

The Influence of Study Habits and Parental Involvement on Algebraic Problem-Solving Achievement

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ABSTRACT The purpose of the study is to examine the relationship between study habits (SH) and parental involvement (PI) in problem-solving achievement (PSA) in algebra. The study employed a descriptive survey design. A problem-solving test in algebra and a questionnaire are used to collect the data. The test is done to determine the algebraic achievement of the students. Also, the questionnaire is designed to find out the students' SH and PI. Pearson's correlation and regression analysis are used to analyse the data. The results revealed that SH and PI had a positive relationship with PSA in algebra. The obtained regression equation shows that SH has more contribution than PI to the prediction of PSA.

INTRODUCTION

Algebra is one of the main branches of mathematics that always plays a significant role in modern science and technology. In recent years, educators and investigators in mathematics educational research have focused on pupils' algebraic problems at school level. (Bardini et al. 2005; Becker and Rivera 2005; Radford 2006; Ali and Das 2021). One of the main concerns in mathematics education at the secondary school level is how to learn and understand algebra properly. Many investigations have revealed that learning algebra is challenging and obstacle for many students' (Molina et al. 2004). Algebra is a separate topic that covers a large portion of the middle and secondary school mathematics curriculum and is interconnected with the other topics. So, learning algebra is a major aspect of achievement in school mathematics and higher studies. Students' found difficulty in learning algebra due to the encounter of problem solving. Students' problem solving ability and achievement in algebra are commonly connected (Norton and Irvin 2007). Students' problem solving is one of the major aspects of mathematical achievement. Problem-solving is one of the essential topics in mathematics discussed by educators or scholars in mathematics education. It has a major effect on students' academic achievement (Zainali and Ahvan 2016). Many studies have identified several factors that influence students' problem-solving achievement (PSA) (Schoenfeld 2007).

Academic achievement is a complicated process that is affected by a variety of factors. In educational research, several studies have been done to find out which factors are most significant in predicting students' achievement in mathematics (Spinath 2012). Among all these factors, students' achievement in mathematics is also influenced by their study habits (SH) and parental involvement (PI). The research identified influencing factors such as SH and PI as being related to their mathematical achievement and discovered significant relationships at the secondary level (Vijayan 2014). Previous research has indicated that students' SH and PI have a correlation with mathematical achievement (Sastro 2018; Kumiawati and Irawan 2019).

The most vital and crucial part of today's educational world is SH. Effective learning outcomes require good SH on the part of students. It is a method or approach that students use on a regular basis when getting lessons from their teachers, reading books, setting aside time to complete tasks, and completing homework. Fitrianti and Riyana (2020) point out that SH is one of the major reasons of mathematics achievement. Study habits (SH) are manners and abilities that can boost inspiration and turn studying into a productive activity with high returns, resulting in increased learning (Hashemian and Hashemian 2014). This behavior and skills can also improve a student's learning, problem-solving, and achievement (Arora 2016). As a result, better SH among students contributes to higher academic

achievement (Sharma and Singh 2021). Thus, SH are the most significant predictor of academic achievement, and many studies have shown that SH affects students' achievement (Kyauta et al. 2017). In research, it has been established that there is a significantly positive association between SH and achievement in mathematics (Kamoru and Ramon 2017; Ebele and Olofu 2017; Looyeh et al. 2017). In a meta analysis of SH and academic achievement (Elango and Manimozhi 2021) they found SH and academic achievement are associated.

The nature and path of a child's growth are shaped by the parents' value and activities (Fuentes et al. 2019). The importance of a subject to parents has an impact on their children's learning in that subject at the secondary level (Fan and Chen 2001; Hong et al. 2010). Parents' perceived knowledge, attitude towards the subject, and their guidance always play a significant role in the learning of a child (Ghazali et al. 2021). Parents have a significant role in their child's learning and achievement. They engaged in educational conversations with their children and attempted to resolve their problems (Boonk et al. 2020). In order to improve academic success, researchers have aggressively supported PI (Hoover-Dempsey et al. 2005; Galindo and Sheldon 2012). Nowadays, the importance of PI has emerged as one of the significant factors connected to mathematics achievement (Hill and Taylor 2004). Studies have found that PI has a positive relationship with student achievement in mathematics (Gordon and Louis 2009).

