ORIGINAL ARTICLE

Variables of Teaching Learning Environment Predicting Attainment of Students

Pooja Arora
Assistant professor,M.K college of Education,Jalandhar
Email: drpoojakalra@gmail.com

ARTICLE HISTORY	ABSTRACT
Received: 09.01.2016 Revised 16.01.2016 Accepted 29.01.2016	*Student, home and teacher variables were studied as predictors of attainment in an important branch of mathematics named trigonometry. A total of 500 students (250 boys and 250 girls) from all over Amritsar district attending grade 10 participated in this study. Intelligence as measured by Jalota's Group Test of General Mental Ability was found to be highly correlated with criterion variable. When all variables were entered together into a regression model, intelligence was still the strongest predictor of the criterion variable which was followed by socio economic status and qualification of teacher.* *Keywords: intelligence, socio economic status, qualification of teacher*
CITATION OF THIS ARTICLE	

INTRODUCTION

Mathematics enjoys a great significance and status in the modern world because of vast implications that it has for extension and enrichment of cultures and civilizations. All the wonderful things that are done by computers today using computer programs use just two symbols that are equivalent to the numerals 1 and 0 of mathematics. Thus, it becomes imperative for the teacher to lay a strong foundation of mathematics right from the initial stages of schooling. Moreover, the teacher should be competent enough with various nuances of the subject. He should be acquainted with psychological principles of teaching-learning and should be in a position evolve a sound system of evaluation.

In mathematics, trigonometry is one of the important set of disciplines which relate to two and three dimensional objects. Anything which one can practically see around can be related to principles of trigonometry and algebra. In the real- world, it is very useful in engineering and construction, where its principles are important in accurately determining the lengths, sizes and areas of objects without having to actually create them first.

Teaching learning environment should support pupils to become independent and active learners. Educators should be encouraged to design learning environments that incorporate as many different forms of experience as possible –social, cultural, physical and psychological – in working towards the desired learning outcomes. Teacher in school can make teaching effective by ensuring that resources are appropriate, accessible, identifiable and relevant to children's learning needs. The teaching learning environment may be present in the school, in the classroom, in home and in the community at large. Learner's achievement at a particular point of time is a function of cumulative input of the variables associated with the family, the peers, or other students and of schools and teacher. These inputs interact with the innate abilities or the learning potential of the students (Hanushek 1972, 1979). These interactions create an environment that affects attitudes, personality and achievement of students (Talton 1987).

OBJECTIVE OF THE STUDY

1. To discover whether attainment in trigonometry has any relationship with variables related to Students,   home and teachers.

2. To ascertain if such relationship were found; which variables contributed most to the Prediction of criterion variable.

HYPOTHESES

[1]. Intelligence shares a significant correlation with achievement scores on TCT and in multivariate regression analysis intelligence will emerge as a significant predictor of criterion variable (TCT).

[2]. There exists no significant relationship between gender and achievement scores on TCT and hence it will not contribute significantly to criterion variable.

[3]. SES shares a significant correlation with achievement scores on TCT and in multivariate analysis it will emerge as a potential predictor of criterion variable.

[4]. There exists no significant relationship between maternal employment and achievement scores on TCT and in multivariate regression analysis this variable will not emerge as a significant predictor of criterion variable.

[5]. There exists no significant relationship between level of education of parents and achievement scores on TCT and in multivariate regression analysis this variable will not emerge as a significant predictor of criterion variable.

[6]. Qualification of teacher shares a significant correlation with achievement scores on TCT and in multivariate regression analysis it will emerge as a significant predictor of criterion variable.

[7]. There exists no significant relationship between commitment of teacher and achievement scores on TCT and in multivariate regression analysis this variable will not contribute significantly to criterion variable.

METHOD

SAMPLE

The sample consisted of 500 students (including boys and girls) of tenth class selected from the different schools of Amritsar district, out of which 250 were boys (125 government and 125 private) and 250 were girls (125 government and 125 private). The sample was collected by using stratified random sampling technique.

TOOLS

The following tools were administered to collect the requisite data:

1. Trigonometric Concept Test constructed and standardized by the investigator.
2. Teacher Role Commitment Scale (Rathod and Varma , 2003).
3. (a) Socio Economic Status Scale (Urban) (Srivastava ,1991) modified by the investigator.
   (b) Socio Economic Status Scale (Rural), (Trivedi and Pareek, 1965) modified by the investigator.
4. General Mental Ability Test (Jalota, 1976).

