A Study of Convergent Thinking and Divergent Thinking among Secondary School Students in relation to Ethnicity, Locale, Types of Institutions and Sex

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Abstract

Joy Paul Guilford identified two types of thinking as convergent thinking and divergent thinking. Convergent thinking was named as intelligence and divergent thinking as creativity. The researchers in the present study have tried to find out a relationship between convergent and divergent thinking. They have further investigated bearing of variables like ethnicity, locale, types of institutions and sex on both these thinking types. The study has employed descriptive survey method and has taken 600 secondary school students of Jharkhand State (Ranchi district only) as sample by using stratified random sampling technique. Verbal group test of R.K. Tandon has been used to measure convergent thinking. To measure divergent thinking, Baquer Mehdi verbal test has been used. Mean, standard deviation, t and r statistics have been employed to analyse the data. Major objectives of the study are : (i) to identify convergent and divergent thinking of secondary school students, (ii) to ascertain a relationship between convergent and divergent thinking, (iii) to study the bearing of ethnicity, locale, types of institutions and sex on convergent thinking and divergent thinking. Major hypotheses of the study are: (H_1) there is no significant relationship between convergent and divergent thinking and

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(H_2) ethnicity, locale, types of institutions and sex does not influence convergent thinking and divergent thinking significantly. The study concludes that (i) there is significant relationship between convergent and divergent thinking and (ii) ethnicity, locale, types of institutions and sex influences convergent thinking significantly.

Guilford identified two types of thinking – convergent and divergent. Both these have their relative importance. Convergent thinking is commonly known as intelligence where as divergent thinking as creativity. Convergent thinking is important for the success of any individual in her/his future life and that is why *General Mental Ability Test* is part of almost all competitive exams. Convergent thinking is a term coined by Joy Paul Guilford as the opposite to divergent thinking. It generally means the ability to give a correct answer to standard questions that do not require significant creativity, for instance, in most tasks in school and on standardised multiple choice tests for intelligence. A critical aspect of convergent thinking is that it leads to a single best answer, leaving no room for ambiguity. In this view, answers are either right or wrong. The solution that is derived at the end of the convergent thinking process is the best possible answer majority of the time. Divergent thinking is a thoughtful process or method used to generate creative ideas by exploring many possible solutions. Divergent thinking typically occurs in a spontaneous, free-flowing manner, such that many ideas are generated in. Many possible solutions are explored in a short amount of time, and unexpected connections are drawn. After the process of divergent thinking has been completed, ideas and information are organized, and structured using convergent thinking. Educationists and psychologists recognize convergent thinking as intelligence and divergent thinking as creativity. In the present study, both these thinking have been used in the same way.

The researchers have gone through different research findings related to convergent and divergent thinking. They have also reviewed research studies related to the relationship between both these thinking B.K. Passi, (1982) has reviewed research studies based on the relationship of intelligence and creativity and has concluded that, "Majority of studies reviewed under this heading have reported a positive and significant relationship between intelligence and creativity (Pathak, 1961, 1962; Raina, 1968; Trivedi, 1969; Pasi, 1971; Sharma, 1971; Sharma, 1972, 1974; Azmi, 1974 ..... Chadha and Sen, 1981)". The correlation between creativity and intelligence, in the above mentioned studies, ranged from 0.10 to 0.44 with a median around 0.30. Passi has again concluded that Badrinath and Satyanarayan, 1979

found that non-verbal creativity was not related to intelligence, whereas verbal creativity was positively and significantly related to it. Passi has again reviewed that Mehdi, 1977 reported a negative correlation between creativity and intelligence for students coming from an urban locality while it was positive in the rural locality. Passi, on the basis of a series of studies has finally concluded that, "intelligence and creativity have a positive but low correlation and a creative person is, normally, above average in intelligence." These studies, and a few other studies have motivated the researchers to undertake a study to find out the relationship between convergent and divergent thinking. Since both these traits of human personality are important in the process of teaching and learning, these traits have their bearing on the entire system of education. The researchers are of the opinion that the study will serve the cause of education in some way or the other.

