Research Article

Lateral Thinking Influencing Mathematical Problem Solving Ability

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Abstract

This study is done with a view to find out the influence of lateral thinking in determining the problem solving ability in mathematics of children studying at the high school level. Lateral thinking, is the ability to think creatively, to use inspiration and imagination to solve problems by looking at them from other than the common perspectives (Flavell, 1990). The influence of lateral thinking in problem solving involves in discarding the general process involved, leaving behind traditional approaches, and throwing away preconceptions (Sternberg, 1992).

In this study, around 80 children studying at the high school level were considered as samples. Certain concepts in Algebra, Logarithms, Functions, Trigonometry and Theoretical Geometry were taught to the children and a test was framed with questions on the dimensions in par with the lateral thinking style. From their achievement scores it was observed that around 55% of children of the selected sample who had applied the lateral style were found to solve the problems with an ease and within a stipulated time. The remaining of the children who had stuck on with the conventional process of solving was found to solve it in a usual way and took an extended time. This study concludes that effective applicability of the lateral thinking style in teaching mathematics will enable higher potentiality among children in their problem solving ability.

Keywords: Lateral Thinking, Mathematical Problem Solving Ability, High School Students, Creative Thinking, Algebra, Trigonometry, Functions, Geometry, Achievement, Educational Research

INTRODUCTION

De Bono (1982) interprets the ability of problem solving in mathematics by means of the lateral thinking style as exploring multiple possibilities and approaches instead of pursuing a common single approach. Further it can be studied that solving problems by an apparently conventional method harass the capacity of thinking process as new strategies of solving a problem goes unidentified. Similar to creative thinking the lateral style techniques were used for changing concepts and perceptions and generating new ones; thus by exploring multiple possibilities and approaches instead of pursuing a single approach (Mc Cormick, 1989).

Mathematics is a strict academic that is supported by thorough basis, continent practice and strict discipline, that involves the study of such concepts as quantity, structure, space and change (Stoulz, 1989). Problem solving in mathematics is of a complex skill that holds several of the mental processes which in thinking style is prominent, the more the style is lateral the more creatively and the more innovatively the problem is solved. Also in lateral style problem solving becomes easier by the reason that the student tries to understand the complex nature of the problem and try not to solve but to provide a dimensional response which makes the solving much simpler (Sloane, 1994). Hence, the need to study the influence of lateral thinking in determining the problem solving in mathematics.

OBJECTIVES

- To study the influence of lateral thinking in determining the problem solving ability in mathematics of children studying at the high school level.
- To study the creative attitude of high school students towards problem solving in mathematics.
- To study the critical thinking style of high school students towards mathematical problem solving.

HYPOTHESES

H.1. There exists no significant association between lateral thinking and mathematical problem solving ability.

a) Creative thinking (H.1.1)

b) Critical thinking (H.1.2)

H.2. There is no significant difference between lateral thinking style and mathematical problem solving ability with respect to,

a) Gender (H.2.1)

b) Board of study (H.2.2)

c) Qualification of the Teacher (H.2.3)

d) Coaching (H.2.4)

e) Previous Exam scores in Mathematics (H.2.5)

f) Periods per week for Maths subject (H.2.6)

METHOD AND SAMPLE

Descriptive study based on the exploratory method of research was employed for the present study. The study employs (1 x 1) 'ex-post facto' design where lateral thinking of students was the independent variable with the critical and creative thinking as the dimensions and Mathematical

Previous Exam scores in Mathematics Coaching	75 and above	57	50.99	8.94	2.061	1.270	N.S
	60 to 75	23	48.68	6.58			
Periods per week for maths subject	5 to 6	40	54.45	11.09	2.722	1.531	N.S
	7 to 8	40	58.62	13.17			

** t-value significant at 0.01 level

* t-value significant at 0.05 level

Table 1 represents the mean and standard deviation scores of lateral thinking scores of the various subgroups of the sample selected based on the relevance of the present study. It can be observed from the table that boys and girls differ significantly (0.01 level) in their lateral thinking styles. Further it can be seen that the mean oflateral thinking scores of students studying in CBSE differ significantly high when compared to the scores of students studying in matriculation board and the level of significance is in line at 0.05 level.

Lateral thinking mean scores of students taught by the Undergraduate teachers at the matriculation and CBSE boards were found to be high when compared to the mean scores of students taught by Post graduate teachers and the level of significance is found to be at 0.05 level. With respect to the coaching students who were coached 'other than school' were found

to highly differ in their lateral thinking mean scores when compared with the students who were coached 'only at school'; the level of significance being 0.01 level.

