



A Comparative Study of Mathematical Creativity of CBSE and UP Board students with reference to their Academic Climate

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Abstract:

National Policy on Education (1986) has envisaged that: "Mathematics should be visualized as the vehicle of communication to train a child to think, to reason, to articulate and to analyze logically. It should be treated as concomitant to any subject involving analysis and synthesis." We need people of high mathematical creativity who can solve not only the mathematically problems creatively but also the problems of other fields by applying creative Mathematics. Mathematical creativity is a more elusive subject of study, has received substantial attention by the mathematics educators. The present study focus how to develop and foster creative talent in Mathematics at school students.

1. Introduction

Lithner (2005) which is a theoretical structuring of the outcomes of a series of empirical studies aiming at analysing characteristics of the relation between reasoning types and learning difficulties in mathematics Bergqvist et al.10 (2000) The framework defines different types of mathematical creative reasoning found in the empirical studies. These comprise rich problem solving (in terms of Creative mathematically founded reasoning) and a family of reasoning types characterised by strive for a recall of algorithms or facts (in terms of Imitative reasoning). When contrasting creative reasoning in mathematics to imitative reasoning there are two types of considerations to make that will be briefly discussed below: What makes it creative and what makes it mathematical Creativity. According to Haylock11 (1997) there are at least two major ways in which the term is used: i) thinking that is divergent and overcomes fixation and (ii) the thinking behind a product that is perceived as grandiose by a large group of people. Silver12 (1997) argues that "although creativity is being associated with the notion of 'genius' or exceptional ability, it can be productive for mathematics educators to view creativity instead as an orientation or disposition toward mathematical activity that can be fostered broadly in the general school population". Thus, a notion of creativeness limited to ii), the thinking of geniuses or the creation of great ideas with large impact on our society, is not suitable for the purposes of the research. Instead, central are the creative aspects of ordinary students' everyday task solving thinking, the reasoning that goes beyond just following strict algorithmic paths or recalling ideas provided by others. Regarding Haylock (1997) sees two types of fixation. Content universe fixation concerns the range of elements seen as appropriate for applications to a given problem. According to Silver (1997), a new research based view of creativity suggests that it is related to deep, flexible knowledge in content domains and associated with long periods of work and reflection rather than rapid and exceptional insights. The framework of this research amalgamates Creativity in Mathematics is a very complex trait. In India, such outstanding mathematicians as Ramanujan, Bhaskracharya, Brahamgupta, Aryabhata, Shridharacharya,

Mahaviracharya etc, have contributed to the study of mathematical creativity. These personalities were the creative mathematicians, and devoted so many years and energy for the development of creative ideas in mathematics. Mahasidhant written by Aryabhata, Grahopdesh by Brahmagupta, Ganitsarsangraha by Mahaviracharya, Trishatika by Shridhracharya, etc. received recognition worldwide. Their work evaluated in terms of product. Creativity in mathematics requires intuition, imagination, experimentation, judicious guessing, blundering, fumbling, hard work, tabulation and real thinking. Mathematics is a process of real thinking rather than the final product. Knowing mathematics should imply using the mathematical habit of thinking. Mathematical creativity expresses itself in generating new significant concepts or theorems, establishing connection between facts of mathematics and facts of nature. Mathematical creativity enables the individual to comfort the problematic situations in life and become good problem solvers by providing innovative and novel situations to each individual problem. Personal characteristics such as mathematical aptitude, home environment and school environment etc. of mathematical creative children are of monumental importance. Personality and attitudinal variables are not only variables related to mathematical creativity but also numerous organisinic, mathematical aptitude, home environment, school environment are the factors related to creative behaviour in mathematics. A rich source of knowledge of present behaviour patterns of an individual is the historical biographical information about the child and his family. It may include home environment, parents behaviour towards children, parent-child relationship, respect in family for autonomy, family size, birth order etc. home environment is suppose to play a decisive role in the development of mathematical creativity. Both the father and mother in a family help to determine the psychological climate of the whole. Creativity theorists and researchers argue that creativity flourishes in a democratic environment and authoritarian environment inhibits pupils' creativity.

2. Objectives of the study

Objectives of the present research study included the following

1. To study The Mathematical Creativity and its dimensions of CBSE and UP Board Students.
2. To study The Academic Climate and its dimensions of CBSE and UP Board Students.
3. To compare students of high and low academic climate group with respect to their mathematical creativity.
4. To find out relationship between mathematical creativity and academic climate exhibited by students of CBSE and UP board.