Bhoodev Singh, (2003) has review several studies related to Mathematics and has concluded, "personal characteristics such as personality, intelligence, attitude, self-concept, etc. of mathematical creative children are of monumental importance. Special attention has been focused on personality and attitudinal characteristics of mathematically gifted children who are our important resource." What Lalit Kumar (2012) has concluded with respect to mathematical creativity is true for general creativity and also for convergent thinking (intelligence), "As creative abilities may be increased through training, it is one of the legitimate functions of the education system to provide such training to foster creativity. A certain type of training to foster creativity needs to be given to parents, teachers and other related persons so that they could make the product, process and environment creative."

The study related to divergent thinking (creativity) and convergent thinking (intelligence) is important as they are important human traits. Their inter-relation is even more important. Studies to find their relationship are few in number and this aspect of research needs to be exhaustive. O. P. Sharma, (1994) has found that intelligence and its different levels have positive correlation on creativity. Lalit Kumar, (1993) in his thesis has reviewed studies related to creativity and intelligence, and has found that most of the studies show positive correlation between these two traits.

Besides establishing a type of relationship between divergent and convergent thinking, the researchers have also tried to study both these thinking in relation to ethnicity, locale, types of institutions and sex and have concluded that this area needs to be given due attention it deserves. Girishwar Misra, (2007) has reviewed psychological researches and discussed studies related to

intelligence and creativity. He has concluded, "The Indian researchers have also shown interest in assessing intelligence and relating it to many variables and processes. A sizable number of studies have attempted to examine the relationship between intelligence and various background variables." In this regard, he suggests to explore the area, "Looking at the theoretical and empirical work in this field, it is important that concerted efforts should be undertaken to go beyond the geographical metaphor of intelligence and look for the multi-factorial intellectual abilities, and evolve strategies to understand the processes in a culturally contextualised manner."

Reviewed by G. Misra, under the head, creativity says, "It is evident from the fact that maximum number of studies during the period under review have been conducted in this area. These studies can be broadly grouped into three sub-categories: (a) demographic and personality correlates of creativity, (b) characteristics of creative people, and (c) interventions for the enhancement of creativity." Mishra has further concluded, "It is clear that creativity as a disposition has been linked with a number of other dispositions and educationally relevant outcomes. The focus has largely been on the ways on how high and low creative pupils differ."

Misra, referring to some studies related to the relationship of creativity and intelligence concludes, "The studies suggest that intelligence is positively related to creativity (Agarwal and Agarwal, 1999). In particular, fluency and flexibility have been studied. Pradhan, Akhani and Janbandhu (1997) found a positive relationship of intelligence with verbal fluency among girls studying in Grades VI to IX. After examining secondary school studies in Kerala, Raj (1994) reported that flexibility was related to verbal and non-verbal intelligence."

Besides finding a relationship between convergent and divergent thinking, the researchers have further studied both these variables in relation to ethnicity, locale, types of institutions and sex. The statement of the problem is "A study of Convergent Thinking and Divergent Thinking among Secondary School Students in Relation to Ethnicity, Locale, Types of Institutions and Sex."

Objectives

1. To identify convergent thinking and divergent thinking of secondary school students.
2. To ascertain a relationship between convergent thinking and divergent thinking.
3. To compare non-tribal and tribal students in their convergent thinking and divergent thinking.
4. To compare urban and rural students in their convergent thinking and divergent thinking.
5. To compare private and government school students in

their convergent thinking and divergent thinking.

6. To compare female and male students in their convergent thinking and divergent thinking.

Hypotheses

1. There is no significant relationship between convergent thinking and divergent think.
2. Non-tribal and tribal students do not differ significantly in their convergent thinking and divergent thinking.
3. Urban and rural school students do not differ significantly in their convergent thinking and divergent thinking.
4. Private and government school students do not differ significantly in their convergent thinking and divergent thinking.
5. Female and male students do not differ significantly in their convergent thinking and divergent thinking.

Methodology

In the present study, the researchers have employed the descriptive survey method to establish a type of relationship between convergent and divergent thinking.

Sample

In the present study, six hundred (600) secondary school students of Jharkhand State (Ranchi district only) have been selected as sample using stratified random sampling technique.

Tools Used

Verbal test of creative thinking, standardized and developed by Baquer Mehdi, has been used to measure divergent thinking. To collect data regarding convergent thinking, verbal group test of intelligence, standardised and developed by R.K. Tandon, has been employed.