The subgroups classified based on the previous exam scores in mathematics does not show any significance difference in their lateral thinking style; but the mean scores of students who scored '75 marks and above' in the previous mathematics exam were found to be high when compared with the students who scored '65 marks till 75 marks'.

Periods per week allotted for teaching mathematics subjects does not show significance in the lateral thinking scores but it can be read from the table that the mean lateral thinking scores are found to be more where a maximum number of periods are allotted; i.e., with the class that is allotted with '7 periods to 8 periods per week'.

Table:2

Mean and S.D scores representing Mathematical Problem Solving Ability based on the dimensions of Lateral Thinking

Variables	Items	Respondents N	No. of correct responses				
			Mean	S.D.	S.E.D.	t-value	Level of significance
Creative thinking	50	80	7.481	1.976	0.317	2.058*	0.05
Critical thinking	50		8.133	2.031			

** t-value significant at 0.01 level

* t-value significant at 0.05 level

Table 2 represents the mean and standard deviation scores of mathematical problem .solving ability based on the dimensions of lateral thinking style namely critical thinking and creative thinking. Of the 100 items chosen for the study from 5 areas in mathematics the first fifty items were of creative dimension and the second fifty items were of critical dimension. From Table 2, it can be interpreted that the mean mathematical problem solving ability scores based on critical thinking was found to be higher than the mean scores of creative thinking among students studying at IX standard level at the matriculation and CBSE boards; the level of significance being observed at 0.05 level.

Table:3

Correlation values representing the Lateral thinking and mathematical problem solving ability of students with respect to the subject areas

	Variables Creative Thinking¦Critical Thinking	r-value	Level of significance
Subject areas	Algebra (n=20)	0.452*	0.05
	Logarithms (n=20)	0.357	NS
	Functions (n=20)	0.670**	0.01
	Trigonometry (n=20)	0.311	NS
	Theoretical Geometry (n=20)	0.593**	0.01

Note: Degrees of freedom= 2

df is based on the number of items selected from each topic.•

** r-value significant at 0.01 level

* r-value significant at 0.05 level

Table 3, reveals the correlation values of lateral thinking with respect to the subject areas on which the items were being constructed for the present study to assess the mathematical problem solving ability. Marked or substantial correlation was found to exist among the subject areas namely Algebra ($r=0.452$, $p<0.05$), Functions ($r=0.670$, $p<0.01$), Theoretical Geometry ($r=0.593$, $p<0.01$). The correlation areas of the subject areas such as Logarithms ($r=0.357$, NS), Trigonometry ($r=0.311$, NS) were observed to hold no significance with respect to the correlation values of lateral thinking and mathematical problem solving.

FINDINGS AND INTERPRETATIONS

It was found that students studying in the CBSE schools were found to solve the questions with an ease when compared to the students studying in the Matriculation schools

This may be perhaps due to the fact that since CBSE syllabus is comparatively critical in nature than the Matriculation syllabus. Students studying in the CBSE stream might have developed the critical sense and creative ability in appreciating and solving the problem.

With regard to the present study on lateral thinking students learning from teachers working at the Post-Graduate (PG) level were found to better the students learning from teachers working at the Under-Graduate (UG) level. UG teachers beyond their consistent experience lack critical skills in solving mathematics problems and also show less creativity in their problem solving approach when compared to the PG teachers. It is observed from the

study that PG teachers handled mathematical problems with an insight that is critical and creative in nature and thus seems to be lateral when compared to the UG teachers.

Students who were coached other than the school were found to possess high lateral thinking scores when compared with the students who were coached only at school. The reason may be that, students who are being coached other than the school may get critically more knowledge and it happens for them to spend more time with a specified subject and this helps them to keep along with the subject more fluently and thus achieve critical and creative ability than compared with children who were coached only at the school.

The results concerning previous achievement scores in mathematics and the number of mathematics periods per week doesn't contribute to significance as these dimensions show very slight difference in the lateral thinking mean and standard deviation scores.

The major dimensions of lateral thinking namely creative thinking and critical thinking (Chapman, 2005 and De Bono, 1970) does show significance in their item variations and hence contribute to the mathematical problem solving ability of students studying at the high school level.

With respect to the present study lateral thinking scores were found to hold high correlation with mathematical problem solving ability and from Table.3 it is found to be significant with the subject areas such as algebra, functions and theoretical geometry. These areas at the high school level both at CBSE and Matriculation boards were found to hold comparatively higher thinking skills when compared with the other areas such as logarithms and trigonometry chosen for the present study. Hence it can be interpreted that the lateral thinking ability does play a prime role in achieving mathematical problem solving ability in certain subject areas of mathematics at CBSE and Matriculation boards at the high school level.

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