Study of Academic Achievement in Mathematics in Relation to Home Environment

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Abstract:
The purpose of this study was to determine if there exist any relationship between various levels and various dimensions of the home environment of a student with academic achievement in mathematics. For study a sample of 600 students of XI and XII class was chosen from various senior secondary schools of Punjab to find the level their home environment and its relationship with academic achievement in mathematics. Study reveals that there is a significant relationship between academic achievement in mathematics and various dimensions of their home environment.

Keywords: Home Environment, Academic achievement in mathematics.

1. Introduction

Origin of mathematics is hidden in the evolution of nature. Creation of nature and mathematics are closely related. Mathematics is the science in which calculations are prime. It is an exact science and involves high cognitive abilities and powers. According to 'Chambers Twentieth Century Dictionary (1987)' "Mathematics is the science of magnitude and number and their relations." Goods Dictionary of Education (1973) "Mathematics is the Science of measurement, quantity and magnitude."According to Webster's new world dictionary (1973) "Mathematics is the Science dealing with quantities, forms etc. and their relationships by the use of numbers and symbols."

Mathematics is as old as humanity itself. Since antiquity, it has been fundamental to advances in science, engineering and philosophy. Mathematics involves simple counting, measurements and calculations and systematic study of numbers, shapes of different objects and motion of physical objects, through the application of abstraction, imagination and logic. The study of the development of mathematics is long and impressive one. The study of mathematics as the subject in its own, right begins in the 6th century B.C. with the Pythagoreans, who coined the term "Mathematics" from the ancient Greek μαθημα (mathema) which means the subject of instructions.

1.1. Nature of Mathematics

Mathematics is the science of logical reasoning where results are developed through the process of reasoning. By far, the most significant development in mathematics was giving it firm logical foundations. This took place in ancient Greece in the centuries proceeding Euclid. Logical foundations give mathematics more than just certainly the tool to investigate the unknown. As a science of abstract objects, mathematics relies on logic rather than an observation as its standard of truth. It employs observation simulation and even experimentation as means of discovering the truth. The special role of mathematics in education is a consequence of its universal applicability.

Mathematics relies on logic and creativity and pursued for both a variety of practical purposes and for its intrinsic interest. The essence of mathematics lies in its beauty and intellectual challenges. For engineers and scientists, chief value of mathematics is how it applies to their work field. Mathematics plays a vital role in modern culture, science and technology. Some basic understanding of the nature of the subject is pre-requisite for scientific literacy.

1.2. Mathematics as an Academic Discipline

Universalization of school education has important implications for mathematics curriculum. Mathematics up to high school level is a compulsory discipline and access to quality mathematics education is every child's right. In the words of David Wheeler "It is more useful to know how to mathematize than to know a lot of mathematics." More important is what mathematics offers is a way of doing things: to be able to solve mathematical problems and more generally to have the right attitude for problem solving and be able to attack all kinds of problems in a systematic way.

The Kothari commission in his report in 1966 said "It emphasized the importance of children's learning mathematics for the development of science and technology and for industrial growth. One of the outstanding characteristic of scientific culture is quantification. Mathematics, therefore assumes a prominent position in modern education. Apart from its role in physical sciences, it is now playing an increasingly important part in the development of biological sciences" (Government of India Ministry of Education, 1966 p.181).

1.3. Achievement in Mathematics
Dyer (1960) says "Academic achievement is the sum total of information a student has at his command when he finishes a course of instruction." According to Spence and Helmreich (1983) "Academic achievement is the task oriented behavior that allows the individual's performance to be evaluated according to some internally or externally imposed criterion that involves the individuals in competing with others or that otherwise involves standard of excellence."

1.4. Home Environment
According to Tewari, Morbhat and Kumar (1999) 'Family Environment is the most important socializing agent that influences the child's life and personality.' Home Environment or family Environment refers to the climate prevailing in the home, which varies from culture to culture; society to society and family to family. It is well known fact that home is the most important place where a child inhales his first fragrance of love, care, empathy through playful learning activities. Environment is the aggregate of the various forces and stimuli which the Individual receive from conception till death. Environment chiefly includes the Individuals social milieu. Home environment or family environment refers to climate prevailing in the home, which vary from culture to culture, society to society and family to family (Moss and Moss, 1986). Ranhotra (1996) " Family environment is the complex of social and cultural condition, the combination of external and extrinsic physical conditions that affect and influence the growth and development of the members of the family. The most instinctive fundamental social group which includes parents and their children.