Definitions of the Terms used in the Study

- **Convergent Thinking:** Convergent thinking has been taken as intelligence, as defined by the psychologists.
- **Divergent Thinking:** Creativity is divergent thinking as perceived by Guilford and other psychologists.
- **Types of Institutions**: Private and government schools have been identified under types of institutions.
- **Ethnicity**: Tribal and non-tribal students have been taken as two ethnic groups under the variable, ethnicity.
- **Locale**: Locale has been used to identify urban and rural students.
- **Sex**: Male and female students account the variable, sex.

Statistical Treatment of the data

The conversion table was used from the manual of the intelligence test to find out the score of convergent thinking. Obtained score on creativity

test was converted into T-Score to find the fluency, flexibility, originality and ultimately, the composite divergent thinking score (Flu + Flex + Orig).

Mean, S.D. t-value and coefficient of Correlation (r) were computed to analyse the data.

Analysis and Interpretation

Table 1

Correlation(r) between convergent thinking and different dimensions of divergent thinking

Divergent Thinking Dimensions	Convergent Thinking	Number of Students	Level of Significance
Fluency	+ 0.27	600	0.01
Flexibility	+ 0.24	600	0.01
Originality	+ 0.22	600	0.01
Divergent Thinking	+ 0.11	600	0.01

Table 1 reveals that the obtained coefficient of correlation (r) between convergent thinking and fluency, flexibility and originality dimensions of divergent thinking are + 0.27, + 0.24 and +0.22 respectively. The coefficient of correlation (r) between convergent thinking and divergent thinking is + 0.11. All these values are significant at 0.01 level of significance (df = 598).

It indicates that convergent thinking and different dimensions of divergent thinking are significantly related. It means there is a significant relationship between convergent thinking and different dimensions of divergent thinking (fluency, flexibility, originality and composite, i.e. divergent thinking).

Table 2

Mean SD and t-value between non-tribal and tribal school students on convergent thinking and on divergent thinking

Thinking	Groups	Mean	SD	N	t-value	Level of Significance
Convergent	Non-Tribal	116.38	18.46	300	7.83	0.01
	Tribal	104.05	20.09	300		
Divergent	Non-Tribal	156.74	29.36	300	5.37	0.01
	Tribal	144.03	28.59	300		

Table 2 reveals that the obtained t-value between non-tribal and tribal school students on convergent thinking is 7.83, which is significant at 0.01 (df=598) level of significance. It indicates that non-tribal and tribal school students differ significantly in their convergent thinking. Non-tribal group is higher on mean value (M_1=116.38) in comparison to tribal group (M_2=104.05), and so it can be concluded that non-tribal students' group is significantly superior in their convergent thinking in comparison to tribal students, group.

Table 3 reveals that the obtained t-value between urban and rural school students on convergent thinking is 11.80, which is significant at 0.01 (df = 598) level of significance. It indicates that urban and rural school students' differ significantly in their convergent thinking. Urban group is higher on mean value (M_1=119.07) in comparison to rural group (M_2=101.55), and so it can be concluded that urban students' group is significantly superior in their convergent thinking in comparison to rural students' group.

Table 3

Mean SD and t-value between urban and rural school students on convergent thinking and on divergent thinking

Thinking	Groups	Mean	SD	N	t-value	Level of Significance
Convergent	Urban	119.07	18.09	300	11.80	0.01
	Rural	101.55	18.28	300		
Divergent	Urban	158.68	30.96	300	7.84	0.01
	Rural	141.30	22.77	300		

Table 2 also reveals that the obtained t-value between non-tribal and tribal school students on divergent thinking is 5.37, which is significant at 0.01 (df = 598) level of significance. It indicates that non-tribal and tribal school students differ significantly in their divergent thinking. Non-tribal group is higher on mean value (M_1=156.74) in comparison to tribal group (M_2 = 144.03), and so it can be concluded that non-tribal students, group is significantly superior in their divergent thinking in comparison to tribal student's group.

Table 3 also reveals that the obtained t-value between urban and rural school students on divergent thinking is 7.84, which is significant at 0.01 (df = 598) level of significance. It indicates that urban and rural school students differ significantly in their divergent thinking. Urban group is higher on mean value (M_1=158.68) in comparison to rural group (M_2=141.30), and so it can

be concluded that urban students' group is significantly superior in their divergent thinking in comparison to rural students' group.

