

**PREDICTING SCIENTIFIC ATTITUDE AMONG SENIOR SECONDARY SCIENCE
STREAM STUDENTS IN RELATION TO THEIR SCHOLASTIC ACHIEVEMENT**

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Abstract

Education is a fundamental component of any society and is also important for development of any nation. The scientific knowledge can be achieved by the introduction of science education in our traditional education system. Recently, the education system of India at higher secondary level is playing very crucial role in developing scientific attitude particularly for science stream students. Therefore, the investigator tried through this study to explore the scientific attitude among the students of senior secondary schools in relation to their scholastic achievement. The objectives of this study were to compare the scientific attitude among senior secondary students of science stream on the basis of gender and locality and to find out the relationship between scientific attitude and scholastic achievement among different groups of students studying at senior secondary level. The data was analysed on the basis of non-parametric statistical tests. The findings were shown that on basis of locality scientific attitude among students of senior secondary was significantly different and there was positive relationship between scientific attitude and scholastic achievement.

Keywords – Scientific attitude, Scholastic achievement, Senior secondary, and Science stream students.



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Introduction –

Human behaviour is rational in nature. Education is a fundamental component of any society and is also important for development of any nation. From the ancient time human beings are curious about the natural phenomena and tried to explore these with their wisdom. Through these explorations human become more aware about the environment and made his/her efforts to search the natural secrets happening in their natural settings. The learning outcomes of students can be measure in terms of scholastic achievement in the schools. NCERT, 1988 enforces the need of scientific temper among the students as “*Education should help the individual not only in acquiring knowledge and its application but also in developing a scientific temper and rational world view.*” Further, due to this rationality, they

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solve their daily life problems in a very logical and scientific manner. Therefore, science imposes a very crucial impact on the human society. The formal school system, one of the momentous strictures to reproduce upon students' over all scholastic performance is achievement in science (Mukhopadhyay, 2014) because it has scientific attitude as an operational dimension. Science, as a discipline stimulates the students to conduct an enquiry in the formal school system and the students of higher secondary education are just entering adolescent age of life which is a stage of stress & strain and storm & strife (Stanley Hall, 1889).

The Indian constitution aims to pioneer democratic values, social, political & economic equality and respect for all religions among the citizens through value education. The education system which helps students to be alive a life of model citizen with peace & understanding is value education. The scholastic achievement is related to the outcomes of learning happened inside the schools. It is the outcomes related to cognitive, affective and conative learning by the students which can be measured by their abilities to perform, express and prompt in form of marks, scores, grades or any other kind of achievements. The scholastic achievement includes cognitive aspects like achievement in literature, social sciences, mathematics and in science subjects also which is a key component in developing scientific attitude among the students. The scholastic achievement related to affective learning outcomes affects many values of our daily life both among male and female students. The combined sample of boys and girls yielded seven factors. It was concluded that the students in the sample are conscientious, venturesome, kind, stable, reserved, trusting, persevering, lively, cooperative, possessing high intelligence and are fairly high on academic achievement (Khan, 2005). Today we survive in the era of science, innovation and technology so; scientific attitude is one of key values particular by National Policy on Education, 1986 which had recommended ten values in the school curriculum including scientific attitude along with patriotism, national integration, modesty, religious tolerance, sensitivity, gender equality, punctuality, dignity of labour and neatness.

Education system of any country plays a very crucial role in its economic development and researches and innovations are also inseparable aspect of education which needs skilled manpower. Therefore, Kothari commission (1964-66) says, "*The skilled manpower needed for the relevant research and its systematic application to agriculture, industry and other sectors of life can only come from a development of scientific and technological education.*"

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In recent past science education has included in the curriculum which leads to the development of scientific attitude among the students at all the levels study and therefore development of scientific attitude becomes universal aims of science education. Some researchers denoted scientific attitude as habit of scientific thinking (Noll, 1933), scientific mindedness (Brunnet, 1944) or spirit of science which is most often characterized by many attitudes like objectivity, open mindedness, curiosity, suspended judgement, believes in cause and effect relationship and willingness to change behaviour. The scientific and technological education leads to develop scientific attitude among students which ultimately leads to economic development of the nation. But the rural schools are lacking basic infrastructures including recent technologies and scientific knowledge for teaching and learning, due to which students of rural localities does not exposed towards basic knowledge of science and technology.