1.5. Concept of Home
Frank (1948) states that "it is the family, which is essential agency for the development of the morality among children and introduces them to the culture in which they grow." Udry (1966) state that "Family is the basic social institution for two reasons i.e. it may be the prime mover in determining the nature of the life in a given society and the primary determinant of the life chances of an individual born here. "
Bhardwaj (2001) Consider home as the first socializing unit which the child has continuous contact and it is also most powerful medium through by which our value system develops. According to Johnson and Medinus (1969) "Home is the socio biological unit that exerts the greatest influence on the development and perpetuation of the individual's behavior.

1.6. Dimensions of Home Environment
Dr. K.S. Mishra (1989) has given ten dimensions of home environment. Operational definitions of these dimensions are as follows:
Control, Protectiveness, Punishment, Conformity, Social isolation, Reward, Deprivation of Privileges, Nurturance, Rejection, Permissiveness.

2. Related Literature
Giraudo (1990) studied the relationship between family environment and school performance between fifth, sixth, seventh grade students and indicates that there exists a significant relationship between family environment variables and a child's academic achievement.
Rajput (1992) studied the effect of certain family factors on the educational aspiration level and academic achievement of secondary school students. Study revealed that educational aspiration level of students in general having high and medium family environment was significantly higher than low family environment & the urban students belonging to medium family environment were influenced more than the low family environment group of rural students in their educational aspiration level.
Molia(2000) undertake a comparative study on home environment of rural and urban students of secondary schools. The sample consists of 300 boys from class VIII (150 rural and 150 urban) of secondary schools of Rajkot district. It was found that urban students be more superior on the home environment scale than the rural ones.
Busantia and Mukhopadhyaya (2001) studied the effect of home environment on academic achievement in rural school students. It was found that home environment had an overall effective impact on school achievement of rural school students. It was also revealed that boys and girls differ on both of home environment and school environment. High achiever boys and girls enjoyed good home as well as good school environment.
Tung & Dhillon (2006) examine the gender differences and family environment correlates of emotional autonomy amongst males and females of middle and late adolescents. It was found that females in both the age groups the family environment dimension of cohesion, expressiveness and independence have significant negative correlation with emotional autonomy dimension.
Thind and Jaswal (2006) based on 100 eleventh grade students drawn from 10 senior secondary schools in Ludhiana city in India shows that good quality of home environment had significant positive correlation with high level (p < 0.001) of academic achievement motivation among high achievers. It was also found that as the quality of home environment deteriorates, the level of academic motivation also deteriorates.

2.1. Objectives of the Study

The present study was undertaken by keeping in view of the following objectives:

- To find out the level of Home Environment of senior secondary stage students.
- To study the difference in academic achievement in Mathematics due to rich and poor Home Environment.

2.2. Hypotheses

On the basis of above mentioned objectives the following null hypotheses have been framed.

- H1. There is no significant difference between levels of home environment of the senior secondary stage students.
- H2. There is no significant relationship between academic achievement in mathematics and Home Environment of a student.

2.3. Tools Used

The following Research tools are used to collect data for the study.
1. Achievement test in Mathematics (Developed by the Investigator)
2. Home Environment Inventory (By K.S. Mishra, 1989)

2.4. Sample

In the present study researcher had selected a sample of 600 students from XI and XII class from the Government and Non-Government senior secondary Schools of Hoshiarpur, Jalandhar and Nawanshahar districts of Punjab.

3. Results and Discussion

In this section of analysis a preliminary assessment was performed on the basis of data collected from the students.

Level of Home Environment	Boys	Girls	Total
Very High Home Environment	38 (12.7%)	22 (7.3%)	60 (10.0%)
High Home Environment	45 (15.0%)	41 (13.7%)	86 (14.3%)`
Above Average Home Environment	69 (23.0%)	73 (24.3%)	142 (23.7%)
Average Home Environment	72 (24.0%)	84 (28.0%)	156 (26.0%)
Low Home Environment	52 (17.3%)	44 (14.7%)	96 (16.0%)
Very Low Home Environment	24 (8.0%)	36 (12.0%)	60 (10.0%)
Total	300	300	G.T. = 600

Table 1: Distribution of the male and female students in terms of their Home Environment scale

The above table 1 gives the descriptive analysis of the students with their various levels of home environment. Table 1 gives the distribution of the students according to the variable home environment for its various dimensions for boys and girls. On analysis of this table the students are categorized on the basis of various dimensions of Home environment i.e. Very high home environment, high home environment, above average home environment, average home environment, low home environment and very low home environment. It is analyzed that 38(12.7%) of the boys and 22(7.3%) of the girl students were with very high home environment while 45(15.0%) of the boys and 41(13.7%) of the girls were with high home environment. On further evaluation it is found that 73(24.3%) of the girls and 69(23.0%) of the boys were with above average home environment and similarly, 84(28.0%) of the girls and 72(24.0%) of the boys were identified as with average home environment. Boy students with low and very low home environment were 52(17.3%) and 24(8.0%) respectively whereas girl students was 44(14.7%) are of low and 36 (12.0%) are from very low home environment respectively.

