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Creative Talents of Elementary School Students of Himachal Pradesh

T.C. Rawat *

Abstract : *The paper focuses on the flexibility component of scientific creative talent of Elementary stage students of Himachal Pradesh with respect to area, type of school and gender. The sample for the study consisted of 1120 elementary school students (classes VII and VIII) spread over five districts of Himachal Pradesh. To collect the requisite data for the present study, the investigator used verbal Test of Scientific Creativity constructed by V.P. Sharma and J.P. Shukla. The data were analyzed with the help of three ways ANOVA (2x2x2). The result revealed that elementary school students belonging to urban area have more flexibility in scientific creative talent as compared to their rural counterparts. The elementary stage boys exhibited slightly more flexible than that of their girl counterparts. It was found that area and school, school and gender interact significantly in developing scientific creative talent among elementary school students. The study indicates that flexibility level in the scientific creative talent of elementary school students needs to improve at the school level.*

Keywords: *Flexibility component, Scientific demonstrable creative talent, Elementary school*

Introduction

The scientific and technological development of today is a long journey from cow dung age to the atomic age. There is tremendous expansion of social, economical and political institutions. There is an expansion of knowledge on all fronts and it is the result of creative thinking. Creative thinking is the process of solving problems creatively. A creative thinker takes into consideration his/her own discoveries and those of others, finding new ways of studying nature and theories come out with new and original solutions. According to Sternberg (1984), creativity is a process which results in a novel work that is accepted as tenable to useful or satisfying to a group of people at some point in time. Spearman (1931) defines creativity as the power of the human mind to create new contents by transforming relations and thereby generating new correlations. Alfughaiman, Abdullah and Mowrer-Reynolds, Elizabeth (2005) studied teachers' conception of creativity and creative students. The study described that teachers were found to possess inaccurate concepts regarding what constitutes creativity and revealed conflict with the classroom behaviours demonstrated by creative students. The paradox between teachers reported support for creative enrichment and virtual lack of related classroom practice is explored as a result of multiple misconceptions and contributing variables. Richardson (2006) encompassed two studies each designed to explore the factors involved in creativity. The first study used a test consisting of eight creativity measures. Subjects were eleventh grade Jamaican students. Factor analysis was used to score each of the measures. Two factors of creativity, a verbal factor and

* *Principal, LalGee College of Education, Gutker, Distt. Mandi H.P.*
E-mail: drtcrawat@gmail.com

a nonverbal factor, were revealed. Similar findings were found in the second study repeated two years later to a comparable sample of subjects. It is suggested that researchers employ both verbal and nonverbal measures to identify creative individuals. Further, the dimensions of flexibility and originality should be considered. Nisha and Gupta (2007) studied the relationship of verbal creative thinking abilities and creative personality. Results revealed that the verbal creative thinking abilities flexibility, original power and ingenious solution of problems are related to creative personality. The relationship between creative abilities and creative personality is higher among males than among females. The definitions and studies presented here have considered creativity both as process and product. But the central essential condition of novelty or newness in the creation has not been overlooked by anyone.

Our present day evolution system is examination ridden. It prepares our students only for passing the examination, but not for developing in them the qualities and potentialities needed for the future mankind's problems. Good education, proper care and provision of opportunities for creative expression inspire, stimulate and sharpen the creative mind, and it is in this sphere, that parent, society and teacher make a significant contribution. They are required to help the children in nourishing and utilizing their creative abilities to the utmost. The educational process, therefore, should aim at developing creative abilities among children. This can be achieved by acquainting the teachers and parents with the real meaning of the creative process and the ways and means of developing nurturing creativity.

Creativity in Science

Being creative in science is tough and requires brain power. Creativity involves seeing new patterns and connections, putting together parts to make a whole and breaking the whole to make new parts. It is viewing something from a different perspective, considering possibilities or alternatives, or thinking unconventionally – thinking straight when the pattern is fuzzy, thinking nonlinearly when the pattern seems straight. The creative process in science begins with the mental processing of a lot of information gathered from the physical world and ends with a tangible result – new knowledge, a new creation, product or discovery. For all these, one needs a superior mind or a powerful brain with a dense circuit of highly interconnected neurons that can process numerous stimuli and generate equally numerous responses quickly, almost instantaneously. Mental processing is not done "in series" or "in parallel," but through a complex circuit or network of neurons. Creative scientists seem to possess these strong emotions which serve as the driving force for the sustained, sometimes lifetime, obsessive pursuit of a field or subject of interest. This excitement or passion is evident during talks or seminars given by eminent scientists. James Watson, famous for solving the structure of DNA in the mid-50s, writes about his passion for science in a book entitled A Passion for DNA.