Thus based on various reviews SH and PI play a significant role in the achievement of mathematics. Also, at the secondary level algebra is the fundamental course for students' access to higher mathematics and future opportunities. So, the study is done to determine the relationship between SH and PI with PSA in algebra.

Objectives

The main objective of this study is

1. To examine the relationship among SH, PI and PSA in algebra.
2. To determine the relative contribution of the SH and PI to the prediction of PSA in algebra.

Research Questions

- a) Is there any relationship between SH, PI and PSA in algebra?

- b) Is there any significant contribution of predictor variables (SH and PI) to the prediction of PSA in algebra?

METHODOLOGY

The study adopted a descriptive survey design is used to carry out the study.

Samples

The sample of the study consisted of secondary school students. For that purpose, 200 class IX students are randomly selected from secondary schools in the Morigaon district of Assam.

Instruments

Following Instruments were used to collect the data for the study-

Problem Solving Achievement Test: The problem-solving test is based on the IX standard syllabus according to the Secondary Education Board of Assam (SEBA). The test consists of 20 multiple-choice items that were verified and validated by some subject teachers in secondary schools.

Questionnaire: A questionnaire is prepared to know about students' study habits (SH) and parental involvement (PI). The questionnaire consists of 20 items of Likert 5 point scales. Out of 20 items, 10 items are related to SH and 10 are related to PI. For each item numerical scores are considered as "5-Always", "4-Frequently", "3-Sometimes", "2-Rarely", and "1-Never". According to Cronbach's alpha, the questionnaire's reliability is 0.842.

Data Analysis

The collected data is analysed with the help of the SPSS 26.0 version. Pearson's correlation and regression analysis are used to analyse the collected data.

RESULTS

From the above Table 1, it is seen that there is a positive and strong correlation between the variables SH and PSA in algebra exists ($r=0.668$, $p<0.05$). Also, there is a significant correlation between PI and PSA in algebra ($r=0.616$, $p<0.05$).

Table 1: Correlation of SH, PI and PSA

Correlations		SH	PI	PSA
SH	Pearson correlation	1	.717**	.668**
	Sig. (two-tailed)		0.000	0.000
	N	200	200	200
PI	Pearson correlation	.717**	1	.616**
	Sig. (two-tailed)	0.000		0.000
	N	200	200	200
PSA	Pearson correlation	.668**	.616**	1
	Sig. (two-tailed)	0.000	0.000	
	N	200	200	200

** . Correlation is significant at the 0.01 level (two-tailed)

Table 2 shows the value of $R^2 = 0.485$. Therefore, the contribution made by SH and PI to the prediction of PSA in algebra is 48.5 percent; however, the remaining 51.5 percent is influenced by other factors (Pallant 2010).

Table 2: Contribution of SH and PI on PSA

Model summary				
R	R ²	Adjusted R ²	Std. error of the estimate	R ² change
.696 ^a	0.485	0.479	0.47259	0.485

a. Predictors: (Constant), PI, SH

Table 3: Simultaneous relationship

ANOVA ^a						
Model	Sum of squares	Df	Mean square	F	Sig.	Sign.
Regression	41.364	2	20.682	92.602	.000 ^b	0.000
Residual	43.998	197	0.223			
Total	85.362	199				

a. Dependent Variable: PSA

b. Predictors: (Constant), PI, SH

Table 4: Multiple linear Regression for algebraic PSA

Coefficients ^a					
	Unstandardized coefficients		Standardized coefficients	t	Sign.
	B	Std. Error	Beta		
(Constant)	0.515	0.211		2.444	0.015
SH	0.521	0.082	0.465	6.338	0.000
PI	0.302	0.078	0.283	3.856	0.000

a. Dependent variable: PSA

The result of multiple linear regression analysis from Table 3 shows that the overall model is highly significant as, $F(2,197) = 92.602$, $p < 0.05$ (from the ANOVA table). Since the model is significant, simultaneous influences exist between SH and PI to the prediction of algebraic PSA.

