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Research Paper

### A Study of Scientific Temper and Scientific Creativity of Senior Secondary Science Students

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**Key words-** *Scientific Temper, Scientific Creativity etc.*

#### Abstract

*Scientific temper is a personality dimension of a person associated with his/her basic drives to think or work in a systematic and scientific way and Scientific Creativity is the creativity in the field of science. It is the process of formulating hypothesis in scientific situation, testing and retesting these hypotheses and modifying and retesting again and so on. A creative work in science requires experimentation, intuition, hardworking, insight and continuous involvement in thinking and rethinking. This paper addresses the relation between scientific temper and scientific creativity. The rationale for the study was to identify the effect of scientific temper and scientific creativity and to find out the ways through which achievement can be improved particularly in science subject. The study was carried out on a randomly selected sample of 600 students of science belonging to senior secondary schools of Jaipur, Bikaner and Ajmer division of Rajasthan. Scientific temper and scientific creativity tests were used to collect the data. Descriptive statistics, t-test and Pearson's correlation were used to analyse and interpret the data and to test the hypotheses. The results revealed that there is no significant correlation between scientific temper and scientific creativity of secondary school science students. There is no significant difference between mean score of scientific temper of boys and girls of senior secondary schools. The girls of senior secondary schools were found better in scientific creativity than the boys of these schools.*

## Introduction

The current century is best called the age of explosion of knowledge. Advancement made in the field of Science and technology is a great human achievement. Knowledge of the Science is self-accumulating, self-accelerating, self-growing, self-pervading and self-correcting. It tries to provide a body of information through procedures that are demonstratively objective but often wiped out a subjective context. It inculcates characteristics of Open-mindedness, free from superstition, curiosity, inquiry, collection of data, demand for verification and proofs, logical reasoning, suspended judgment, acceptance of warranted conclusions and willingness to change one's opinion within the light of the latest evidence. Science has countless benefits, but the best is that it is the most fascinating, difficult, thrilling, and delightful endeavour that mankind has invented. If one considers the most progressive art created in the past for the development of humankind, it is always termed as "Science". Science education has a very important role to play within the all-around cultural and societal development of humankind and for evolving a civilized society. The essence of the scientific spirit is to think globally and act locally since the cognitive domain is universal while the fruit of science has some site-specificity. Science untangles the threads that make the tapestry of our living world. It tries to figure out how the threads merge in the overall ecological networks creating and maintaining humankind and also contributes to the thought process of the person. Probably, it may also be the spirit that may reverse the steady downward trend of our world's health and wealth. The teaching of science at different levels of school has the same objectives as other school subjects but additionally, science inculcates certain values peculiar thereto which no other subject can offer. But, besides satisfying the normal criteria for its inclusion in the curriculum like academic, cultural, spiritual, aesthetic, disciplinary, utilitarian, and vocational values -science teaching provides training in the scientific method and also helps to develop scientific temper, scientific aptitude & scientific creativity among its learners. These qualities imbibed by the learner through science are of great value to a citizen living in the present age. For the advancement of culture and civilization in the right direction, the development of scientific temper and scientific creativity among the younger generation is now considered a vital task in our Education Policies. India gives great value to the development of "Scientific Temper" and "Scientific Creativity" among its people, which was appropriately incorporated into the constitution. Scientific institutions that foster such a temper and lead to technical excellence in this country. According to the National Policy of Education, 1986 - "Science education is going to be strengthened, to develop within the child, well-developed abilities and values like the spirit of inquiry, creativity, the courage to questioning and our aesthetic sensibility. Science education programmes are going to be designed to enable the learner to accumulate problem-solving and decision-making skills and to get the connection of science with health, agriculture, industry and other aspects of daily life." Thus, our science education programmes should be such to develop the qualities

of scientific creativity, scientific aptitude & scientific temper among its learners. These qualities or outcomes of learning must be achieved to develop a national moreover individual personality. It's quite evident that processes that occur as a part of formal school education have a significant role to play in the development or achieving of these outcomes.

### **Concept of the “Scientific Temper”**

Scientific temper is the trait of an individual through which he/she scientifically interact with the external world. The scientific temper includes proposing problems, refining and defining them more productively, setting up hypotheses and their testing with the help of controlled experiments, thinking out new solutions, discarding personal opinion in the light of new evidence and suspending judgment in case of conflicting evidence, discarding even the principle of authority, if found necessary, and in short, distinguishing among scientific information, popular information and beliefs etc. In other words, it is the way of an individual's thinking critically and rationally along with the ability to question. He/she is not satisfied with the answer just because it is uttered by or with authority.

Since the scientific temper has many dimensions and these dimensions must be specified. To make a scientific selection of the dimensions of scientific temper, relevant and meaningful dimensions were chosen and sent to five experts in the field by the researcher for approval. Experts were unanimous (100 % approval) of the following dimensions of scientific temper –

1. Scientific information
2. Free from superstitions
3. Reasoning and logical ability.
4. Problem-solving ability.
5. Cause finding ability.
6. Curiosity.

