Effect of School Environment on the Scientific Creativity among Secondary Level School Students

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Abstract

Scientific creativity has been of central concern to all who work on creativity and is a topic that has been tackled by almost every major area in psychology ranging from psychoanalytic accounts of creativity (Freud 1932), to Gestalt (Wertheimer 1945), Social (Amabile 1983), Cognitive (Simon 1977), and Psychometric approaches (Roe 1952).

The present study deals with the need to ascertain a link between scientific creativity of secondary level students (both boys and girls) and school environment of government and private schools. The researcher chose two types of tools, one is the Scientific Creativity Test (by Majumdar) which has five dimensions and the second is the School Environment Inventory (by K. S. Mishra) which contains 70 items related to the six dimensions of school environment.

It was concluded that there exists a positive correlation between school environment and scientific creativity of secondary school students and also that there is a significant difference between the scientific creativity of secondary school students of government and private schools. Further, a significant difference was observed between the scientific creativity of secondary school boys and girls. The study can help the science educators for making necessary curriculum decisions and in guiding the pupils to develop the proper scientific creativity.

Background

For the overall development of students, for bringing about desirable changes in the behaviour of students and making school as a means of development of community and society, good and conducive environment plays an important role. 'School Environment' means all those conditions, resources and their integrated and interrelated activities which directly or indirectly affect functioning of the school. A positive correlation is found in such type of performance and school environment. Better the school environment better will be the functioning of the school. In an unsuitable environment or opposing environment the possibility of going in opposite direction becomes prominent. The quality of the school-good or bad; is reflected by the environment of the school. The school environment and surroundings can be classified into four main components: Physical Environment, Social Environment, Psychological Environment and Academic Environment.

The National Curriculum Framework (NCF 2005) states that the school must be a demonstration of the environmental values that the education system tries to convey. Whether the context is that of drinking water and sanitation facilities, paper, energy use, garbage management, composting, or greening, the school needs to exemplify good practices and needs to communicate these, through demonstration, not only to the students but also to the community. These resources need to be built up with the involvement of the community and various other stakeholders. Locale specific standards

need to be set for this, but care needs to be taken to ensure that central models are not propagated. Classroom education needs to support the understanding, use and maintenance of this infrastructure.

Creativity is the ability to see something in a new way, to see and solve problems no one else may know exists, and to engage in mental and physical experiences that are new, unique, or different. Creativity is a critical aspect of a person's thoughts and ideas. Scientific creativity (creativity in science) can be considered to help achieve new and original steps in performing the targets of science. Moravcsik (1981:222) defined the scientific creativity by saying, "it can explain itself in comprehending the new ideas and concepts added to scientific knowledge, in formulating new theories in science, finding new experiments presenting the natural laws, in recognizing new regulatory properties of scientific research and the scientific group, in giving the scientific activity plans and projects originality, and many other areas".

Scientific creativity and other commonly related constructs like academic achievement, adolescent children, and home relationship etc. are interrelated. The person, who has scientific creativity, has convergence, fluency, flexibility, elaboration and originality as his characteristics. It has been found that there are many variables such as academic achievement, family environment, school environment, etc which affect scientific creativity. Creativity and Education is organized under four or five main headings: the creative process, measurement, personality, and effects of home and school environment. For example, Family relationship, as disputes among parents and child may lead to unstable and shattered youth. Understanding and free relationship with parents might facilitate scientific creativity of the child.

The development of creativity can be linked to many factors. However, the formation of negative or positive attitudes and creativity in science may be primarily linked to the environment in the science classes, because the classroom is the primary setting for learning about science in our society (Haladyana and Shaughnessy, 1982).

The science classroom can be particularly potent physical environment (i.e., containing sufficient and complex apparatus, organisms and odor); the most influential aspect of science classrooms may be the social and learning environments that result from the interactions between the teachers and the students, and between a student and a student.