From the Table 4, it is clearly indicated that the predictor variables have a positive influence on PSA in algebra, as SH ($t=6.338$, $p < .05$) and PI ($t=3.856$, $p < .05$) is significant. Since the Beta coefficient are positive, so that SH and PI have a positive relationship to the prediction of PSA in algebra. Also SH has a higher B coefficient value (0.521) than the value of PI (0.302). So, SH has a more contribution to the prediction of PSA in algebra as compared to PI. From all these the prediction model of the linear equation is-

$$PSA = 0.515 + 0.521 \cdot SH + 0.302 \cdot PI$$

From above the regression model, the positive unstandardized B coefficient for SH (0.521) as a predictor of PSA in algebra indicated that there is about a 0.521 increase in PSA for each unit increase in SH. This means that the PSA in algebra increases as SH increases. Similarly, an increase in PSA in algebra leads to an increase in PI.

DISCUSSION

The finding reveals that there is a significant relationship between SH and PSA. This means

that better study habits (SH) lead to a better algebraic PSA. The finding is consistent with prior research that indicated a positive relationship on SH and achievement (Jafari et al., 2019). Also, it has been established by Looyeh et al. (2017) that SH and achievement are extensively correlated. The influence of study habits on the learning process of a student is reflected in problem-solving and educational achievement in mathematics (Arora 2016).

The study also reveals that a significant relationship exists between PI and PSA. It means that more parental involvement (PI) leads to a better algebraic PSA (Farooq and Asim 2020). This result corresponds to several study reports that have identified an affirmative connection between PI and secondary school students' achievement (Griffith 1998; Hubbard 1999). Thus, parental involvement has an impact on their children's mathematical achievement (Hong et al. 2014) and their academic achievement (Fan 2001).

Also, the model is significant (From the ANOVA Table 3) and the predictor variables have 48.5 percent contribution to the prediction of PSA in algebra. From the above regression equation, the predictor variable has a contribution to PSA, and SH has a greater contribution to PSA than PI. Previous research has also found that SH is a significant predictor of PSA in algebra (Quilez-Robres 2021) and contributes more to its prediction (Vijayan 2014). Other studies have found that PI is the most significant predictor of achievement among secondary school students (Stiller and Ryan 1992; Farooq and Asim 2020).

CONCLUSION

The study is done to examine the significant relationship between the predictor variables (SH and PI) and PSA in algebra and the relative contribution of the predictor variables. The results showed that SH and PI had a positive relationship with PSA in algebra. Also, there is a simultaneous influence of SH and PI on the prediction of PSA in algebra. The obtained regression equation shows that SH significantly contributes more to the prediction of PSA in algebra. Thus, based on the findings, it can be concluded that students' better SH and more PI lead to their better achievement.

RECOMMENDATIONS

The result of the study reveals that there is a significant correlation between SH and PI with PSA in algebra. It can be recommended that students' problem-solving ability should be developed through their better study habits. So, their study habits should be monitored and encouraged for their better achievement in mathematics. Also, parents should be aware of how to provide effective support for their children and their role in improving children's mathematical achievement. There should be frequent communication between parents and teachers regarding their children's upliftment in mathematical achievement as a whole

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Appendix-A

Questionnaire

The questionnaire consists of 20 statements. Each statement has five options namely - Always, Frequently, Sometimes, Rarely, Never. From sl. no 1 to 10, based on study habits, and 11 to 20, based on parental involvement. Please, tick (✓) any one option you find most appropriate.

S.No.	Statements	Always	Frequently	Sometimes	Rarely	Never
1.	I study the textbook several times to understand mathematical problems.					
2.	I have a regular study schedule for mathematics.					
3.	I practice algebraic problems regularly.					
4.	I Always do my homework on time.					
5.	I spent more time in mathematics especially in algebra.					
6.	I prepare for classes beforehand and review what I have learned.					
7.	I always focus on mathematics during the class. what the teacher teach.					
8.	Whenever I face difficulty to solve a problem always discuss with my teacher or parents.					
9.	I always discuss with my peers when found difficulty in solving a problem.					
10.	In problem solving, I pay much attention to details.					
11.	My parents provide tuition for additional support in mathematics.					
12.	My parents help me when I face difficulty in mathematics.					
13.	My parents frequently discuss my progress, performance related to mathematical issues with teachers.					
14.	My parents help me in my home work.					
15.	Whenever I lose confidence my parents encourage me.					
16.	My parents monitor my studies at home.					
17.	My parents monitor my school performance, especially in mathematics.					
18.	My parents ask me about homework regularly.					
19.	My parents provide time to study at home.					
20.	My parents can assist me to enhance mathematical knowledge.					