3. Hypotheses of the Study

1. CBSE and UP Board students differ significantly on their mathematical creativity and its dimensions.
2. CBSE and UP Board schools differ significantly on their academic climate and its dimensions.
3. Students belonging to high and low academic climate groups differ significantly on their mathematical creativity.
4. There exists a significant correlation between mathematical creativity and Academic climate.

4. Methodology

The theory of the topic under study, the objectives and hypotheses of the study, the resource available to investigator, the competencies of investigator etc determine the choice of research method. These considerations have led the present investigator to use NORMATIVE SURVEY METHOD of research for this study.

5. Sample of the Study

A statistical sample of 300 UP board and 300 CBSE board students was selected by using stratified random sampling techniques For this investigator prepared lists of Schools affiliated to CBSE and UP board. Each school in the population was given a code number. Ten sample schools were selected from each board. Viz. CBSE and UP board).

6. Sample Structure

Board	CBSE Board		UP Board		Total
	Boys	Girls	Boys	Girls	
Rural	75	75	75	75	300
Urban	75	75	75	75	300
Total	150	150	150	150	600

7. Tools

The investigator selected standardized tool for the present study.

1. Mathematical Creativity Test prepared and standardized by Prof. Bhoodev Singh Head and Dean BHU Varanasi.
2. The investigator selected standardized tool for the present study. Academic Climate Description Questionnaire by M.L. Shah and Amita Shah.

8. Statistical Techniques used

To analyze the data the investigator has used measures of central tendency mean, standard deviation, ‘t’ test, chi-square, standard score t score were used as statistical techniques in the present study.

9. Result and Discussions

Table 1: Comparison of Mathematical Creativity of CBSE and UP Board students

Variable	Board	Mean	S.D.	N	t value
Mathematical Creativity	CBSE	53.94	10.64	300	9.43
	UP	47.01	6.99	300	
Fluency	CBSE	53.24	9.18	300	5.72
	UP	49.22	8.01	300	
Flexibility	CBSE	52.85	11.21	300	15.09
	UP	41.23	7.43	300	
Originality	CBSE	57.85	11.23	300	4.55
	UP	48.18	8.23	300	

Significant at 0.01 Level

CBSE and UP Board students differ significantly on their mathematical creativity and its dimensions. CBSE students are higher in mathematical creativity as well as in its dimensions viz. fluency, flexibility and originality than UP Board students. This shows that the type of board affects the mathematical creativity of students. CBSE board student posses high mathematical creativity than UP board students which tell us that CBSE board students are more aware in study of mathematics. CBSE schools provide a better environment and facilities for fostering of Mathematical creativity talent such as mathematical Laboratory, institutional and instructional facilities well trained and qualified teachers, continuous internal assessment system, innovative policy of education. Results of few years and percentage of selections in competition IIT- JEE and state engineering competition show the better performance of CBSE Board in comparison to UP board students. Achievement and giftedness in mathematics affects the mathematical creativity. Parasnisl (1985) and Tuli2 (1979) reported significant correlation between

achievement in mathematics and mathematical creativity. Few years Board results, performance in competition show that CBSE board students' are superior than UP Board students on their achievement in mathematics. That is why CBSE board student posses high mathematical creativity than UP board students.

Table 2: Comparison of Academic Climate of CBSE And UP Board Students

Academic Climate	Very High	High	Average	Low	Very Low	Total
CBSE Board	48	85	109	32	26	300
UP Board	20	36	80	43	121	300
Total	68	121	189	75	147	600

Chi-square value Degree of Freedom and level of Significance for Academic Climate

Chi-Square	Calculated Value	Table value	df	Level of Significance
	12.35	8.76	4	Significant at 0.01 Level

In the above table calculated value of χ^2 is 12.35 which is greater than the table value at given level of significance (0.01) and df 4. This show that null hypothesis is rejected.

On the basis of above results we can conclude that “CBSE and UP Board schools differ significantly on their academic climate. CBSE Schools have better academic climate than UP Board schools”.