Table 4 reveals that the obtained t-value between government and private school students on convergent thinking is 8.28, which is significant at 0.01 (df = 598) level of significance. It indicates that government and private school students differ significantly in their convergent thinking. Government school students' group is higher on mean value (M_1=116.78) in comparison to private school students' group (M_2=103.85), and so it can be concluded that government school students' group is significantly superior in their convergent thinking in comparison to private school students' group.

Table 4 reveals that the obtained t-value between government and private school students on divergent thinking is 5.09, which is significant at 0.01 (df = 598) level of significance. It indicates that government and private school students differ significantly in their divergent thinking. Government school students' group is higher on mean value (M_1=160.61) in comparison to private school students' group (M_2=139.38), and so it can be concluded that government school students' group is significantly superior in their divergent thinking in comparison to private school students' group.

Table 4

Mean, SD and t-value between government and private school students on convergent thinking and divergent thinking

Thinking	Groups	Mean	SD	N	t-value	Level of Significance
Convergent	Government	116.78	20.10	300	8.28	0.01
	Private	103.85	18.09	300		
Divergent	Government	160.61	31.20	300	5.09	0.01
	Private	139.38	25.43	300		

Table 5

Mean, SD and t-value between female and male school students on convergent thinking and divergent thinking

Thinking	Groups	Mean	SD	N	t-value	Level of Significance
Convergent	Female	113.83	19.83	300	4.33	0.01
	Male	106.80	19.93	300		
Divergent	Female	153.95	31.76	300	3.43	0.01
	Male	146.03	24.25	300		

Table 5 reveals that the obtained t-value between female and male students on convergent thinking is 4.33, which is significant at 0.01 (df = 598) level of significance. It indicates that female and male students differ significantly in their convergent thinking. Female students' group is higher on mean value (M_1=113.83) in comparison to male students' group (M_2=106.80), and so it can be concluded that female students' group is significantly superior in their convergent thinking in comparison to male students' group.

Table 5 also reveals that the obtained t-value between female and male students on divergent thinking is 3.43, which is significant at 0.01 (df = 598) level of significance. It indicates that female and male students differ significantly in their divergent thinking. Female students' group is higher on mean value (M1=153.95) in comparison to male students' group (M2=146.03), and so it can be concluded that female students' group is significantly superior in their divergent thinking in comparison to male students' group.

Findings of the study

(i) Convergent thinking and different dimensions of divergent thinking are significantly related.

Torrance (1962), Yamamoto (1963, 1964), Cropley (1967) and Lynch (1980) found a significantly high positive relationship between creativity and Intelligence. Guilford (1950) and Mackinnon (1962) found a low positive relation. Rawat and Agarwal (1993) found in their study that high achievers in intelligence were not the high achievers in creativity.

(ii) (a) Non-tribal and tribal school students differ significantly in their convergent thinking. Non-tribal group is higher on mean value in comparison to tribal group showing non-tribal students' group significantly superior to tribal students' group.

P Annaraja and A.P. Thiagarajan, (1993) found regarding intelligence that Non-ST adolescents were better than STs.

(b) Non-tribal and tribal school students differ significantly in their divergent thinking. Non-tribal group is higher on mean value in comparison to tribal group showing non-tribal students' group significantly superior to tribal students' group.

Lalit Kumar, (1993) found non-tribal students superior to tribal students in their creativity.

(iii) (a) Urban and rural school students differ significantly in their convergent thinking. Urban group is higher on mean value in comparison to rural group showing that urban students' group is significantly superior to rural students' group.

Sudhir and Khiangti (1997) found that high creative girls

from urban areas turned out to be more intelligent, emotionally stable, conscientious and apprehensive than high creative girls from rural background.

(b) Urban and rural school students differ significantly in their divergent thinking. Urban group is higher on mean value in comparison to rural group showing that urban students' group is significantly superior to rural students' group.

Shukla and Sharma (1986) found rural students superior in their creativity. Seghal (1978) found no significant difference between creative potential of urban and rural students. Andal, Krishanan and Stephen (1996) found urban students superior in their creativity.

