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International Journal of Current Research
Vol. 7, Issue, 12, pp.24168-24171, December, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

STUDY OF THE COMBINED EFFECT OF SELF-CONCEPT AND HOME-ENVIRONMENT ON ACADEMIC ACHIEVEMENT IN MATHEMATICS AT SECONDARY STAGE OF EDUCATION

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ARTICLE INFO

Article History:
Received 16th September, 2015
Received in revised form
25th October, 2015
Accepted 29th November, 2015
Published online 30th December, 2015

Key words:

Self-concept,
Home-environment,
Academic Achievement.

ABSTRACT

Self-concept is the sole perspective from which one can understand an individual's behaviour. Academic performance is a complex student behavior and underlies several abilities, e.g., memory, previous knowledge or aptitude as well as psychological factors such as motivation, interests, temperaments or emotions. Home-environment or family environment refers to climate prevailing in the home, which varies from culture to culture, society to society and family to family. In this study attempt has been made to find a relationship between self-concept and home-environment with academic achievement in mathematics and also to find the interactional effect of self-concept and home-environment on academic achievement in mathematics.

***Citation*: Parvinder Singh. 2015.** "Study of the combined effect of self-concept and home-environment on academic achievement in mathematics at secondary stage of education", *International Journal of Current Research,* 7, (12), 24168-24171.

INTRODUCTION

The study of mathematics as a subject in its own, right begins in the 6th century B.C. with the Pythagoreans, who coined the term "Mathematics" from the ancient Greek $\mu\alpha\theta\eta\mu\alpha$(mathema) which means subject of instructions. From ancient period there is mathematical text which one are available as Plimpton 322 (Babylonian mathematics 1900 BC), Rhind Mathematical Papyrus (Egyptian mathematics 2000-1800 BC) and Moscow Mathematical Papyrus (Egyptian mathematics 1890 BC). Different parts of the world different branches of the subjects have been developed at various rates by the contribution of industrious mathematicians. Greek mathematicians advanced the methods through the induction and deduction reasoning and mathematical rigor in proofs. Chinese made contribution towards place value system. The Hindu-Arabic numeral system which included the rule for the use of its operations used in the world today, it evolved by due course of the first millennium A.D. in India and transmitted to West via Islamic mathematics. During this period many Greek and Arabic mathematical text were translated into Latin which led to further development in the mathematics in medieval Europe. Great inventions in the subject take place during the period of 12th century. The Renaissance a period from the 14th to the 17th century, considered the bridge between the middle ages and modern history.

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It started as a cultural movement in Italy in the late medieval period and later spread to the rest of Europe. During this period in Europe various developments in mathematics had occurred. Solution of cubic equations, area of large maps, trigonometry, quadratic equations, arithmetic, geometry, ratio and proportions and various branches of mathematics had flourished in this period.

Importance of Mathematics

It is said that mathematics is the gate and key of all sciences. According to the famous philosopher Kant "A science is exact only if so far as it employs mathematics. So all scientific education which does not commence with mathematics is said to be defective at its foundation. Neglect of Mathematics works injury to all subjects." The literal meaning of mathematics is "things which can be counted" now you can think that counting has vital role in our daily life, just imagine that there were no mathematics at all, how would it be possible for us to count days, months and years?

Self-concept

Self-concept is the construct that negotiates these two selves. In other words, it connotes first the identification of the ideal self as separate from others, and second, it encompasses all the behaviours vetted in the actual self that you engage in to reach the ideal self. Behavioural scientists often assert that the self-concept is the sole perspective from which one can understand

an individual's behaviour, because it includes all the dimensions of the self including how one looks (self-image) and what one knows (self-knowledge) and the ways in which these exist for others. Cokley (2000) defined self-concept as a student's views of his or her academic ability when compared with other students. Academic self-concept can also be measured a specific subject areas such as Mathematics, English, and Science. It is an important construct in education because of its linkage with academic achievement (Byrne, 1984; Valentine, 2004).