India is a developing country and education can establish the India in the list of developed country. Indian society is basically traditional, stereotype and customary in nature. The traditional society does not accept scientific changes easily and the people in such society are bounded with the traditional rituals and customs. Therefore, there is requirement of scientific knowledge to explore the phenomena and to solve the problems in a more rational and scientific way. The scientific knowledge can be achieved by the introduction of science education in our traditional education system. Recently, the education system of India at higher secondary level is playing very crucial role in developing scientific attitude particularly for science stream students. So, the investigator tried through this study to explore the scientific attitude among the students of secondary school in relation to their scholastic achievement.

Objectives of the study – The following objectives were framed to study the scientific attitude among senior secondary students of science stream.

- To compare the scientific attitude among senior secondary female and male students of science stream.
- To compare the scientific attitude among senior secondary rural and urban students of science stream.
- To compare the scientific attitude among senior secondary rural and urban female students of science stream.

- To compare the scientific attitude among senior secondary rural and urban male students of science stream.
- To study the relation between scientific attitude and scholastic achievement among senior secondary students of science stream.
- To study the relation between scientific attitude and scholastic achievement among senior secondary female students of science stream.
- To study the relation between scientific attitude and scholastic achievement among senior secondary male students of science stream.
- To study the relation between scientific attitude and scholastic achievement among senior secondary rural students of science stream.
- To study the relation between scientific attitude and scholastic achievement among senior secondary urban students of science stream.

Research Questions – In quest of the above objectives, the following research questions were upstretched –

- i) Is there any difference in the scientific attitude among senior secondary female and male students of science stream?
- ii) Is there any difference in the scientific attitude among senior secondary rural and urban students of science stream?
- iii) Is there any difference in the scientific attitude among senior secondary rural and urban female students of science stream?
- iv) Is there any difference in the scientific attitude among senior secondary rural and urban male students of science stream?
- v) What is the relation between scientific attitude and scholastic achievement among senior secondary students of science stream?
- vi) What is the relation between scientific attitude and scholastic achievement among senior secondary female students of science stream?
- vii) What is the relation between scientific attitude and scholastic achievement among senior secondary male students of science stream?
- viii) What is the relation between scientific attitude and scholastic achievement among senior secondary rural students of science stream?

- ix) What is the relation between scientific attitude and scholastic achievement among senior secondary urban students of science stream?

Hypotheses of the study – To study the above objectives and for answering the above research questions following null hypotheses were formulated and tested accordingly -

- There is no significant difference between the means of scientific attitude among senior secondary female and male students of science stream.
- There is no significant difference between the means of scientific attitude among rural and urban senior secondary students of science stream.
- There is no significant difference between the means of scientific attitude among senior secondary rural and urban female students of science stream.
- There is no significant difference between the means of scientific attitude among senior secondary rural and urban male students of science stream.
- There is no significant correlation between scientific attitude and scholastic achievement among senior secondary students of science stream.
- There is no significant correlation between scientific attitude and scholastic achievement among senior secondary female students of science stream.
- There is no significant correlation between scientific attitude and scholastic achievement among senior secondary male students of science stream.
- There is no significant correlation between scientific attitude and scholastic achievement among senior secondary rural students of science stream.
- There is no significant correlation between scientific attitude and scholastic achievement among senior secondary urban students of science stream.

Research methodology –

- A. **Method** –In the present study survey method of descriptive research was followed.
- B. **Population and sample** –For the present study total 70 students of science stream were incidentally selected from Government Higher Secondary School, Baghraj, Tilli, Sagar (M.P.)which includes 30 male and 40 female science stream students. The sample includes both the students of rural and urban localities of Sagar district. i.e. 34 students were belonging to rural locality and 36 students were

belong to urban localities of Sagar district of Madhya Pradesh. The distribution of sample is represented in the table No. 1.

Table No. 1 Distribution of students comprising the sample

Group	Rural	Urban	Total
Female Students	16	24	40
Male Students	18	12	30
Total	34	36	70

C. **Tool used** – For collection of data on scientific attitude of science stream senior secondary students, Scientific Attitude Scale was used. The scale was constructed by *Avinash Grewal*, Regional College of Education, Bhopal (M.P.). For the test split-half reliability and test retest reliability were 0.86 and 0.75 respectively. The tool was significantly valid to discriminate the science stream and arts stream senior secondary students. For measuring scholastic achievement of students of senior secondary science stream, the total marks of students achieved in all the subjects of examination in the last academic session were considered as such.

