Influential Factors Affecting Math Achievements in the Secondary Schools Functioning in Northern and Mountainous Part of Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

The purpose of this study is to recognize and analyze factors affecting achievement in math subject. This is basically a correlational study, with the main focus revolving around the relationships among various factors affecting math achievement. This quantitative study was conducted using a survey instrument comprising of 23 items representing STC, ST, EBS, PC, SCC and GC. Questionnaires were distributed to 113 teachers of secondary schools situated in Wari (mountainous area) sub-division, Dir Upper, Khyber Pakhtunkhwa Province and affiliated with Board of Intermediate and Secondary Education (BISE), Malakand, Pakistan. A total of 100 teachers returned the survey instrument in complete form. Data were analyzed with the help of statistical tools, SPSS version 22, and AMOS graphics version 22. Data obtained was found to be normally distributed. Results of the contemporary study shows that there are certain factors affecting math achievement. Correlation between some exogenous and endogenous variables is higher. The proposed theoretical model affirms that the predictors contribute towards math achievement. This could be an interesting contribution to the literature. This study provides a roadmap and suggest self-development of education system of Pakistan.

Keywords: Math achievement, Parents role, student's attitude, teacher knowledge, text books.

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1.0 Introduction:

Education has its vital role in the socio economic development of a state. For this purpose there should be a continuous focus on the improvement of education sector especially in developing countries like Pakistan. Keeping this concern of various countries a programme launched in 2003 branded as PISA (the Programme for International Student Assessment), initially forty one countries joined, containing Canada and all thirty OECD status. PISA exams evaluates reading and science literacy and literacy in mathematics of the fifteen years old students. PISA exams arranged by the Organization for Economic Co-operation and Development (OECD).

The main focus of PISA exam in 2003 was relating to the field of mathematics, then secondary focus was on reading skills, science subject and problem-solving skills. Next year, in 2004 outcome of the PISA test exposed that Canadian students maintained their performance in international settings. A study piloted by (Sezgin, 2017), the foremost persistence of this study was to find out aspects touching mathematics literacy level of partaking nations in the exam settled by Programme for International Student Assessment (PISA) in 2012. The nation states joined in PISA 2012 were categorized in light of PISA published results (OECD, 2014, p7)cited in (Sezgin, 2017). This classification was in three groups, high-achieving, normal-achieving, and low-achieving. Different studies has been conducted to find out the root causes of low, intermediate and high performance in the PISA test, these studies have forth forward various factors contributing in test score. Students' learning behaiour and efforts are more important component in learning process, and these results reflects the national qualification framework (Gallavara et al., 2008), and standard of educational institute (Hou, 2010). Achievement is considered as the command over the subject by pupils. While Learning outcomes is usually concerned with different facets of knowledge (Sezgin, 2017).

Mathematical achievement is the termed as the capability of the student in the subject of mathematics. It can be observed after acquiring knowledge, clear concepts, expertise and techniques gained in mathematics at a specific time. Its gauges the score obtained after contesting test of mathematics (Muda, Karim, Rashid, & Mohamed, 2019).

Different studies conducted worldwide presents that influencing domain like attitudes for learning mathematics and learner success are both soundly correlated (Altawallbeh, Soon, Thiam, & Alshourah, 2015; Ayob & Yasin, 2017; Mensah, Okyere, & Kuranchie, 2013; Wan &

Shen, 2015). One of the reason of the low achievement is because of the improper and incomplete knowledge and lack of skills to clear the concepts of students, and deficiency of Mathematics textbooks that emphasis appropriately on approved curricula (Bosman & Schulze, 2018; Siyepu, 2013). This is also confirmed by Henning (2013), that these teachers are unable acknowledge cognition in learners. For more support of this statement another Study carried out by Firmender, Gavin, and McCoach (2014) who confirmed that there is a significant correlation between instructional exercise and mathematics attainment. Suleman and Hussain (2014) conveyed that various studies related with classroom environment exposed that physical atmosphere plays a vibrant role during teaching-learning practice. Apart from the contents conclusion and teaching methodology, students' assertiveness towards mathematics may also inclined by instruction quality, especially in terms of classroom management, classroom supervision, learning atmosphere (Mensah et al., 2013). Mathematics plays multifaceted role in both science and technology as there is no single area in these subjects without application of mathematics (Muda et al., 2019; Okereke, 2006). On the other hand, considering the aforementioned aspects linking with success in mathematics, this study is going to confirm some others factors which are closely linked with math score in local context of Pakistan. This study will further analyze the relationship between these factors. Additionally, this study will analyze that among these factors which factor will be the best predictor of math achievement. Answers of the following questions will be find out after analyzing the collected data.