Scientific Creativity

To develop creativity in science, first we must understand what is unique about science as a field of human knowledge. Science involves the study of the physical or material world. In science, we study all aspects of Nature, which consists of all material things, including man and the environment. The scientific method, which is considered a refinement of the human cognitive process, is traditionally described as a chronology of activities which begins with a hypothesis to solve a problem or explain a phenomenon in the physical world. This is followed by observations and experiments to test the hypothesis, and it ends with the hypothesis being proven right or wrong. Deductive and inductive reasoning, analytical thinking and synthesis, are exercised throughout this process.

Today science is taught in a less structured way and generally involves the continuous interplay of empirical, experimental and rational methods. This is aimed at understanding the underlying principle, mechanism or function of a physical, chemical or biological phenomenon. The scientific facts or "truths" discovered and propounded by scientists must be shown to be verifiable and reproducible; being drawn from conclusions obtained using methods which are as objective and quantitative as possible. Indeed, through the years, certain scientific "truths" have been overturned or disproved by new ones.

Depending on the field of interest or specialization in science, one method may be used predominantly over the others. Thus, physicists can either be experimental physicists or theoretical physicists. The field of biology, generally considered an empirical science in the past, now benefits from a great deal of experimentation, manipulation, and mathematical modeling, due to the development of new techniques in cell biology and molecular engineering and the availability of very powerful instruments and computers. The trend in science seems to be toward understanding the complexity of Nature at greater depth and breadth, from the systems biology level down to the molecular level. Moreover, scientists in specialized fields are coming together under multi-disciplinary research programs, and mathematicians are interacting more with scientists. Thus, we see the growth of fields such as Biophysics, Molecular Medicine, and Computational Biology, to name only a few. These new combined perspectives and "multi-tasking" efforts have led to deeper insights and greater creativity in solving problems in science. For example, today, biological principles and biological structures are being used as models to solve engineering problems in a more environment-friendly way.

Scientific creativity may be considered as specific creative expression, unique production in science and technology. It may be a unique scientific process responsible for some creative contribution in the field of science, technology or otherwise. Scientific Creativity may be defined in the following ways:

Holmes (1992) scientific creativity deals with the unusual and original excellence in the field of science or scientific productivity. Thomas and Chess (1977) Scientific creativity can be thought as scientific method or scientific process primarily involved in production of unusual and original scientific contribution. Brown (1989) the unusual scientific thinking abilities characterized by systematic approach for all contents whether from science or humanities or otherwise could be considered as the basic attribute of scientific creativity.

For developing such a measure which could tap exactly the scientific creativity as defined here, it is essential that content of the test items of scientific creativity should be of very general nature. Though the content need not be restricted to the fields of science; however it would be effective in measuring such a dimension of scientific creativity if they touch the fundamental or general elementary contents of science. No doubt creativity as a natural endowment needs stimulation and nourishment. Most of the creative talents if the absence of proper training, education and opportunities for expression is wasted. Therefore it becomes essential for the full growth and development of the creative talents of children. We have entered in the 21st century - the age of science and technology. All the scientists have their foundation during the school education. This is why this study is on various facets of environment stimulating creativity in elementary stage school children. Various facets of environment like stimulation, nurturance, relaxation, constructive feedback, learning opportunities, diversity of view points, freedom with accountability for excellence, creators as role models and facilities for experimentation are taken into consideration, as stimulating scientific creative talent among elementary stage school children under various factors like, home, school, society and work/study environment.

