



A Comparative Study of Creativity Among Under-Graduate Mathematical Gifted Boys and Girls

KEYWORDS

Mathematics, gifted, gender, creativity, undergraduate

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ABSTRACT Today, in the era of information technology, job market required highly skilled workers without gender discrimination. Expertise in information technology also requires higher level of skill in the field of mathematics, which attracts many to opt for mathematics as one of the subjects of their study. Since, creativity amongst the boys and girls are different thus it is also expected in the case of mathematically gifted children. Keeping in the mind the above facts, the present study was conducted at Jabalpur in order to investigate the difference in relation between different aspects of verbal creativity of mathematical gifted boys and girls. The sample includes 158 boys and 119 girls of randomly selected under graduate students of the departments of mathematics of various higher educational institutes located at Jabalpur city. These students further evaluated by using three different tests of creativity and mental ability. The mean, standard deviation and student t-test were performed to analyze statistically significance difference between boys and girls. The finding reveals that boys differ significantly in all variable of verbal creativity from girls. The finding also reveals that girls excelled boys in fluency, flexibility and originality aspects of verbal creativity.

INTRODUCTION

Creativity is an asset to human beings. Of all the abilities that man has, which distinguish him from the rest of animal life, creativity is undoubtedly the unique. About five or six decades, back creativity was attributed toward divine source and was termed as "spark of genius". However, today it is attributed to psychic functioning of human beings.

Creativity is a potentiality, which influences human activity in almost all spheres of life. Creativity has been recognized as a precious source of emergence, development and survival of man's culture through ages. Most of the changes and advancements in society as well as other fields tell us nothing but the story of man's endeavor to create. Man's creative potentialities are unfathomable. Creativity has defined in many ways, based on Chambers 21st century dictionary, creativity means being inventive or imaginative. Torrance (1966) defined creativity, as a process of sensing gaps or missing elements, forming ideas or hypotheses concerning theory, testing these hypotheses and communicating the results.

Mathematics is one of the oldest organized disciplines of human knowledge, with a continuous line of development spanning 5000 years and every major culture. 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 a concomitant to any subject involving analysis and synthesis". A mathematically gifted students or child were identified by their ability of learning and understanding of mathematical ideas quickly; working systematically and accurately; high level of analytical skills; logical thinking; quick identifying ability and application of self knowledge to new or unfamiliar contexts.

NEED OF STUDY

Gender differences in mathematics abilities continue to attract researchers' attention. The proportion of girls taking mathematics at school, college and at university level is still very low. Before 1975, the proportions of female and male were only 1:40. In recent years, the importance of mathematics skill in the job market has attracted the girls to opt for mathematics as one of the subjects of their study. In the area of gender, differences in creativity of mathematical gifted very few research studies has conducted. Children said to be the richest national resources and to the extent, their multiphase diverse creative talent and potentialities in mathematics should identify, integrated and promoted.

Recognition, motivation and effective enfoldment and development of creative potentialities of the child through socialization process and social learning activities will generate creative environment and raise the status and standard of creativity of mathematical gifted.

CREATIVITY AND SEX DIFFERENCE

Middents (1970) on a college sample of 191 female and 123 male found boys scores higher than those of girls do. Mar'i (1971) in his study of Arab rural students observed significantly high creativity scores in favors of male over female. Torrance (1962, 1965) and Harold's (1968) results indicated that there are significant sex differences on several creativity variables, with males being stronger than the females. Tara (1981) found that males excelled females on measures of verbal flexibility. Agrawal & Agrawal (1991) reported that the boys are more creative than girls are. Bourke & Adams (2011) found that boys outperforms girls on verbal major. Singh (1982) made an extensive study and found that boys achieved significantly higher mean scores than the girls on the measure of creative thinking.

Torrance & Alotti (1969) in his study found that US girls were better than boys on the measure of creativity were. Richmond (1971) has concluded that females scored higher than males. Sudhir (2002) found that females performance were better than males in the creative process and creativity in verbal thinking. Pandit (1976) and Sethi (2012) found that female students were significantly higher than male on each of the component of verbal creativity, viz., fluency, flexibility and originality. Razik (1962) observed that females outranked males in their creative ability on four out of six tests of creativity on a sample of students from colleges of agriculture, education, and engineering and applied arts. Singh (2006) found that girls were significantly superior to boys on all the components of creativity and composite creativity.