(iv) (a) Government and private school students differ significantly in their convergent thinking. Government school students' group is higher on mean value in comparison to private school students' group showing that government school students' group significantly superior to private school students' group. Showing environment positively related to intellectual ability, Behera (1993) observed that urban students of Navodaya Vidyalayas scored significantly higher on verbal intelligence, but not on non-verbal measures of intelligence.

(b) Government and private school students differ significantly in their divergent thinking. Government school students' group is higher on mean value in comparison to private school students' group showing government school students' group significantly superior to private school students' group.

Kumar (1994) found private school students superior over government school students in creativity. Gupta (1978) also found private school students superior. L. Kumar and E. Alam (2014) have found significant difference between the creative ability of private and government school students on the originality dimension of creativity. Private school students were found superior.

(v) (a) Female and male students differ significantly in their convergent thinking. Female students' group is higher on mean value in comparison to male students' group showing female students' group significantly superior to male students' group.

C. Thanavathi and V. Thamodharan (2012) have found significant difference in cognitive intelligence of male and female students. Female students were found superior. K.V. Sridevi and L. Parveen (2008) found significant difference in emotional intelligence among higher

secondary students with respect to their gender. The study found female students superior.

(b) Female and male students differ significantly in their divergent thinking. Female students' group is higher on mean value in comparison to male students' group showing female students' group significantly superior to male students' group.

Mishra (1986), Rawat and Garg (1993) and S.K. Singh (2011) have also found female students superior to male students in their creativity. Jarial and Sharma (1993), Ahmed, A (1993), Hussain and Sinha (1995) and Agarwal and Agarwal (1999) have found male students superior in their creativity. Bhaskar and Sharma (1993), Tiwari and Sharma (1993) and Kapoor (1996) have found no significant difference between the creative potential of male and female students. Gakhar and Lata (2010) have not found difference in the creative ability of delinquent and normal students among both male and female students.

General Conclusions

(1) Convergent and Divergent thinking are significantly related.

(2) (a) Non-tribal students' group is significantly superior in their convergent thinking in comparison to tribal students' group.

(b) Non-tribal students' group is significantly superior in their divergent thinking in comparison to tribal students' group.

(3) (a) Urban students' group is significantly superior in their convergent thinking in comparison rural students' group.

(b) Urban students' group is significantly superior in their divergent thinking in comparison to rural students' group.

(4) (a) Government school students' group is significantly superior in their convergent thinking in comparison to private school students' group.

(b) Government school students' group is significantly superior in their divergent thinking in comparison to private school students' group.

(5) (a) Female students' group is significantly superior in their convergent thinking in comparison to male students' group.

(b) Female students' group is significantly superior in their divergent thinking in comparison to male students' group.

Educational Implications

As known to us, two major traits of human personality – convergent and divergent thinking, have its bearing on the other related personality traits

on one hand, and its wider influence on the entire process of teaching and learning on another. The study reveals that convergent and divergent thinking are significantly correlated to each other. It clearly indicates that if intelligence (convergent thinking) of learners are sharpened, the creativity (divergent thinking) of the learners will automatically be taken care of. The study also suggests to investigate the relationship in wider perspectives to establish a more generalised nature of relationship between the discussed variables.

Study again reveals that convergent and divergent thinking has their bearing on ethnicity, locate, types of Institutions and sex. The findings of the study are in accordance with some previously done research, and simultaneously, there are some differences in the light of another few findings. It is difficult in behavioural science to find the same result every time, but generalisation can be approached by making the sample size sufficiently large and conducting research work in groups.

The study further suggests to exhaust the field to find something in a more general form. It is one of the important aspect of the study that every chosen independent variable behaves in the same manner to both the dependent variables – convergent and divergent thinking. In brief, ethnicity, locale, types of institution and sex have the same result with both variables. Is the same trend of behaviour with respect to convergent and divergent thinking an issue to be investigated further? The study has answered many questions in some way or the other, but the important aspect of the study is the raised questions to be investigated or to be answered. Findings of the study and raised questions will certainly lead the researchers, teachers, policy makers and other practitioners of education in the desired direction. To generate issues for investigation is one of the purposes of every kind of research and the present study has also tried to do so in this way.

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