### **Concept of the Scientific Creativity**

There is no universally agreed definition of creativity. Since a person can behave creatively in numerous different ways. According to **Torrance (1967)** creativity is, “The process of becoming sensitive to problems, deficiencies, gap in knowledge, missing elements, disharmonies and so on; identifying the difficulty: searching for solutions, making guesses or formulating hypothesis about the deficiencies, testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.” The definition of Torrance appears comprehensive and operational. He has emphasized the following aspects of creativity:

1. Sensitive to problems.
2. Identification of difficulty or problem.
3. Formulating hypothesis as solution for the problem.
4. Testing or verifying the hypothesis.
5. Arrive at some conclusions or results.

This definition is based on the process of reflecting thinking, while reflective thinking involves awareness plus divergent thinking.

**Lobart (1994)** defined scientific creativity as a dimension of sensitivity against scientific problems. **Barron F.X. (1969)** defined “Scientific creativity is the creativity in the specific field i.e. science”. It is the process of formulating hypothesis in scientific situation, testing and retesting these hypotheses and modifying and retesting again and so on.

A creative work in science requires experimentation, intuition, hardworking, insight and continuous involvement in thinking and rethinking. There are reasons, why it is important to develop scientific creativity in children. The unprecedented changes undergo with the passage of time demands that we must equip our children with such skill, abilities and temper so as to creatively meet the future problems of life. They should be trained to think creatively at the same time when they are being trained to think logically. Keeping in view, the type of abilities that we need to develop in children to live successfully in the years to come, knowledge alone is not sufficient.

### **Objectives**

1. To compare scientific temper of senior secondary science students in terms of gender.
2. To compare scientific creativity of senior secondary science students in terms of gender.
3. To find correlation between scientific temper and scientific creativity of senior secondary science students

### **Hypothesis**

1. There is no significant difference between boys and the girls with respect to their scientific temper.
2. There is no significant difference between boys and the girls with respect to their scientific creativity.
3. There is no significant correlation between scientific temper and scientific creativity of senior secondary science students

### Delimitations

The following are the delimitation of the present study – 1. The study is limited only to the senior secondary science students belonging to three administrative divisions of the Rajasthan State – Jaipur, Ajmer & Bikaner. 2. The study is limited to science students of PCM (Physics, Chemistry & Mathematics) & PCB (Physics, Chemistry & Biology) groups only. 3. The sample of the study is 600 subjects.

### Methodology

The present study is aimed to study the scientific temper and scientific creativity of senior secondary science students. The following procedure has been adopted in the present study–

### Population

The population of the present study comprises all senior secondary science students of three administrative divisions of the Rajasthan i.e. Ajmer, Jaipur and Bikaner.

### Sample

A sample of 600 (300 urban and 300 rural) senior secondary science students had been selected randomly from three administrative divisions of the Rajasthan – Jaipur, Ajmer and Bikaner.

### Sample Distribution

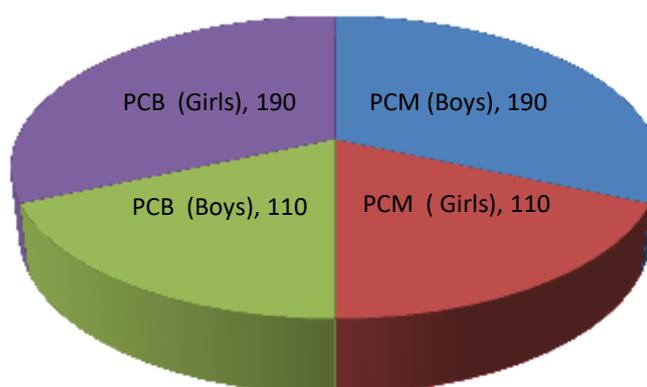


Fig.1

### Research Design

Since the study has attempted to study the scientific temper and scientific creativity of senior secondary students, the descriptive survey method was appropriate for the present study. The following tools have been used for the collection of data under the present study-

**Tools**

In the present study the following research tools were used;

1. Verbal Test of Scientific Creativity (VTSC) Dr. V.P. Verma 2006 and Dr. J.P. Shukla.
2. Self-developed standardized tool of Scientific Temper

**Analysis and interpretation**

**Comparison of the scientific temper of senior secondary science students in terms of gender**

The scientific temper of senior secondary science students in terms of the gender is described in the following table as-

**Table 1**

Type of Group	N	Mean ( M )	Standard Deviation ( $\sigma$ )	C.R. Value	Level of Significance	
					0.05	0.01
Boy	300	111.41	17.05	1.35	Not	-
Girl	300	109.51	17.45		Significant	

Table- 1 shows that the mean value of the scientific temper of boy and girl students is 111.41 and 109.51 respectively. The mean value of boy student (111.41) is higher than the girl student (109.51). The standard deviations of both groups are 17.05 and 17.45 respectively. The calculated C.R. value 1.35 is less than the critical table value of C.R. (1.96) at a 0.05 level of significance. Therefore, the difference between means of the scientific temper of boy and girl science students is not significant at 0.05 level of significance. Hence null hypothesis “There is no significant difference in the scientific temper of senior secondary boys and girls science students. “is retained.