The information regarding education of parents and maternal employment was sought from the information schedule given on the title page of TCT constructed and standardized by the investigator.

DELIMITATIONS OF THE STUDY

1. Study was delimited to 500 students (including boys and girls) studying in 10th class in government and private schools located in urban and rural areas of Amritsar district.

2. The study was further delimited to

a) Variables associated with student viz., intelligence and gender.

b) Variables associated with home viz., SES, maternal employment, education of parents.

c) Variables associated with teacher viz., qualification and commitment.

STATİSTİCAL TECHNİQUE

The correlation coefficient in the present study was used to determine the relationship between pupil achievement on TCT and variables of teaching learning environment as related to student, home and teacher and multivariate regression analysis was used to study the contribution of these variables in the prediction of criterion variable.

RESULTS AND DISCUSSION

Multiple 'R' with different combinations of variables of teaching learning environment as related to student, home and teacher by stepping up one variable at a time were computed to test the hypotheses related to multivariate regression analysis. To test the significance of difference between values of R^2 from one specific combination of variables to the subsequent variable explaining the stepping up of an additional variable to the previous combination, 'F' ratios were computed. The results of 'r', multiple R, R^2, R^2 change and F-ratios have been shown in Table I.

TABLE I: Showing results of Stepwise Regression Analysis

Variables	r	R	R^2	R^2 Change	F
X_1 (Intelligence)	0.443*	0.443	0.1962		121.283*
X_2 (Gender)	0.051	0.443	0.1962	0.0000	0.0000
X_3 (SES)	0.222*	0.490	0.2401	0.0439	28.6543*
X_4(Maternal Employment)	0.165*	0.495	0.2450	0.0049	3.2126
X_5 (Education of parents)	-0.006	0.508	0.2581	0.0131	8.7227*
X_6 (Qualification of Teacher)	0.199*	0.522	0.2725	0.0144	9.7584*
X_7 (Commitment of Teacher)	0.089**	0.523	0.2735	0.0010	0.6772

Regression Equation for predicting attainment on TCT

$Y(TCT) = -1.157 + .165 X_1* + .396 X_2 + .187 X_3* + 1.557 X_4 - 1.968 X_5* + 2.096 X_6* + .257 X_7$

Significance of difference between multiple R's (Guilford and Fruchter, 1973, chapter 16, p. 368).
*Significant at .01 level
**Significant at .05 level
For df = 498, the value of 'r' = .115 at .01 level
The value of 'r' = .088 at .05 level
Discussion Based on Table I
Table I shows the predictive values of variables of teaching learning environment as related to student, home and teacher and identifies the variables which could be used as predictors of attainment on Trigonometric Concept Test. The variables were stepped up in the following order:

1) Student variables
2) Home variables
3) Teacher variables

In each category (viz. student, home and teacher) variables were stepped up one at a time in order of decreasing correlation with the criterion. In the first instance, student variables i.e. intelligence followed by gender were stepped up and the following hypotheses were tested:

(i) Intelligence shares a significant correlation with achievement scores on TCT and in multivariate regression analysis intelligence will emerge as a significant predictor of criterion variable (TCT).
(ii) There exists no significant relationship between gender and achievement scores on TCT and hence it will not contribute significantly to criterion variable.

As observed from Table I, when the linear variable of intelligence was entered in order to see how much variance it accounts for towards Trigonometric Concept Test scores, the value of 'R' between Trigonometric Concepts and Intelligence was found to be .443 which is significant at .01 level. Also significant value of F = 121.283 at .01 level explains that intelligence significantly contributed to the variance in the criterion variable that is 19.62 percent of variation in trigonometric achievement was attributed to the variable of intelligence. The contribution of intelligence for the prediction of academic attainment has also been supported by Kaile (1985), Fisher (1995), Laidra et al. (2007), Lu et al. (2011) and Kappe & Vander Flier (2012). The correlation between X_1(INT) and criterion variable as seen from table I is of the order of .443. For degree of freedom 498, the value of r = .115 is significant at .01 level, therefore, the obtained value of 'r' is highly significant at .01 level. This conclusion falls in line with a host of studies. Fisher (1995), Bajwa (1998), Soni (2002), Kaur (2008) have found intelligence to be positively and significantly related with academic achievement. These findings clearly testify the hypothesis (i) which states that Intelligence shares a significant correlation with achievement scores on TCT and in multivariate regression analysis intelligence will emerge as a significant predictor of criterion variable.