According to Katrina Salta and Chryssa Tzougraki (2002), the curriculum programmes of school sometimes do not help students to understand some of the concepts and principles and also they do not help them to develop process skills. Therefore, there is a need of extracurricular activities related to science in schools. Through science activities they are also exposed to the world and the spirit of service. These activities:-

- Inculcates scientific attitude/ temper among students and provide opportunities for training in scientific methods.
- Develops habits of exploration and of creative and innovative aspects.
- Widens the outlook of students and enable them to apply the knowledge in certain life situations.
- Develops in children a sense of healthy competition for a better cause
- Provides ample opportunities for problem solving
- Popularize science among the laymen
- Provide opportunities for developing scientific skills
- Helps to explore local resources, and learn to maintain and protect the environment
- Provide opportunities for bringing forth hidden talents

- Keep students in touch with latest development in science and their effects on human being
- Develops interest in scientific hobbies and utilization of leisure properly

Also, teachers have a key role to play in enhancing creativity. Teaching for creativity can happen in the course of normal education. It doesn't necessarily need special time set aside (Fryer, 2003). Teachers can:

- Stimulate students' motivation — in the tasks they set, when giving feedback on their performance, in their interactions with their students, and in the way in which they construct the learning environment;
- Allow students to work alone for at least some of the time — so that they can get deeply absorbed in tasks they find motivating;
- Enable students to apply a range of heuristic/creative problem-solving strategies appropriately;
- Enable students to evaluate solutions and, where appropriate, implement them;
- Develop students' knowledge and skills;
- Demonstrate that they value creativity;
- Encourage questions and respect unusual questions;
- Take students' learning needs into account — with regard to their progress in creativity, their level of development and academic performance;
- Set tasks which require creativity — so that students can learn to be creative by creating, just as they learn to read by reading;
- Enhance the creativity of their more confident and capable students by introducing task constraints designed to stimulate their ingenuity.

When permissive education was popular in 1960s, it was widely assumed that to promote creativity, all one had to do was to provide the resources and young people would simply create. But, as Torrance and Myers (1970) have argued, promoting creativity in education, demands the most highly skilled teaching.

So, schools as well as families can encourage creativity in science by offering children activities that give them an active role in their own learning, allow them freedom to explore within a loosely structured framework, and encourage them to participate in creative activities for the sheer enjoyment of it rather than for external rewards.

Importance of the Research

Scientific creativity has been of central concern to all who work on creativity and is a topic that has been tackled by almost every major area in psychology ranging from Psychoanalytic accounts of creativity(Freud 1932), to Gestalt(Wertheimer 1945), Social(Amabile 1983), Cognitive(Simon 1977), and Psychometric approaches(Roe 1952). For Scientific Creativity, many researchers believe that in order to foster creativity in science subject, in schools, education should be based on the discovery of knowledge and the development of critical attitudes, rather than on the passive absorption of knowledge. They believe this applies whether the class is in art, history, science, or humanities. However, most school teaching in the United States is based on the child's ability to memorize. The highest marks are often given to those who merely studied their lessons well. The pupil whose creative side is more developed may be considered a disruptive member of the class.

Even in India, many schools are opting for various techniques (Brainstorming technique, effect of strokes etc.) to enhance the creativity of the students. But before integrating

creativity with science subject, which is referred to as scientific creativity, it is essential to know whether other variables affect scientific creativity of students. One of the most common ways of investing scientific creativity has been to analyze either the life of a creative scientist or how a scientist made an important scientific discovery. But at school level it is essential to analyze whether other variables (like school environment, home environment etc.) also affect scientific creativity of the pupils. So, the present study analyzes the relationship of school environment on scientific creativity.

Title of the Research

A study of Effect of School Environment on the Scientific Creativity among secondary level school students

Operational Definitions

a) **Scientific Creativity** - Creativity is the potential of a person to produce creative works, thus scientific creativity refers to the potential of a person's new ideas in the field of science.

b) **School Environment** - It refers to the general socio-psychological climate of school which provides conditions and opportunities to develop scientific attitude and scientific creativity (School Environment Inventory by Mishra, K.S).

Objectives of the Study

The present study has been conducted with the following objectives:

1) To study the effect of School Environment on the Scientific Creativity among secondary level school students.
2) To compare the scientific creativity of secondary level students of government and private school.
3) To compare the scientific creativity of secondary school boys and girls.

Hypothesis of the Study

The present study has been conducted with the following hypothesis:

1) There is a significant relationship between the school environment and the scientific creativity of secondary school students.
2) There is a significant difference between scientific creativity of government and private secondary school students.
3) There is a significant difference in the scientific creativity of secondary school boys and girls.