D. **Statistical technique** – For analysis of data first of all the assumptions of parametric statistical tests like test of normality, skewness and kurtosis etc. were considered but finally due to nonfulfillment of assumptions of parametric statistical tests parallel non-parametric statistical test i.e. independent sample Mann-Whitney U-test was employed to compare the means of different groups and for analysis of relationships product moment coefficient of correlation was calculated.

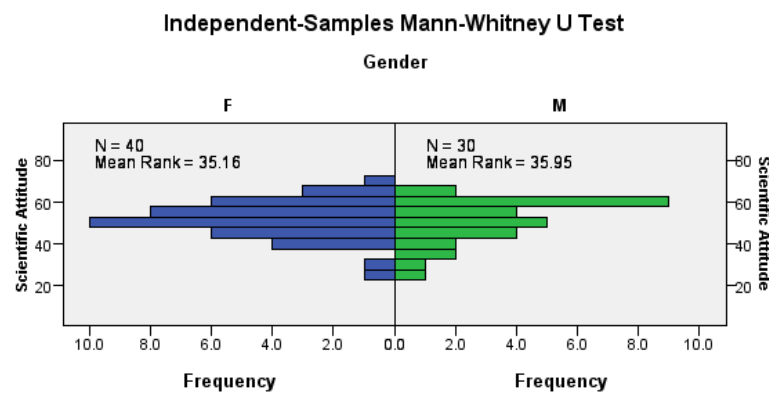
Analysis of Data and Interpretation –

To study the scientific attitude among senior secondary male and female students of science stream, it was hypothesized that there is no significant difference between the means of scientific attitude among senior secondary male and female students of science stream. The U-test has been computed to test this hypothesis. Results have been depicted in table No. 2.

Table No. 2 Summary of U-test between scientific attitude of female and male senior secondary students of science stream

Group	N	Mean Rank	Standard Error	U-test
Female Students	40	35.16	84.197	0.873
Male Students	30	35.95		

The table No. 2 revealed that the U-test between scientific attitude between male and female senior secondary science stream students is 0.873 which is not significant at 0.05 level. Therefore, null hypothesis is not rejected. It is indicated that female and male science stream students of senior secondary level are not significantly different on scientific attitude. So, the distribution of scientific attitude is the same across categories of female and male gender for senior secondary students of science.



Total N	70
Mann-Whitney U	613.500
Wilcoxon W	1,078.500
Test Statistic	613.500
Standard Error	84.197
Standardized Test Statistic	.160
Asymptotic Sig. (2-sided test)	.873

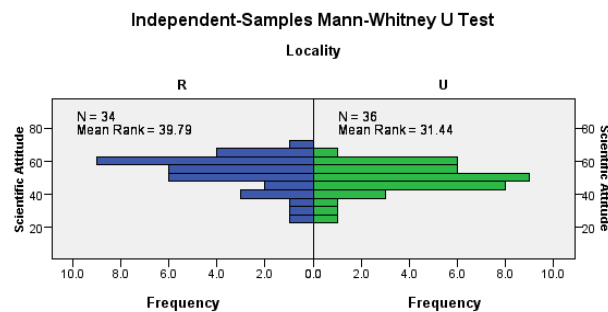
Figure 1 Showing the results of independent sample Mann-Whitney U-test for scientific attitude between the senior secondary female and male students of science stream.

To study the scientific attitude among senior secondary rural and urban students of science stream, it was hypothesized that there is no significant difference between the means of scientific attitude among senior secondary rural and urban students of science stream. The U-test has been computed to test this hypothesis. Results have been depicted in table No. 3.

Table No. 3 Summary of U-test between scientific attitude of senior secondary rural and urban students of science stream

Group	N	Mean Rank	Standard Error	U-test
Rural Students	34	39.79	85.035	0.086
Urban Students	36	31.44		

The table No. 3 stated that the U-test between scientific attitude of rural and urban senior secondary science stream students is 0.50 which is not significant at 0.05 level. Therefore, null hypothesis is not rejected. It is indicated that rural and urban science stream students of senior secondary level are not significantly different on scientific attitude. So, the distribution of scientific attitude is the same across categories of rural and urban locality for senior secondary students of science stream.