John (2000) "Self-concept is the product of reflectivity; it is the concept of the individual of himself as a physical, social and moral and existing being. The self-concept is sum total of the individual's thought and feelings about him or herself as an object." Self-concept "is the set of perceptions or reference points that the subject has about himself. It is the set of characteristics, attributes, qualities and deficiencies, capacities and limits, values and relationships that the subjects knows to be descriptive of himself and which he perceives as data concerning his identity" (Hamachek, 1981). It is the set of knowledge and attitudes that we have about ourselves; the perceptions that the individual assigns to himself and characteristics or attributes that we use to describe ourselves. (Purkey, 1988) defines the term self-concept as "The totality of a complex, organized, and dynamic system of learned beliefs, attitudes and opinions that each person holds to be true about his or her personal existence."

Self-Concept and Academic Achievement

Self-concept is frequently positively correlated with academic performance, but it appears to be a consequence rather than a cause of high achievement (Baumeister *et al*., 2003). This suggests that increasing students' academic skills is a more effective means to boost their self-concept than vice versa. Gage and Berliner (1992), in their research on the relationship between self-concept and school achievement suggests that measures of general or even academic self-concept are not significantly related to school achievement. It is at the level of very specific subjects that there is a relationship between self-concept and academic success. This suggests that success in a particular subject area is not really changing one's self-concept but rather having impact on one's expectation about future success based on one's past experience. Most past researches shows relentless support towards the belief that there is a significant relationship between academic self-concept and academic achievement in secondary and post-secondary school students (Cokley & Patel, 2007; Gordon, 1997; Yara, 2010) but none could resolve the issue of whether academic self-concept affects academic achievement or rather academic achievement affects academic self-concept (Hattie 1992). Recent study by Yara (2010) on student's self-concept and mathematics achievement in some secondary schools in South-Western Nigeria revealed that students with good self-concept perform well in mathematics.

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 individual's social milieu. According to Moss and Moss (1986) Home-environment or family environment refers to climate prevailing in the home, which varies from culture to culture, society to society and family to family. 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. Bhardwaj (2001) Consider home as the first socialization 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. The psychological atmosphere of a home may fall into any of the four quadrants, each of which represents one of the four general combinations i.e. acceptance-autonomy, acceptance-control, rejection-autonomy and rejection control."

Review of Related Literature

Wong (1992) Mathematics achievement is closely related to self-concept and attitude towards mathematics. As in the case of general self esteem, more mathematically confident students have significantly higher scores on a standardized measure of mathematics computations. Tiwari and Bansal (1994) from a sample of 885 girls of four different places consisting of 100 samples and on the basis of marks obtained by them in state examination board claims that 50 girls were treated as high achievers and 50 were low achievers. Their self-concept was measured and it comes out that high achievers exhibited high self-concept as compared to the self-concept exhibited by low achievers. Ebeh (2000) Claimed that high self-concept in a subject promotes happiness in the learning of the subject, social acceptance and achievement; whereas low self-concept in a subject may contribute to failure in the subject.

Nabuka (2012) in his study on the achievement of Fijian and Indian students explore the possible factors that might explain the differences in achievement between two ethnic groups. Student sample for the analysis was taken from 40 secondary schools selected randomly from all education divisions in Fiji. Investigation of student's achievement was made by analyzing the results in individual subjects set for 1981 FJC examination in English, mathematics, and Basic sciences, Biology, Chemistry, Physics, Social Sciences, History and Geography. Study shows different areas in which different ethnic groups performed differently. Mishna and Bamba (2012) study was aimed at investigating the impact of family environment on academic achievement of a child. Study reveals that secondary school children have been found to have significant and positive relationship with children's perception of overall family environment and its four dimensions viz: Achievement orientation, Cognitive stimulation, Recreational orientation and

Home structure. It was also found that achievement orientation and cognitive stimulation dimension of family environment have relatively higher relationship with school performance in comparison to their other dimensions. Karimzade and Mohseni (2013) investigate the relationship between self-concept (academic and non-academic) and academic achievement among 300 female students in second year high school studying mathematics, physics and human sciences in Tehran. Analysis of variance on all the variables shows that two groups are significantly different in general and math's self-concept as well as the academic achievement.