Significance of the Study

As scientific creative talent accounts for academic achievement and this can be generated in a creative environment. Sincere attempts have been made by the investigator to highlight the children's scientific creative potentialities. It is an attempt to ascertain whether area and type of school has any relation to scientific creative environment available for the elementary stage students or not. Here an attempt has been made to find out how congenial and conducive these variables are in case of the elementary school students. So, there is urgent need to investigate whether such conditions affect the scientific creative talent of the elementary stage students along with education. The present study focuses on flexibility component of scientific creative talent, the important side of the education. No such study of this has been conducted so far in Himachal Pradesh. Hence, the researcher decided to undertake this study

Objectives of the Study

The objectives of the present study are as follows:

i. To study the flexibility component of scientific creative talent of elementary school students of rural and urban areas.

ii. To study the flexibility component of scientific creative talent of elementary school students studying in Government. and Private Schools.

iii. To study the flexibility component of scientific creative talent of boys and girls elementary school students.

iv. To study double and triple interactional effect of Area and School on the flexibility component of scientific creative talent of elementary school students.

v. To study double and triple interactional effect of School and Gender on the flexibility component of scientific creative talent of elementary school students.

vi. To study double and triple interactional effect of Gender and Area on the flexibility component of scientific creative talent of elementary school students.

vii. To study interaction effects of Area, School and Gender on the flexibility component of scientific creative talent of elementary school students.

Hypotheses

The hypotheses of the present study are as follows:

H_{01} There exist no significant difference between elementary students of rural and urban areas in the flexibility component of scientific creative talent.

H_{02} Elementary students of Government and Private schools do not differ significantly in the flexibility component of scientific creative talent.

H_{03} Elementary school boys and girls do not differ significantly in the flexibility component of scientific creative talent.

H_{04} Area and School do not interact significantly in developing flexibility component of scientific creative talent among elementary school students.

H_{05} Gender and Area do not interact significantly in developing flexibility component of scientific creative talent among elementary school students.

H_{06} School and Gender do not interact significantly in developing flexibility component of scientific creative talent among elementary school students.

H_{07} Area, School and Gender do not interact significantly in developing flexibility component of scientific creative talent among elementary school students.

Methodology

Descriptive survey method of research was employed in carrying out the study. It involves the description, recording, analysis and interpretation of conditions that now exist.

Sample

The population of the present study consists all the students of elementary classes studying in schools affiliated to Himachal Pradesh Board of School Education. Five districts, viz. Shimla, Mandi, Chamba, Bilaspur, and Hamirpur, out of twelve districts of H.P., were selected randomly to draw the required sample of 1120 students for the study. The schools were selected from rural and urban areas purposively.

Tool used

To collect the requisite data for the present study, the investigator used Verbal Test of Scientific Creativity constructed V.P. Sharma and J.P. Shukla. The investigator administered the Verbal Test of Scientific Creativity, personally, on the selected students of elementary classes VII and VIII. The norms of the test administration were followed by the researcher. Flexibility has been scored in terms of total number of categories.

Statistical Technique

The statistical technique of three way ANOVA (2×2×2): Area (Rural × Urban); School type (Government × Private); and Gender (Boys × Girls) was used by the investigator to analyse the data.

Analysis and Results

To fulfill the objectives of the present study, the investigator analyzed the data of flexibility component of scientific creative talent obtained through the Verbal Test of Scientific Creativity from the sampled boys and girls of VII and VIII classes of the academic session 2008-09 and 2009-10:

A. Effect of Area, School Type and Gender on the Flexibility

In order to study the main effects of type of Area, School and Gender on the flexibility scores of sampled elementary stage students, statistical technique of analysis of variance (ANOVA) (2×2×2, factorial design involving two types of Area, i.e. rural and urban, two types of Schools, i.e. government and private and two levels of Gender i.e. boy and girl) was applied on the means of flexibility scores. The means of flexibility scores of elementary stage students are given in the table 1 as follows:

Table 1: Means of Flexibility Scores of Elementary School Students By Area, School and Gender

Type of Area		Rural	Urban	Total
School	**Gender**			
Govt.	Boys	20.92	43.36	64.78
	Girls	08.91	25.50	34.41
Private	Boys	27.84	30.29	58.13
	Girls	18.15	20.41	38.56
Total		75.82	119.56	195.38

It is clear from the results of table no. 1 that elementary school students belonging to urban area are more flexible in scientific creative talent (Mean Score=119.56) as compared to their rural counterpart (Mean Score=75.82). Elementary stage students of government schools are more flexible in scientific creative talent as compared to the elementary stage students of private schools. The elementary school boys exhibited slightly more flexibility than the elementary school girls (Mean = 112.91 and 72.97 respectively). From the means of flexibility scores of elementary school students on Verbal Test of Scientific Creativity, F-values were calculated. The results are summarized in the table 4.2 as follows:

Table 4.2: Summary of Analysis of Variance of Flexibility Scores of Elementary School Students