Total N	70
Mann-Whitney U	466.000
Wilcoxon W	1,132.000
Test Statistic	466.000
Standard Error	85.035
Standardized Test Statistic	-1.717
Asymptotic Sig. (2-sided test)	.086

Figure 2 Showing the results of independent sample Mann-Whitney U-test for scientific attitude between the senior secondary rural and urban students of science stream.

To study the scientific attitude among senior secondary rural and urban female students of science stream, it was hypothesized that there is no significant difference between the means of scientific attitude among senior secondary rural and urban female students of science stream. The U-test has been computed to test this hypothesis. Results have been depicted in table No. 4.

Table No. 4 Summary of U-test between scientific attitude of senior secondary rural and urban female students of science stream

Group	N	Mean Rank	Standard Error	U-test
Rural female Students	16	26.84	36.191	0.005
Urban female Students	24	16.27		

*Significant at 0.01 level.

The table No. 4 stated that the U-test between scientific attitude of rural and urban senior secondary science stream female students is 3.42 which is significant at 0.01 level. Therefore, null hypothesis is rejected. It is indicated that rural and urban science stream students of senior secondary female students are significantly different on scientific attitude. So, the distribution of Scientific Attitude is the same across categories of rural and urban locality for senior secondary female students of science stream.

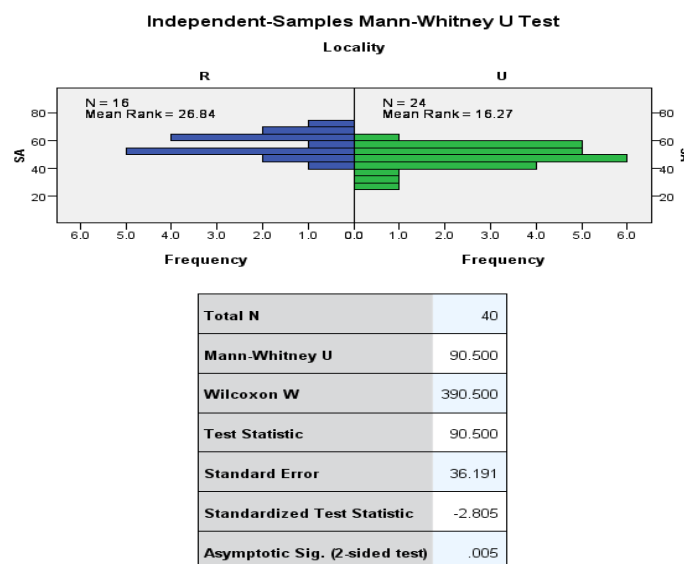


Figure 3 Showing the results of independent sample Mann-Whitney U-test for scientific attitude between the senior secondary rural and urban female students of science stream.

To study the scientific attitude among senior secondary rural and urban male students of science stream, it was hypothesized that there is no significant difference between the means of scientific attitude among senior secondary rural and urban male students of science stream. The U-test has been computed to test this hypothesis. Results have been depicted in table No. 5.

Table No. 5 Summary of U-test between scientific attitude of senior secondary rural and urban male students of science stream

Group	N	Mean Rank	Standard Error	U-test
Rural male Students	18	14.75	23.588	0.573
Urban male Students	12	16.62		

The table No. 5 stated that the U-test between scientific attitude of rural and urban senior secondary science stream male students is 0.573 which is not significant at 0.05 level. Therefore, null hypothesis is not rejected. It is indicated that rural and urban science stream male students of senior secondary level are not significantly different on scientific attitude. So, the distribution of scientific attitude is the same across categories of rural and urban locality for senior secondary male students of science stream.