Objectives of the study

The following objectives were framed for the study:

- To study the relationship between academic achievement in mathematics and self- concept of the students.
- To study the relationship between academic achievement in mathematics and home-environment of the students.
- To study the combined effect of self-concept and home-environment on academic achievement in mathematics.

Hypotheses of the study

Keeping in view the above mentioned objectives the following null hypotheses have been framed:

H1: There is no significant relationship between academic achievement in mathematics and self-concept of the students.
H2: There is no significant relationship between academic achievement in mathematics and home-environment of the students.
H3: There is no significant combined effect of self-concept and home-environment of a student on academic achievement in mathematics.

Tool used

The following research tools were used to collect data for the present study

- Self-Concept Scale (Saraswat, 1992).
- Home-environment inventory (Mishra, 1989).
- Achievement test in Mathematics (Developed by the Investigator).

Sample

Investigator selected a sample of 600 students of class XI and XII from the Government and Non-Government senior secondary Schools of Hoshiarpur, Jalandhar and Nawanshahar districts. From each of these districts 200 students were selected for sample out of which 100 are boys and 100 are girls.

RESULTS AND DISCUSSION

Hypothesis H1

Table 1.1 shows that mean academic achievement score in mathematics with average self-concept is 69.22 with the standard deviation of 14.050, with above average self-concept the mean score is 74.45 with standard deviation of 14.351, with high self-concept score is 75.29 with standard deviation of 15.137, the null hypothesis assumed H1 is rejected as F

Table 1. ANOVA analysis of the academic achievement of the students on basis of their self-concept scores

Category	N	Mean	SD	F Test
Average self-concept	27	69.22	14.050	1.970 p = 0.249
Above Average self-concept	477	74.45	14.351	
High self-concept	96	75.29	15.137	Significant
Total	600	74.35	14.487	

Table 1.2. ANOVA analysis of academic achievement in mathematics categorized on basis of their Home-environment

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

Table 1.3. ANOVA analysis (with interaction) of the effect of self-concept and home-environment on the academic achievement in mathematics

Source	Type III Sum of Squares	df	Mean Square	F	P value
Corrected Model	7398.036[a]	17	435.179	2.141	0.005
Intercept	842844.040	1	842844.040	4.144623	0.000
Self-concept	1096.447	2	548.224	2.697	0.068
Home-environment	1815.60	5	363.128	1.786	0.114
Self-concept * Home-environment	3271.700	10	327.170	1.610	0.100
Error	118099.429	581	203.269		
Total	3436329.000	599			
Corrected Total	125497.466	598			

value is 1.970 and p-value is 0.249 which is significant at .01 level of significance and shows that there is significant relationship among the different categories of the self-concept of the students with their academic achievement in mathematics.

Hypothesis H2

Table 1.2 shows that the null hypothesis assumed H2 is rejected as F value is 2.983 and p-value is 3.124 which is significant and shows that there is significant relationship reported between academicachievement in mathematics and home-environment of the students. It is analyzed that statistically there is significant relationship recorded in the average scores of the very high home-environment (r=67.83), high home-environment (r=87.98), above average home-environment (r=73.24), average home-environment (r=72.41), low home-environment (r=52.57) and very low home-environment (r=49.87) of the students.

Hypothesis H3:

From table 1.3 it is analyzed that F- ratio is 1.610 and p value is 0.100 with df 10 between self-concept and home-environment variables was found. Here $p = 0.100 > 0.05$ which shows that there is no significant relationship between academic achievement in mathematics and combined effect of self-concept and home-environment. Therefore null hypothesis H3 which states that 'There is no significant combined effect of self-concept and home-environment of a student on academic achievement in mathematics" stands accepted.

Conclusion

The study revealed that

- There is significant relationship among the different categories of the self-concept of the students with their academic achievement in mathematics.
- There is significant relationship among the different categories of the home-environment of the students with their academic achievement in mathematics.
- There is no significant relationship between academic achievement in mathematics and combined effect of self-concept and home-environment.

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