or area in which the study was carried out since socio-cultural elements, educational environments, and regulations differ around the world.
- The research may not have been able to fully capture changes in teacher views over time. Over time, policies, cultural changes, and other external variables that are not taken into account in a snapshot survey might cause attitudes to alter.
- Social desirability bias might affect the data gathered from self-reporting surveys or interviews. Teachers could give answers they think would be accepted by society instead of sharing their actual opinions.
- Accurately assessing teacher attitudes may be challenging for the study, particularly if cultural quirks differ in how they impact answers in urban and rural settings.
- Regarding infrastructure, funding, and student demographics, urban and rural schools might differ greatly from one another. Oversimplified conclusions might result from failing to take this internal variety into consideration.
- Since attitudes are arbitrary concepts, measuring them may be difficult. Distinguishing between true opinions and transitory feelings might lead to design flaws in the study.

- The study might not have a longitudinal viewpoint, which would restrict its capacity to investigate how teacher attitudes change over time and the variables affecting these changes.
- The complex dynamics of teacher-student interactions, which have many facets and can have a big influence on teachers' attitudes, may not be fully explored in this study.
- If minority groups in urban and rural areas are not sufficiently represented in the study, it may have limits and miss important viewpoints and attitudes.

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