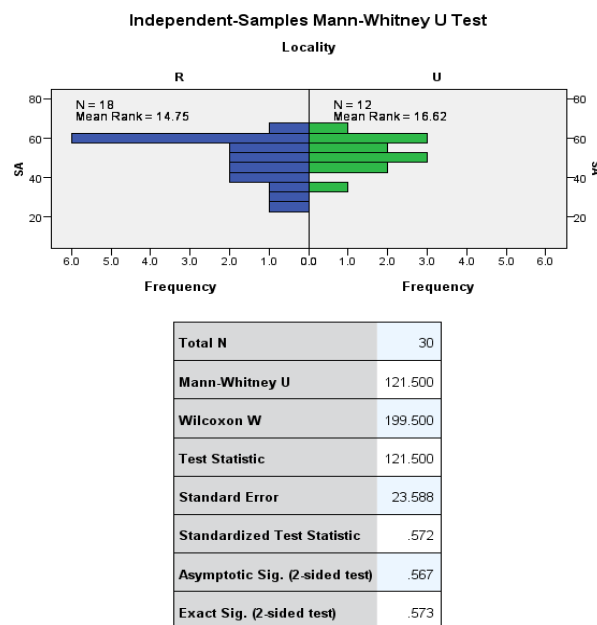


Figure 4 Showing the results of independent sample Mann-Whitney U-test for scientific attitude between the senior secondary rural and urban male students of science stream.

To study the correlation between scientific attitude and scholastic achievement among senior secondary students of science stream, it was hypothesized that there is no significant correlation between scientific attitude and scholastic achievement among senior secondary students of science stream. The product moment coefficient of correlation has been computed to test this hypothesis. Results have been depicted in table No. 6.

Table No. 6 Correlation between scientific attitude and scholastic achievement among senior secondary students of science stream

Students	N	Coefficient of correlation
Secondary Students	70	0.224

Observation of table No. 6 shows that the coefficient of correlation between scientific attitude and scholastic achievement among senior secondary students of science stream is 0.224 which is moderate correlation and is not significant at 0.05 level. So, the null hypothesis that there is no significant relationship between scientific attitude and scholastic achievement among senior secondary students of science stream, cannot be rejected. It means that the scientific attitude is moderate and positively correlated with scholastic achievement among senior secondary students of science stream but not significant.

To study the correlation between scientific attitude and scholastic achievement among senior secondary female students of science stream, it was hypothesized that there is no significant correlation between scientific attitude and scholastic achievement among senior secondary female students of science stream. The product moment coefficient of correlation has been computed to test this hypothesis. Results have been depicted in table No. 7.

Table No. 7 Correlation between scientific attitude and scholastic achievement among senior secondary female students of science stream

Students	N	Coefficient of correlation
Secondary Female Students	40	0.176

Observation of table No. 7 shows that the coefficient of correlation between scientific attitude and scholastic achievement among senior secondary female students of science stream is 0.176 which is negligible correlation and is not significant at 0.05 level. So, the null

hypothesis that there is no significant relationship between scientific attitude and scholastic achievement among senior secondary female students of science stream, cannot be rejected. It means that the scientific attitude is negligible and positively correlated with scholastic achievement among senior secondary female students of science stream but not significant.

To study the correlation between scientific attitude and scholastic achievement among senior secondary male students of science stream, it was hypothesized that there is no significant correlation between scientific attitude and scholastic achievement among senior secondary male students of science stream. The product moment coefficient of correlation has been computed to test this hypothesis. Results have been depicted in table No. 8.

Table No. 8 Correlation between scientific attitude and scholastic achievement among senior secondary male students of science stream

Students	N	Coefficient of correlation
Secondary Male Students	30	0.293

Observation of table No. 8 shows that the coefficient of correlation between scientific attitude and scholastic achievement among senior secondary male students of science stream is 0.293 which is moderate correlation and is not significant at 0.05 level. So, the null hypothesis that there is no significant relationship between scientific attitude and scholastic achievement among senior secondary male students of science stream, cannot be rejected. It means that the scientific attitude is moderate and positively correlated with scholastic achievement among senior secondary male students of science stream but not significant.

To study the correlation between scientific attitude and scholastic achievement among senior secondary rural students of science stream, it was hypothesized that there is no significant correlation between scientific attitude and scholastic achievement among senior secondary rural students of science stream. The product moment coefficient of correlation has been computed to test this hypothesis. Results have been depicted in table No. 9.

Table No. 9 Correlation between scientific attitude and scholastic achievement among senior secondary rural students of science stream

Students	N	Coefficient of correlation
Secondary Rural Students	34	0.205

Observation of table No. 9 shows that the coefficient of correlation between scientific attitude and scholastic achievement among senior secondary rural students of science stream is 0.205 which is moderate correlation and is not significant at 0.05 level. So, the null hypothesis that there is no significant relationship between scientific attitude and scholastic achievement among senior secondary rural students of science stream, cannot be rejected. It means that the scientific attitude is moderate and positively correlated with scholastic achievement among senior secondary rural students of science stream but not significant.