Delimitations of the Study

Keeping in view the limitation of available time and resources, the present investigation took place with the following delimitations to define the scope of the problem under investigation:

a) The sample is confined to secondary level school students.
b) The study is restricted to school of Delhi & NCR only.
c) The study is restricted to government and private schools.
d) The study is confined to 200 students.

Significance of the Study

Kalam, Abdul A.P.J. (2005) emphasized about attracting bright and enthusiastic youth to science and producing scientists. He said that youth must be made to understand the beauty of doing science, the pleasure of doing science, and the ultimate bliss when results of science make you understand nature, master it, control it, and finally make things that improve the quality of life of humankind. Every scientist must pledge that he or she will spend at least some time visiting schools to ignite young minds by recounting his or her experiences.

One of the most common ways of investing scientific creativity has been to analyze either the life of a creative scientist or how a scientist made an important scientific discovery. But at school level it is essential to analyze whether other variables (like school environment, home environment etc.) affect scientific creativity of the pupil.

The investigator found out researches relating scientific creativity with academic achievement, motivation, home environment etc but very few researches were found out depicting the relation between scientific creativity and school environment. So, present study will analyze the relationship of school environment with scientific creativity.

Research Variables

- School Environment is the independent variable of the research.
- Scientific Creativity is the dependent variable of the study.

Plan of the Study

The plan of the present investigation involved three stages:

- Selection of tools
- Formation of sample and collection of data
- Analysis of data and interpretation of results

Research Tools

Keeping in mind the objectives of the present study, the researcher had chosen two types of tools:

a) Scientific Creativity Test (By Majumdar)

The selections of dimensions that measure scientific creativity are as follows:

i) Convergent items: it meant to elicit certain definite correct answers
ii) Fluency items: it is expected to elicit multiple responses, and where the no of valid responses should be considered.
iii) Flexibility items: it is responded to, preferably with various diverse types of ideas
iv) Elaboration items: it needs the elaboration of the item
v) Originality items: it emphasizes on novelty or originality of the responses.

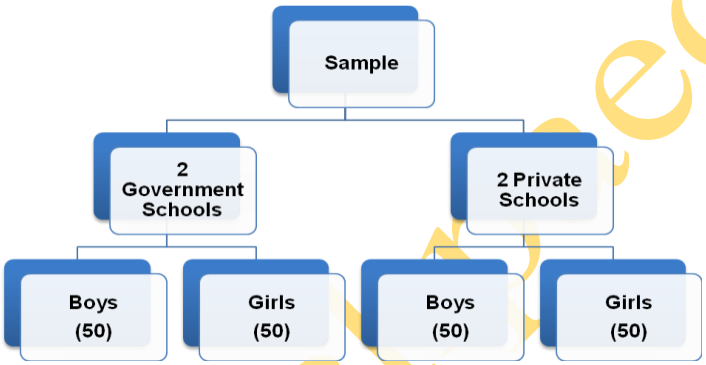
b) School Environment Inventory (K. S. Mishra)

SEI contains 70 items related to the six dimensions of school environment. The six dimensions are:

i) Creative stimulation (CRS)
ii) Cognitive encouragement (COE)
iii) Acceptance (ACC)
iv) Permissiveness (PER)
v) Rejection (REJ)
vi) Control (CON)

Formation of Sample and Collection of Data

Since the present study is a comparative study between government and private secondary school students therefore 8 schools (4 government and 4 private) of NCR were approached out of which 4 schools(2 government and 2 private) agreed to participate in the study. A total of 50 students from the selected schools comprising of boys and girls were taken as sample from each type of school. Given below is the sampling procedure followed:



In each type of selected schools there were 3 to 4 sections of class IX with the strength of 50 students per section. One section from each type of school was chosen on the basis of random sampling for the purpose of data collection. The tests were administered on a sample of 200 students comprising 25 boys and 25 girls from each of the selected schools. The researcher administered the tests as well as marked the answer sheets herself. After this the scores were entered on paper. These were then computerized for further processing work.

Analysis of Data and Interpretation of Results

Mean, Standard Deviation, Correlation and t-test were planned to find out the level of difference among the students belonging to the Government and Private schools. The data was analyzed both qualitatively and quantitatively as per the objectives of the study.