3.1. Hypothesis H1

On the analysis of the above table it is verified that students differ from their various levels of home environment and using the significance of the mean at .01 levels Hypothesis H1 is rejected and study reveals that students differ on their level of home environment significantly.

Dimension		Academic Achievement
Control	Pearson Correlation	.027
	P value	.511
	N	600
Protectiveness	Pearson Correlation	.187**
	P value	.000
	N	600
Punishment	Pearson Correlation	.004
	P value	.929
	N	600
Conformity	Pearson Correlation	.077
	P value	.061
	N	600
Social Isolation	Pearson Correlation	-.023
	P value	.571
	N	600
Reward	Pearson Correlation	.089*
	P value	.030
	N	600
Deprivation of Privileges	Pearson Correlation	-.114**
	P value	.005
	N	600
Nurturance	Pearson Correlation	.000
	P value	.994
	N	600
Rejection	Pearson Correlation	-.233**
	P value	.000
	N	600
Permissiveness	Pearson Correlation	-.018
	P value	.667
	N	600
Home Environment Total Score	Pearson Correlation	-.008
	P value	.842
	N	600

Table 2: Correlation analysis of the academic achievement in mathematics and the dimensions of the home environment of the students
* means significant at 5% and ** means significant at 1%.

Table 2 gives the correlation analysis of the dimensions of the home environment of the students with their academic achievement in mathematics. The null hypothesis H2 was used in this case. The analysis of the table 2 shows that the null hypothesis H2 is rejected as there is significant correlation presents between the academic achievement in mathematics of the students and those students who had dominant home environment on the dimension of protectiveness r = .187, on reward r =.089, on deprivation of privileges r = -.114 and on rejection r = -.233. It is further analyzed that there is significant positive correlation between the academic achievement in mathematics and the protectiveness dimension of home environment i.e. r = 0.187 and with the reward dimension of home environment i.e. r = 0.089. Again, it is analyzed that there is significant negative correlation between the academic achievement in mathematics and the deprivation of privileges dimension of home environment i.e. r = -0.114 and with the rejection dimension of home environment i.e. r = -0.233. It is further reveals that other dimensions of home environment like control r = .027, punishment r = .004, conformity r = .077, social isolation r = -.023, nurturance r = .000 and permissiveness r = -.018 had no correlation with the academic achievement in mathematics of the students.

Category	N	Mean	SD	F Test
Very High Home Environment	60	67.83	8.73	
High Home Environment	86	87.98	9.69	
Above Average Home Environment	142	73.24	10.13	2.983
Average Home Environment	156	72.41	11.24	P=3.124
Low Home Environment	96	52.57	8.44	**Significant**
Very Low Home Environment	60	49.87	7.37	
Total	**600**	**76.45**	**13.87**	

Table 3: ANOVA analysis of the academic achievement of the students categorized on basis of their Home Environment scores

3.2. Hypothesis H2
The analysis of the table 3 shows that the mean score with very high home environment is 67.83 with standard deviation of 8.73, with high home environment mean score is 87.98 with standard deviation of 9.69, with above average home environment mean score is 73.24 with standard deviation of 10.13, with average home environment mean score is 72.41 with standard deviation of 11.24, with low home environment mean score is 52.57 with standard deviation of 8.44 and with very low home environment mean score is 49.87 with standard deviation of 7.37. As F value is 2.983 and p value is 3.124 which are significant at .01 level of significance, therefore null hypothesis assumed H2 is rejected and study shows that there is significant relationship reported among the different levels of home environment of the students with their academic achievement scores in mathematics. Therefore it is analyzed statistically that there is significant relationship between the various categories of home environment and academic achievement in mathematics.

4. Findings
- Only 10% of the students are of having very high home environment.
- Majority of the students either males or females belongs to average home environment.
- 10% of the students are of having very low home environment.
- Academic achievement in mathematics significantly related with home environment of a student.
- There is significant correlation between academic achievement in mathematics and various dominant dimensions of home environment such as protectiveness, reward, deprivation of privileges and dimension of rejection.
- There is no significant relationship between academic achievement in mathematics and control, punishment, conformity, social isolation, nurturance, and permissiveness dimensions of home environment.

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