To study the correlation between scientific attitude and scholastic achievement among senior secondary urban students of science stream, it was hypothesized that there is no significant correlation between scientific attitude and scholastic achievement among senior secondary urban students of science stream. The product moment coefficient of correlation has been computed to test this hypothesis. Results have been depicted in table No. 10.

Table No. 10 Correlation between scientific attitude and scholastic achievement among senior secondary urban students of science stream

Students	N	Coefficient of correlation
Secondary Urban Students	36	0.292

Observation of table No. 10 shows that the coefficient of correlation between scientific attitude and scholastic achievement among senior secondary urban students of science stream is 0.292 which is moderate positive correlation and is not significant at 0.05 level. So, the null hypothesis that there is no significant relationship between scientific attitude and scholastic achievement among senior secondary urban students of science stream, is not rejected. It means that the scientific attitude is moderate and positively correlated with scholastic achievement among senior secondary urban students of science stream but not significant.

Results – On the basis of analysis of data for the present investigation, following results were found –

- The female and male science stream students of senior secondary level were not different on their scientific attitude.
- The rural and urban science stream students of senior secondary level were not different on their scientific attitude.
- The rural and urban science stream students of senior secondary female students were different on their scientific attitude.
- The rural and urban science stream male students of senior secondary level were not different on their scientific attitude.
- The scientific attitude and scholastic achievement were moderate and positively correlated among senior secondary students of science stream.
- The scientific attitude and scholastic achievement were negligible and positively correlated among senior secondary female students of science stream.
- The scientific attitude and scholastic achievement were moderate and positively correlated among senior secondary male students of science stream.
- The scientific attitude and scholastic achievement were moderate and positively correlated among senior secondary rural students of science stream.
- The scientific attitude and scholastic achievement were moderate and positively correlated among senior secondary urban students of science stream.

Conclusion –On the basis of above results it may be concluded that scientific attitude and scholastic achievement are very much significant for senior secondary students of science stream. The gender and locality of senior secondary students were not contributing in scientific attitude whereas when only female students of rural and urban localities were studied on their scientific attitude, it showed differences but male students of rural and urban localities were not different on their scientific attitude. Further, the scientific attitude and scholastic achievement were negligible and positively correlated among senior secondary students of science stream but among senior secondary male students of science stream the scientific attitude and scholastic achievement were moderate and positively correlated and among senior secondary female students of science stream the scientific attitude and scholastic achievement were negligible and positively correlated. Similarly, the scientific attitude and scholastic achievement were moderate and positively correlated among senior secondary rural students of science stream but the scientific attitude and scholastic

achievement were negligible and positively correlated among senior secondary urban students.

Educational Implications –This study shows that the senior secondary schools of rural localities do not share their responsibilities to develop scientific attitude among their students. Therefore, if they will share their responsibilities then scientific attitude also be developed among the senior secondary students of rural localities also. In comparison to urban schools of senior secondary level, the principles and teacher of rural schools of senior secondary level may take extra responsibilities towards organising curricular as well as cocurricular activities for the students to develop scientific attitude. The curriculum and other school activities may be supported with curiosity, open-mindedness, rationality, willingness to change behaviour, scientific outlook and scientific temperament.

Suggestions – On basis of above results followingsuggestions can be proposed –

- It was found that rural and urban science stream students of senior secondary female students are significantly different on scientific attitude. Hence, the female science stream students of senior secondary schools residing in rural localities should be exposed more towards scientific activities to develop scientific attitude among them.
- It was also revealed that the scientific attitude is high and positively correlated with scholastic achievement among senior secondary urban students of science stream whereas scientific attitude and scholastic achievement is not significantly correlated among rural students of science stream of senior secondary. Therefore, like urban students of science stream of senior secondary schools, rural students of science stream of senior secondary should also be exposed more towards scientific activities to develop scientific attitude among them.
- In the senior secondary schools of rurallocalities, the principals and teachers should take initiatives to organize scientific activities to develop scientific attitude among the students of the schools and society also.
- In the senior secondary schools of rural localities, the teachers should use scientific methods of teaching to deliver the content during the classroom activities.
- The senior secondary schools of rural localities should also organize cocurricular activities like science quizzes, essay based on science, seminars, debate competition on science related topics, celebration of different days based on themes of science and

lecture series on contributions of different scientists etc. to develop scientific attitude among them.

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