Sethi (2012) while using sample of 700 students, reported that, high creative students scored higher mean scores as compared to low creative students. Masih (1989-91) found that both male and female students of B.Sc. (Hons.) and B.Ed. were equally creative. Some studies (Ai (1999); Palaniappan (2000); Sak & Maker (2006); Bare (2008); Habibollah et al., (2009)), Middents (1970), Prakash (1966), Raina (1969), Gagneja (1972), Mar'i (1971), Guilford (1966) show that boys surpass girls on some components of creativity, but girls are generally better than boys on others.

STATEMENT OF THE PROBLEM

Therefore, the present study has been constituted to explore the difference between different aspects of verbal creativity among the under-graduate mathematical gifted boys and girls of Jabalpur city.

METHODOLOGY:

Sample: The present study based on survey method. Subjects were selected with the help of multistage random sampling technique. Randomly selected 277/1403 (158 boys and 119 girls) student of B.Sc. 1st and 2nd semester (mathematics group) studying in five different colleges both government and private, affiliated to Rani Durgavati Vishwavidyalaya were included. Out of five colleges, there were two girls and three Co-Educational institutes, in the city of Jabalpur, Madhya Pradesh, India. Out of total sampled students, 170 students belonged to the government college and 107 to private Colleges. The numbers of boys and girls students belonging to these colleges were 158/819 and 119/584 respectively. The numbers of boys and girls students belonging to Government Colleges were 122/628 and 48/227 respectively. The corresponding values for private Colleges were 36/191 and 71/357 respectively. The sample of gifted students was almost 20% of total strength.

Research Tool: The investigator administered the following tools to collect the required Information:

Tool No. 01 A Group Test of General Mental Ability (11-16 years) prepared by Dr. S. S. Jalota (1972);

Tool No. 02 Self made Mathematics Achievement Test,

Tool No. 03 Verbal Test of Creative Thinking (age 13+) H/E, prepared by Baqer Mehdi (2009).

DATA COLLECTION PROCEDURE

A Group Test of General Mental Ability (11-16 years) prepared by Dr. S. S. Jalota (1972) administered to all the sample subjects in different sittings. The subjects scoring above 75th percentile on the I.Q. Test (I.Q.>130) were termed as gifted (N=295).

Mathematics Achievement Test was administered to all the (N=295) sample subjects in different sittings. Mathematics achievement test is a 20 question multiple objective types is based on three cognitive level that is one more correct answer for each test item are scored manually each correct answer scored one mark while wrong answer scored 0. Student total test score is the level of achievement of a student. The subjects scoring above 80th percentile on Mathematics Achievement Test were termed as mathematical gifted. (N=277). For the present study, data collected in two phases. In first phase of sampling data collected during September-November 2012. In second phase, data collected from institution during December-January 2012. Out of 295 students, 277 students selected from various institution of Jabalpur city, as the final sample for testing the hypothesis. All sample student belonging to B.Sc. 1st year (mathematics group). On each sampling date, the selected students gathered in separate classroom. Students made to sit comfortably, one or two in a bench for privacy and instructed for proper attempt of the test. The students engaged during their leisure.

All the above tools were administered investigator herself to measure creativity of mathematical gifted students. It took three days in each college belonging to Jabalpur city. On 1st day of sampling Tool No.1, Group test of general mental ability administered to find out gifted students. On 2nd day of sampling Tool No. 02, mathematics achievement test administered to find out mathematical gifted students. On 3rd day of sampling Tool No. 03, Verbal Test of Creative Thinking prepared by Baqer Mehdi administered. The verbal test, which has used in this study, is a part of the total battery, which consists of verbal and non-verbal test. The verbal test of creative

thinking includes four sub tests, namely consequences test, unusual uses test, similarity test, product improvement test.

(1) Consequences Test:-

The consequences test consists of hypothetical situations. Ex: What would happen if man could fly like birds?

The subject is required to think as many consequences of the situation as he can. The test encourages free play of imagination and originality. The time allowed for the three problems is four minutes each.

(2) Unusual Uses Test:-

This test presents the subject with the name of three common objects like, a wooden sticks, a piece of stone and water-and requires him to write as many novel, interesting and unusual uses of these objects as he may think of. The time allowed for the tasks is five minute each.

(3) New Relationship Test:-

This test presents the subject with three pair of words apparently different: tree and house, chair and ladder, air and water-and requires him to think and write as many novel relationships as possible between the two objects of each pair. The time allowed for each pair of words is five minutes.