The second student variable that is Gender was then combined with intelligence to see whether the variable X_2 (Gender) was a useful addition or not in increasing the variance. A look at table I reveals that gender was insignificantly correlated with the criterion, the value of 'r' being of the order of 0.051. The value of R^2 = .1962 and R = .443 remained same. Also there was no significant increase in the criterion variance of the criterion test (TCT) as is clear from insignificant F-value (F = 0.00) which means that gender in conjunction with intelligence (X_1) had no effect on the attainment of criterion test and was unable to predict any significant criterion variance. This inference confirmed the hypothesis (ii) that there exists no significant relationship between gender and achievement scores on TCT and hence it will not contribute significantly to criterion variable. The results of multiple regression analysis in research studies conducted by Mc Millian (2001) and Ventura (2010) also support this result.

Further home variables were entered and the hypotheses tested were:

(iii) SES shares a significant correlation with achievement scores on TCT and in multivariate analysis it will emerge as a potential predictor of criterion variable.

(iv) There exists no significant relationship between maternal employment and achievement scores on TCT and in multivariate regression analysis this variable will not emerge as a significant predictor of criterion variable.

(v) There exists no significant relationship between level of education of parents and achievement scores on TCT and in multivariate regression analysis this variable will not emerge as a significant predictor of criterion variable.

SES was first added to the combination of intelligence and gender to see whether this variable significantly increases or reduces the variance. SES shared a significant correlation of .222 with the criterion variable and an increase in proportion of variance accounted for by SES scores was observed in the criterion test. Table I shows that R^2 increased from .1962 to .2401 for Trigonometric Concept Test, the increase being highly significant at .01 level (F = 28.02 for TCT). The coefficient of multiple R was boosted from .443 to .490. Thus, this variable contributed significantly in explaining the variance in achievement on Trigonometric Concept Test and led to the acceptance of hypothesis (iii) that SES shares a significant correlation with achievement scores on TCT and in multivariate analysis it will emerge as a potential predictor of criterion variable. The findings of Mohan (1998), Rath and Patnaik (1999), Barry (2006) and Byrnes and Wasik (2009) also support this result.

The linear variable X_4 (Maternal employment) was then entered in the combination of variables X_1, X_2, X_3 to assess its contribution in predicting the criterion variance. The addition of variable X_4 resulted into insignificant increase in value of R (.490 to .495) on TCT. Table I reveals that variable X_4 shared significant 'r' of magnitude .165 with the criterion however insignificant F ratio (F = 3.2126) reveals that increase in R^2 from .2401 to .2450 was not significant and hence this variable failed to predict any significant criterion variance. This inference rejected the first part of hypothesis (iv) which states that there exists no significant relationship between maternal employment and achievement scores on TCT as significant correlation of order .165 has been observed between X_4 (ME) and criterion however, second part of hypothesis (iv) i.e. in multivariate regression analysis this variable will not emerge as a significant predictor of criterion variable stood accepted. The study conducted by Rockwell (1983) also found maternal employment to be predictive of only a small part of the variance associated with achievement which supports the present result.

The independent contribution of variable X_5 i.e. education of parents was now studied by adding it to the previous combination of intelligence, gender, SES and maternal employment. Close observation of Table I reveals that the increase in R^2 from .2450 to .2581 was found to be significant (F = 8.7227). Education of parents was found to have non significant correlation (r = -.006) with the criterion variable (TCT) but significant correlation of the order of .426 with the valid predictor X_3 (SES), thereby, indicating that X_5 is a suppressor variable, which suppresses that part of variance in SES which does not contribute to the prediction of TCT. The suppressor variable itself correlates insignificantly, or even to the tune of zero with the criterion but it shows significant correlations with the valid predictors. Thus, from result obtained it can be concluded that though no significant relationship between education of parents and achievement scores on TCT was obtained yet it contributed significantly to the prediction of TCT but in the form of suppressor variable. Thus, hypothesis (v) was partially accepted and partially rejected. Multiple regression results found a significant effect of parental education on student achievement in mathematics in research study conducted by Beasley (1980) and academic achievement in general in research studies conducted by Lan (2004) and Hines (2009).