Appendix-B**Problem-solving test Questions****Marks: 20**

The question paper consists of 20 questions.
Each question carries 1 mark.

- The co-efficient of x^2 in the expansion of $(2x-3)(x^2-3x+1)$ is
(i) 9 (ii) -9 (iii) 1 (iv) -1
- If $p(x) = 5x^3 - 2x^2 = 3x - 2$, then $p(1)$ is
(i) 4 (ii) -4 (iii) 0 (iv) 1
- The zero of $p(y) = 2y + 5$ is
(i) 0 (ii) $-5/2$ (iii) $-2/5$ (iv) $5/2$
- When $x^3 + 3x^2 + 3x + 1$ is divided by $x+1$, the remainder is
(i) 4 (ii) -4 (iii) 0 (iv) 1
- If $x-1$ is a factor of $p(x) = x^2 + x + k$, then the value of k is
(i) 2 (ii) 4 (iii) 0 (iv) -2
- One of the solution of $3x + y = 8$ is
(i) (1, 2) (ii) (2, 2) (iii) (3, 2) (iv) (1, 1)
- If $x = -1$ and $y = 2$ is a solution of $kx + 3y = 7$, then the value k
(i) 1 (ii) 2 (iii) -2 (iv) -1
- Which of the following polynomial has a factor of $y+1$
(i) $y^3 + y^2 + y + 1$ (ii) $y^4 + y^3 + y^2 + y + 1$ (iii) $3y^2 + 3y + 1$ (iv) $3y^2 + y$
- The solution of $x - 2y = 4$ is
(i) (2, 4) (ii) (1, 0) (iii) (4, 0) (iv) (1, 1)
- If the point (3,4) lies on the equation $3y = ax + 7$, then the value of a is
(i) 2 (ii) $5/3$
(iii) $3/5$ (iv) $1/2$
- If the equation $2y = ax - 4$ passes through the point (1,2), then the value of a
(i) 4 (ii) 8
(iii) -8 (iv) 2
- If the point (p,4) lies on the equation $4x + y = 6$, then the value of p
(i) $1/2$ (ii) $-1/2$ (iii) 2 (iv) -2
- The value of $(3-2x)(3+2x)$ is
(i) $9+4x$ (ii) $9-4x^2$ (iii) $4x^2 - 9$ (iv) $4x-9$
- The value of x in the linear equation $6x - 8 = 4x + 4$
(i) 6 (ii) 2 (iii) -2 (iv) 3
- If $a + b + c = 0$ and $a^2 + b^2 + c^2 = 16$, then the value of $ab + bc + ca$
(i) -8 (ii) 8 (iii) 3 (iv) 0
- If $x+y+z=0$, then the value of $x^3+y^3+z^3$ equal to
(i) xyz (ii) $-xyz$ (iii) $3xyz$ (iv) $-3xyz$
- If one of the factors of $x^2 - 6x - 16$ is $(x - 8)$ then the other factor is
(a) $(x-1)$ (b) $(x-2)$ (c) $(x+2)$ (d) $(x-16)$
- The expanded form of $(-2x+3y+2z)^2$ is
(a) $4x^2 + 9y^2 + 4z^2$ (b) $4x^2 + 9y^2 + 4z^2 - 12xy + 12yz$
(c) $-4x^2 + 9y^2 + 4z^2$ (d) $4x^2 + 9y^2 + 4z^2 - 12xy + 12yz - 8xz$
- If $x + y = 3$ and $x^2 + y^2 = 5$, then xy is
(i) 1 (ii) 3 (iii) 2 (iv) 5
- The possible dimensions of the cuboid whose volume is $3x^2 - 12x$
(i) 3, x^2 and $12x$ (ii) $3x^2$ and 12
(iii) 3, x and $x-4$ (iv) $3x$ and $12x$