(4) Product Improvement Test:-

In this test, the subject asked to think of a simple wooden toy of a horse and suggest addition of new things to it to make it more interesting for the children to play. The time allowed is six minutes. The total time required for administering the test is 48 minutes.

The examination pattern kept the same in all colleges. The norms and condition followed strictly everywhere. The student instructed to go through the instruction carefully and do all the required questions in the given period. The completed test booklet, scored strictly according to the prescribed method using the scoring key provided with the manual. Scores so obtained tabulated and processed by standard statistical method like the one central tendencies and the students't-test calculated to analyze the data.

RESULT & DISCUSSION:

Comparison between mathematical gifted boys and girls on fluency shows extremely statistically significant difference between two groups. The mean scores of mathematical gifted boys and girls were 55.18 and 67.39 and S.D.S is 17.39 and 27.28 respectively. The t- value is 4.54, which is significant at the level 0.001 indicative of girls with their significant higher mean score possessed significantly greater fluency. (Table 1)

TABLE – 1

Difference between mathematical gifted boys and girls with respect to their creativity score

Variable	B#/G\$	N	Mean	SEM	S.D.	t-ratio	d.f.	SED
Fluency	B	158	55.18	1.38	17.39	4.53*	275	2.69
	G	119	67.39	2.50	27.28			
Flexibility	B	158	40.72	1.26	15.87	3.85*	275	2.43
	G	119	50.11	2.65	24.58			
Originality	B	158	18.14	0.78	9.85	4.13*	275	1.58
	G	119	24.69	1.50	16.38			
Total creativity score	B	158	128.83	2.32	29.22	2.44**	275	3.46
	G	119	137.31	2.53	27.64			

#B:boys;\$G: Girls;* Significant at $p<0.001$; ** Significant at $p=0.01$ level

Comparison between mathematical gifted boys and girls on flexibility shows extremely significant difference two groups. The mean scores of boys and girls were 40.72 and 50.11 and S.D.S was 15.87 and 24.58 respectively. The t- value was 3.85, which is also significant. Result of this study indicates that there exist gender differences regarding flexibility. One interpretation that might explain this gender difference is

that boys and girls do extremely well in different aspects of verbal creativity, which is significant at 0.001 levels. This dissimilarity may be possible due to gender identity.

Comparison between mathematical gifted boys and girls on originality shows statistically significant difference between two groups. The mean scores of mathematical gifted boys and girls were 18.14 and 24.69 and S.D.S was 9.85 and 16.38 respectively. The t-value was 4.13 with degree of freedom 275, which is significant at 0.001 levels. As such, in conclusion girls with their higher mean scores possessed significantly greater originality than the boys are.

As per the result of Table 01 significant difference was found in the total verbal creativity scores between mathematical gifted boys and girls students due to significant t-value at 0.01 level ($t=2.44$). It was found that mathematical gifted girls students scored higher on total creativity ($M= 137.31$) as compared to the mathematical gifted boys students ($M= 128.83$). The finding reveals that mathematical gifted girls are superior to mathematical gifted boys on all dimension verbal creativity scores, therefore, gender difference found. Some studies (Ai (1999); Palaniappan (2000); Sak & Maker (2006); Bare (2008); Habibollah et al., (2009)), Middents (1970), Prakash (1966), Raina (1969), Mar'i (1971), Guilford (1966) show that boys surpass girls on some components of creativity, but girls are generally better than boys on others.

The finding of this study agreed with earlier studies reported by Singh (1982) that males are not superior to females on any

dimension as well as total creativity scores. The result of the study were supported by Sethi (2012), Richmond (1971), Torrance & Alotti (1969), Kogan (1974), Tegano & Moran (1989), Flaherty (1992), Prouse (1967) and Sudhir (2002) shows that females were better than males on creativity scores.

CONCLUSION:

The finding reveals that mathematical gifted boys differ significantly in all variable of verbal creativity from mathematical gifted girls. The finding also reveals that mathematical gifted girls performed significantly better than mathematical gifted boys on fluency, flexibility and originality aspects of verbal creativity and composite creativity. Girls in this investigation scored better than boys on all the components of verbal creativity, may be because of the age group (17 to 19 years) girls would have attained maturity earlier than boys and the effect of this spurt in maturity might have been reflected in their better performance. Girls grow up faster than boys do and the difference can be seen even before birth. At, birth, girls are about four to six weeks physically more mature than boys are, by puberty, the difference corresponds to two years development. This is possibly the reason why more girls than boys are survive at birth. It is certainly the reason why girls do better at school, college and university level in late puberty.

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