OBJECTIVE 1

To study the effect of School Environment on the Scientific Creativity among secondary level school students

HYPOTHESIS

There is a significant relationship between the school environment and the scientific creativity of secondary school students.

To study the relationship between Scientific Creativity and dimensions of School Environment, coefficient of correlation was calculated and represented in the tabular form (Table 1).

S.No.	Independent Variable	Dependent Variable	Correlation
A.	Creative Stimulation	Scientific Creativity	0.00162261
B.	Cognitive Encouragement	Scientific Creativity	0.019459
C.	Acceptance	Scientific Creativity	0.010185
D.	Permissiveness	Scientific Creativity	0.0103981
E.	Rejection	Scientific Creativity	-0.03365
F.	Control	Scientific Creativity	-0.01456

Table 1: *Relationship between school environment and scientific creativity among secondary school students*

OBJECTIVE 2

To compare the scientific creativity of secondary level students of government and private school

HYPOTHESIS

There is a significant difference between scientific creativity of government and private secondary school students.

The results obtained after administering the Scientific Creativity Test (by Majumdar) on government and private school students are given in Table 2.

Sample (N)	Mean	S.D.	t-value
Private School (N=100)	92.63	36.38	4.19
Government School (N=100)	76.37	13.44	

Table 2: *Significant difference between scientific creativity of private and government school students*

OBJECTIVE 3

To compare the scientific creativity of secondary school boys and girls

HYPOTHESIS

There is a significant difference between scientific creativity of secondary school boys and girls.

The mean, standard deviation and t-value of the scores attained by the secondary school boys and girls are given in Table 3.

Sample (N)	Mean	S.D.	t-value
Boys (N=100)	82.21	29.32	1.13
Girls (N=100)	86.79	27.70	

Table 3: *Significant difference between scientific creativity of secondary school boys and girls*

Conclusions of the Research

- **There is a significant relationship between the school environment and the scientific creativity of secondary school students.**

On the basis of mean, standard deviation and correlation, it is concluded that there exists a positive correlation between school environment and scientific creativity of secondary school students. Hence the above stated hypothesis is accepted which means the null hypothesis that there is no significant relationship between the school environment and the scientific creativity of secondary school students is rejected.

- **There is a significant difference between scientific creativity of government and private secondary school students.**

On the basis of mean, standard deviation and t-test, it is concluded that there exists a significant difference between the scientific creativity of secondary school students of government and private schools. Hence the above stated hypothesis is accepted which means the null hypothesis that there is no significant difference between the scientific creativity of secondary school students of government and private schools is rejected.

- **There is a significant difference in the scientific creativity of secondary school boys and girls.**

On the basis of mean, standard deviation and t-test, it is concluded that there exists a significant difference between the scientific creativity of secondary school boys and girls. Hence the above stated hypothesis is accepted which means the null hypothesis that there is no significant difference between the scientific creativity of secondary school boys and girls is rejected.

Educational Implications

Scientific Creativity leads to inventions and invention leads to scientific advancement of the human civilization. Scientific Creativity plays a major role in human advancement. It is the responsibility of the educational sector to provide the creative platform not only for identification of scientific creativity but also to create appropriate environment for the same. Some of the major educational implications of the present study, a comprehensive study of scientific creativity and school environment are as follows:

1. The scientific creativity, a major objective of science teaching and the predictor of future performance, may be cultivated and developed to a greater extent among secondary school students.
2. The study of association between scientific creativity and school environment may help the science educators for making necessary curriculum decisions and in guiding the pupils to develop the proper scientific creativity.
3. The school should focus on different techniques like brainstorming etc. to enhance scientific creativity of the children.
4. As it is substantiated in the present study that there is a significant difference in scientific creativity of government and private school students. Therefore it may represent that the quality of education in science subject in private school is better than government schools. So government schools should increase the quality standard to cater scientific creativity of the children.
5. The teachers should inculcate different techniques in the lesson plan to cater scientific creativity of the children.
6. On the basis of the positive or negative relationship between scientific attitude and school environment of secondary school students, proper measures can be taken to promote or eliminate the factors responsible.

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