Source of Variation	Sum of Squares	Df	Mean Square	F- Value
Area (A)	33452.36	1	33452.36	280.93*
School (B)	71.51	1	71.51	0.60
Gender (C)	42768.07	1	42768.07	359.17*
Area × School (A × B)	20597.15	1	20597.15	172.97*
Area × Gender (A× C)	637.52	1	637.52	5.35**
School × Gender (B × C)	1859.15	1	1859.15	15.61*
Area × School × Gender (A × B × C)	558.64	1	558.64	4.69**
Error variance (Within Treatment)	132412.84	1112	132412.84	-
Total	232375.24	1119		

*DF = df (Degrees of Freedom), *Significant at 0.01 level of significance (p<0.01)*
***Significant at 0.05 level of significance (p<0.05)*

Main Effects

Effects of Area

The computed value of F-ratio for the main effect of Area on the flexibility scores of elementary school students irrespective of the type of school and gender for df= 1/ 1112 came out to be 280.93, which is higher than the table value (6.64) at 0.01 level of significance. Thus, there exists significant difference in the flexibility component of Scientific Creativity of elementary stage students of rural and urban areas. Hence, the null hypothesis H01: There exist no significant difference between elementary students of rural and urban areas in the flexibility component of scientific creative talent was rejected.

Effects of School Type

The computed value of F-ratio for the main effect of school type on the flexibility scores of elementary school students irrespective of the type of area and gender for df= 1/ 1112 came out to be 0.60, which is lower than the table value (3.84) at 0.05 level of significance. Thus, there does not exist significant

difference in the flexibility component of Scientific Creativity of elementary school students of Govt. and Private schools. Hence, the null hypothesis H02: Elementary students of Government and Private schools do not differ significantly in the flexibility component of scientific creative talent, was retained.

Effects of Gender

Main effect for the variable of gender was significant, F (1,1112) = 359.17 > 6.64 at 0.01 level of significance. It is found that the elementary stage boys and girls differ significantly at 0.01 level of significance. Hence, the null hypothesis H03: elementary school boys and girls do not differ significantly in the flexibility component of scientific creative talent, was rejected.

Interactional Effects

Area and School Type

The interaction effect of Area and School type on the flexibility component of scientific creative talent was found to be significant (F =172.97; df=1/ 1112; p< 0.01). It indicates the difference in flexibility of elementary school students of rural and urban areas and elementary school students of Govt. and Private schools. Hence, null hypothesis H04: Area and School do not interact significantly in developing flexibility component of scientific creative talent among elementary school students, was rejected.

Area and Gender

The interaction effect of Area and Gender on the flexibility component of scientific creative talent was found to be significant (F = 5.35; df= 1/ 1112; p<0.05). It is concluded that effect of Area on Flexibility is significantly different for both type of gender, i.e. boys and girls. Hence, the null hypothesis H05: Gender and Area do not interact significantly in developing flexibility component of scientific creative talent among elementary school students, was rejected.

School Type and Gender

The interaction effect of School and Gender on the flexibility component of scientific creative talent was found to be significant (F= 15.61; df=1/ 1112; p< 0.05). Hence the null hypothesis H06: School and Gender do not interact significantly in developing flexibility component of scientific creative talent among elementary school students, was rejected.

Area, School and Gender

The interaction effect of Area, School, and Gender on the flexibility component of scientific creative talent was found to be significant (F= 4.69; df=1/ 1112; p< 0.05). Thus, the null hypothesis H07: Area, School and Gender do not interact significantly in developing flexibility component of scientific creative talent among elementary school students, was rejected.

Major Findings of the Study

i. The Elementary school students belonging to urban area are more flexible in scientific creative talent as compared to their rural counterparts.

ii. There found a significant difference in the flexibility component of scientific creativity of elementary school students of rural and urban area.

iii. The elementary school students of Govt. Schools are more flexible in scientific creative talent as compared to Elementary school students of Private Schools.

iv. There does not exist significance difference in the flexibility component of scientific creativity of elementary school students of Govt. & Private schools.

v. The elementary school boys exhibit slightly more flexibility than the elementary school girls.

vi. There is a significant difference in the flexibility component of scientific creativity of elementary school boys and girls.

vii. It is found in the study that variables such as area, school type and gender interact significantly in developing scientific creative talent among elementary school students. Thus, the study indicates that flexibility level in the scientific creative talent of elementary school students needs to improve at the school level.

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