From the regression equation mentioned under table I, it was seen that the value of 'a' was -1.157 which can be called the starting point of the regression line and will remain constant. The other constant in the regression equation was 'b' corresponding to the slope of respective predictors. Coming to the interpretation of 'b' coefficients or regression coefficients, the t-values of regression coefficient in multiple regression equation indicate whether the variable contributes significantly or not in predicting the criterion variance.

Two variables of teacher; namely qualification of teacher (X_6) and commitment of teacher (X_7) were then added one after the other and the following two hypotheses were tested:

(vi) Qualification of teacher shares a significant correlation with achievement scores on TCT and in multivariate regression analysis it will emerge as a significant predictor of criterion variable.

(vii) There exists no significant relationship between commitment of teacher and achievement scores on TCT and in multivariate regression analysis this variable will not contribute significantly to criterion variable.

Variable X_6 was found to have correlation of the order of .199 with the criterion which is significant at .01 level. The change in the value of R^2 from .2581 to .2725 was found to be significant (F = 9.7584); thereby indicating that X_6 (Qualification of teacher) is a significant predictor of criterion variance. This inference confirmed hypothesis (vi) which states that qualification of teacher shares a significant correlation with achievement scores on TCT and in multivariate regression analysis it will emerge as a significant predictor of criterion variable. Our finding is supported by research studies carried out by Mullens (1993) and Berry et al. (2004). They found that highly qualified teacher accounts for lion's share of variance in student achievement. Results of multiple regression analysis in research study conducted by Abduliahi also found qualification of teacher to be a predictor of students' achievement in Mathematics.

Variable X_7 (commitment of teacher) correlated positively and significantly (r = .089) with the criterion at .05 level. The addition of variable X_7 (COT) resulted into slight insignificant increase in the value of R (.522 to .523) on trigonometric concept test. Also F = .6772 indicated that there was insignificant change in the value of R^2 from .2725 to .2735. Therefore, though X_7 was significantly correlated with the criterion yet it was unable to predict any meaningful criterion variance. This led to the rejection of first part of hypothesis (vii) which states that there exists no significant relationship between commitment of teacher and achievement scores on TCT. However second part of hypothesis that in multivariate regression analysis this variable will not contribute significantly to criterion variable was accepted. Research study conducted by Cox (2005) also reported similar result. The study showed that although teacher characteristics are related to positive learning experience for students but they cannot be used as predictors of students outcomes.

CONCLUSIONS

When all the variables related to student, home and teacher were entered in stepwise regression analysis the value of R^2 came out to be .2735 which clearly shows that 27% variation in attainment of TCT was because of the seven variables related to student, home and teacher that were taken up in this research study. From the regression equation mentioned under table I, it was seen that the value of 'a' was -1.157 which can be called the starting point of the regression line and will remain constant. The other constant in the regression equation was 'b' corresponding to the slope of respective predictors. Coming to the interpretation of 'b' coefficients or regression coefficients, the t-values of regression coefficient in multiple regression equation indicate whether the variable contributes significantly or not in predicting the criterion variance. Thus, on the basis of regression equation, it was found that the variables X_1, X_3 and X_6 had regression weights .165, .187 and 2.096 which were significant at .01 level, thereby, indicating that these variables emerged as significant predictors of criterion (TCT). The variables X_5 had regression weight -1.968 which was negative and significant at .01 level. Despite insignificant correlation with the criterion, this variable, due to its negative and significant regression weight and significant correlation with the valid predictor X_3(SES), emerged as predictor of criterion but in the form of suppressor variable. Similar results were obtained on the basis of discussion based on F-values calculated to observe whether the change in R^2 was significant or not.