**Comparison of scientific creativity of senior secondary science students in terms of gender**

The scientific creativity of senior secondary science students in terms of the gender is described in the following table as-

**Table 2**

Type of Group	N	Mean ( M )	Standard Deviation ( $\sigma$ )	C.R. Value	Level of Significance	
					0.05	0.01

Boy	300	69.37	20.74	6.19	Significant
Girl	300	79.63	19.86		

Table -2 shows that the mean value of scientific creativity of boy science students is 69.37 and that of girl science students is 79.63. Standard Deviations of both groups are 20.74 and 19.86 respectively. On bases of mean difference and standard error, C.R. value has been calculated 6.19 (df ) 598. The calculated C.R. value 6.19 is higher than critical table value of C.R. (2.58) at 0.01 level of significance. Therefore, the difference between means of scientific creativity of boy and girl science students is significant at 0.01 level of significance. The mean value of girl students (79.63) is higher than boy students (69.35). So, it may be said that girl science students have higher scientific creativity in comparison to boy science students.

**Correlation between Scientific Temper and Scientific Creativity:-**

**Table 3**

Variables	N	r
Scientific Temper	600	-0.012
Scientific Creativity		

It is apparent from table -3 that correlation between scientific temper and scientific creativity of senior secondary students, calculated by pearson product moment formula, is - 0.012 (df )598. The value of calculated correlation coefficient (-0.012) is lower than the critical value of r shown in table at 0.05 level of significance (0.062) and 0.01 level of significance (0.081). Thus, there is a no significant correlation between scientific temper and scientific creativity of senior secondary science students.

**Major Findings of the Study**

1. There is no significant difference between mean score of scientific temper of boys and girls of senior secondary schools.
2. Both the boys and the girls of senior secondary schools possessed equal scientific temper.
3. There exists significant difference between mean score of scientific creativity of boys and girls of senior secondary schools.

4. The girls of senior secondary schools were found to be better in scientific creativity than the boys of these schools.
5. There exists no significant correlation between scientific temper and scientific creativity of senior secondary science students

### **Conclusion**

It is concluded that the boys and the girl of senior secondary science students were equal on their scientific temper but the girls were found better in scientific creativity in comparison to the boys of these schools. There exists no significant correlation between scientific temper and scientific creativity of senior secondary science students.

### **Educational Implications**

The observations and conclusions of the present study have implications for educators, teacher educators, stakeholder, researcher personnel, curriculum designers, and, last but not least, students. It would be useful to present some of the current study's educational implications here – 1. Scientific temper and scientific creativity is a way of living and a major outcome of science teaching and learning. The researcher, in the present study, has developed a standardized test for measuring the scientific temper of the students. This test may be useful in measuring students' scientific temper of senior secondary science students of age group 15-20 years. It will be better to organize various co-curricular activities such as science fair, science exhibitions, scientific debate; science club etc. and use of inductive inquiry training model, concept attainment model, project method, problem solving method, Brain storming and programme instruction in teaching rather than conventional method of teachings. Use of teaching-learning materials, ICT and emphasis on learning by doing may be useful in fostering scientific temper among science students. Science is the product of creative thinking. The development of creative genius of

our youth should be of prime importance in our education system. Scientific information, reasoning & logical ability and cause finding ability shows slightly upward trend with the increase in the scientific creativity of the students. Use of ICT will be possible to foster scientific temper and scientific creativity among students.

### **References**

1. Anita Rampal (2020): Scientific temper and humanism: Rereading Nehru during the Covid-19 pandemic, *Saha Sutra*, [www.sahapedia.org](http://www.sahapedia.org).
2. Gupta N. K. (2010): Research in Teaching of Science, A.P.H. Publishing Corporation, New Delhi, P. 132-147

3. Kothari C.R. (2003): Research Methodology, Methods & Techniques, Wishwa Prakashan P. 68-115
4. Mahanti, Subodh (2016): Nehru's Vision of Scientific Temper, Vol 4,( No 3 & 4), Journal of Scientific Temper.P.154-166
5. Prasad, Rajendra. "The Debate on Scientific Temper." *Social Scientist*, vol. 10, no. 1, 1982, pp. 56–60. *JSTOR*, [www.jstor.org/stable/3517123](http://www.jstor.org/stable/3517123).
6. Rajput J.S. (2000): Science Education in Schools, Journal of Indian Education, NCERT.P.1-11
7. Singh, Hem Lata (1990): Scientific Temper and Education, Commonwealth Publisher, New Delhi.
8. Vaidya Narendera (1968): Problem Solving in Science, S. Chand & Co.New Delhi P.41-50
9. Vaidya Narendra: The Nature of Science, Fifth Survey of Research in Education, NCERT.P- 354
10. Vaidya Narendra (1999): Science Teaching for the 21st Century, Deep & Deep Publications, New Delhi.P.51-88

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