Table 3: Comparison of Academic Climate’s Dimension: Physical Materials of CBSE And UP Board Students

Physical Materials	Very High	High	Average	Low	Very Low	Total
CBSE Board	45	81	88	44	42	300
UP Board	35	55	124	43	43	300
Total	80	136	212	87	85	600

Chi-square value Degree of Freedom and level of Significance for PMT

Chi-Square	Calculated Value	Table value	df	Level of Significance
	12.35	8.76	4	Significant at 0.01 Level

In the above table calculated value of χ^2 is 12.35 which is greater than the table value at given level of significance (0.01) and df 4. This show that null hypothesis is rejected. On the basis of above results we can conclude that “CBSE and UP Board schools differ significantly on their Physical Materials such as School infrastructure, Laboratories, libraries etc. CBSE Schools have better Physical Materials than UP Board schools”.

Table 4: Comparison of Academic Climate’s Dimension: Inter-Personal Trusts of CBSE And UP Board Students

IPT	Very High	High	Average	Low	Very Low	Total
CBSE Board	30	53	118	67	32	300
UP Board	46	54	73	62	65	300
Total	76	107	191	129	97	600

Chi-square value Degree of Freedom and level of Significance for IPT

Chi-Square	Calculated Value	Table value	df	Level of Significance
	12.35	8.76	4	Significant at 0.01 Level

In the above table calculated value of χ^2 is 12.35 which is greater than the table value at given level of significance (0.01) and df 4. This show that null hypothesis is rejected. On the basis of above results we can conclude that “CBSE and UP Board schools differ significantly on their Inter-Personal trusts. CBSE Schools have better Inter-Personal trusts than UP Board schools”.

Table 5: Comparison of Academic Climate’s Dimension: School Provisions of CBSE And UP Board Students

School Provisions	Very High	High	Average	Low	Very Low	Total
CBSE Board	60	95	93	31	21	300
UP Board	13	59	57	82	95	300
Total	73	154	150	113	116	600

Chi-square value Degree of Freedom and level of Significance for School Provisions

Chi-Square	Calculated Value	Table value	df	Level of Significance
	121.35	8.76	4	Significant at 0.01 Level

In the above table calculated value of χ^2 is 121.35 which is greater than the table value at given level of significance (0.01) and df 4. This show that null hypothesis is rejected. On the basis of above results we can conclude that “CBSE and UP Board schools differ significantly on their school provisions. CBSE Schools have better school provisions than UP Board schools”.

Table 6: Comparison of Academic Climate’s Dimension: Academic Provisions of CBSE And UP Board Students

Academic Provisions	Very High	High	Average	Low	Very Low	Total
CBSE Board	45	75	106	35	39	300
UP Board	22	58	71	46	103	300
Total	67	133	177	81	142	600

Chi-square value Degree of Freedom and level of Significance for IPT

Chi-Square	Calculated Value	Table value	df	Level of Significance
	47.35	8.76	4	Significant at 0.01 Level

In the above table calculated value of χ^2 is 47.35 which is greater than the table value at given level of significance (0.01) and df 4. This show that null hypothesis is rejected. On the basis of

above results we can conclude that “CBSE and UP Board schools differ significantly on their academic provisions. CBSE Schools have better academic provisions than UP Board schools”.

Table 7: Comparison of Mathematical Creativity of Students Belonging to High and Low Level of Academic Climate

Variable	Mean	S.D.	N	t Value
MCT of Students having High Level of Academic Climate	154.82	27.32	173	2.65
MCT of Students having Low Level of Academic Climate	148.44	24.92	427	

Significant at 0.05 Level

The above table depicts Mean, S.D. and t-value Mathematical Creativity of students having High and Low level of Academic Climate. The calculated mean and S.D. of students having high academic climate as shown in the table has come out 154.82 and 27.32 respectively. Whereas students of low academic climate has scored 148.44 as a mean and 24.92 as S.D. and t- value of this group is 2.75. The t-value is greater than the value at given level of significance. This show that null hypothesis is rejected. On the basis of above table we can conclude that students belonging to high academic climate group and low academic climate group differ on their level of Mathematical Creativity.

Table 8: Correlations between Mathematical Creativity and Academic Climate of Students

Variables	Sample size	df	Correlation coefficient	Significance
Mathematical Creativity	600	598	0.33	Significant at 0.01 Level
Academic Climate				

The two tailed test of significance of correlation has been done against the null hypothesis that the population correlation is in fact zero. When N=600 statistically df= 598, the value of r should be at least 0.15 and 0.11 above to be significant at 0.01 and 0.05 level respectively. table shows that Academic Climate of Students is significantly correlated with Mathematical creativity.

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