REFERENCES

1. Abduliahi O. E. and Onasanya, S. A. (2010). Effect of teacher effectiveness on Kwara State secondary school students' achievement in mathematics. *Medwell Journals*, 5, 4, 286-292.
2. Bajwa, H. Singh (1998). A study of academic achievement in Physics in relation to intelligence, creativity and aptitude for Physics at the senior secondary stage. Ph.D. Thesis, Panjab University, Chandigarh.
3. Barry, Jennifer (2006). The effect of socio economic status on academic achievement. (Master's Thesis). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 1443933).
4. Beasley, Nickie N. (1980). Relationship of selected variables to student achievement in the transition from elementary to middle school. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 8108379).
5. Berry, B., Hoke, M. and Hirsch, Eric (2004). NCLB: Highly Qualified Teachers- The search for Highly Qualified Teachers. Retrieved from www.eric.ed.gov. ERIC No. EJ703113.
6. Byrnes, James P. and Wasik, Barbara A. (2009). Factors predictive of mathematics achievement in kindergarten, first and third grades: An opportunity–propensity analysis. *ContemporaryEducational Psychology,* 34, 2, 167-183.
7. Cox, Becky Jane Moore (2005). Relationships between professional teacher characteristics and academic achievement of middle school science students. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 3170199).
8. Fisher, Janis L. (1995). Relationship of intelligence quotients to academic achievement in the elementary grades. Retrieved from www.eric.ed.gov. ERIC No. ED388428.
9. Hanushek, E. A. (1972). Education and Race: An analysis of the education production process. Cambridge, Massachisetts: Health-Lexington.

10. Hanushek, E. A. (1979). Conceptual and emprical issues in the estimation of education production functions. *Journal of Human Resoures,* 14, 351-388.
11. Hines, Erik M. (2009). An examination of parental variables, ecological factors, and the academic achievement of African American male students. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 3991240).
12. Kaile, H. S. (1985). Verbal and Non verbal intelligence as correlates of achievement in mother tongue and foreign language. *The Educational Review*, XCI, 8, 130-133.
13. Kappe, Rutger and Van der Flier, Henk (2012). Predicting academic success in higher education: What's more important than being smart ? *European Journal of Psychology of Education,* 27, 4, 605-619.
14. Kaur, Sandeep (2008). A study of academic achievement in relation to mental health and intelligence of secondary school students. M.Ed. dissertation, Panjab University, Chandigarh.
15. Lan, Chiu-Hui(2004). Relationships among socio-economic status, parenting academic achievement, and self esteem in early and middle adolescence: A longitudinal study. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession   Order No. AAT 3158351).
16. Lu, Liping, Weber, H. S., Spinath, Frank M. and Shi, Jiannong (2011). Predicting school achievement from cognitive and non cognitive variables in a Chinese sample of elementary school children. *Intelligence,* 39, 2-3, 130-140.
17. Mc Millian, Marciea Monique (2001). Is there a gender gap in academic disengagement and achievement in middle childhood and early adolescent African Americans from low income families? (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 3031878).
18. Mohan, Radha (1998). Academic achievement and certain selected variables-a suggested discriminent function model. Perspectives in Education, 14, 3, 161-171.
19. Mullens, John E.(1993). The relationship between teacher qualification and student learning : A study of standard one classrooms in Belize, Central America. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 9326318).
20. Rath, Arundhati and Patnaik, Sangeeta(1999). Role of maternal disciplinary practices on academic achievement and peer social status among adolescents. *Experiments in Education,* XXVII, 7, 116-123.
21. Srivastava, G.P. (1991). *Manual for Socio-Economic Status Scale (Urban).* National Psychological Corporation, Agra.
22. Soni, J. (2002) A study of academic achievement of class IXth students of Chandigarh in mathematics in relation to intelligence and study habits. M.Ed. Dissertation, Panjab University, Chandigarh.
23. Talton, B.L. and Simpson, R.D. (1987). Relation of attitude towards classroom environment with attitude towards achievement in science among tenth grade biology students. *Journal of Research in Science Teaching,* 24, 1, 507-525.
24. Trivedi,G. and Pareek, Udai (1965). *Manual of the Socio-Economic Status Scale (Rural).* National Psychological Corporation, Agra.
25. Ventura, Allison Burnett (2010). Perceptions of academic achievement barriers and supports of urban Hispanic students : A scale development. (Doctoral dissertation). Retrieved from Pro Quest Dissertations and Theses. (Accession Order No. AAT 3420965).