RQ1: Is there any significance relationship between the factors affecting math achievement?

RQ2: How will do these measures (factors) of control predict perceived math achievement?

RQ3: Which is the best predictor of the perceived math achievement?

RQ4: Does gender play a role of moderator?

RQ5: Does the collected data fits with the proposed model.

2.0 Literature review:

Education is a process which help an individual to reshape his attitude, thinking and may enhance grooming process (Kalhotra, 2013). This aspect of education is well stated by Pesto Lozzi as "Education is the natural harmonious and progressive development of man's innate power" (Kalhotra, 2013). Several reasons are antecedent while we probe dropout cases from

educational institutes; the foremost among these reasons is the failure in mathematic subject .Therefore, this study is conducted to determine various factors causing a failure in the mathematic subject. Lastly, this study will further analyze that is there any significant relationship between these factors.

2.1 Meaning and concept of mathematics

Mathematics is a language like others and it has a crucial role in human development and no stronger and more influential language has been introduced by an anthropoid, because mathematics expresses long statements in form of symbols, no ambiguity in understanding its logics and provide concrete form for a statement (Kalhotra,2013). One of the famous Indian leaders, Pundit Jawahar Lal Nehru has spoken about mathematics that; "mathematics is supposed to be a dull subject, but is increasingly recognized that it is of high importance in scientific developments today. Indeed, mathematical research has evidenced the horizon of the human mind tenuously and has helped in the understanding, to some extent, of nature and the physical world" (Kalhotra, 2013). Up to the mark performance in the subject of mathematics reflects quality education system of a country (Reddy, 2005). Mathematics literacy comprises detecting solving problems and understanding the situations (OECD, 2014) cited in (Sezgin, 2017). Some of the researchers contemplate that understanding mathematics language has also an indeed importance as performing in mathematics because the latter one cannot be developed without the former is utilized effectively (Gafoor & Sarabi, 2015; Riccomini, Smith, Hughes, & Fries, 2015). The reason is that, understanding and performing well in mathematics has a vital role for the development of science and technology.

Factors affecting Mathematics learning and achievement

Salman, Mohammed, Ogunlade, and Ayinla (2012), are in favor of searching causes of poor academic attainment in mathematics as these factors are unending. Quite a lot of factors have been recognized and associated with learning. Generally, these learning factors have strong relationships with classroom instruction and learning practices, these can be categorized, namely content coverage, teaching practice and quality of teaching. Content stresses that concentrations on improving mathematical concept is noticed to have positive effect on students' attitudes towards learning mathematics (Hamed, Bahari, Abdullah, & Ghani, 2008).

Influential Factors Affecting Math Achievements in the Secondary Schools Functioning in Northern and Mountainous Part of Khyber Pakhtunkhwa, Pakistan

Attitude:

Taking into account the domain of mathematics education, it is observed that achievement in the subject matter is widely linked with cognitive domain and attitude of the student towards learning mathematics (Bayaga & Wadesango, 2014; Mensah et al., 2013; Zan, 2013). Thus those students who have a perception of learning mathematics will be enable of getting high grades in mathematics. Mounting evidence proposes that approaches towards learning mathematics are supposed to relates with many factors, these factors motivates for leaning mathematics (Ayob & Yasin, 2017; Mohamed & Waheed, 2011; Yaratan & Kasapoğlu, 2012). *Study of Singh & Imam (2013) cited in Muda et al. (2019) also affirms that achievements in mathematics will be higher if students' attitude is more inclined towards learning mathematics.* Similarly, there are Several studies which confirms that simultaneously attentiveness and motivation escalates chances of high mathematics achievement (Sukada, Sadia, & Yudana, 2013), Supported by Surifah, Mustiati, Syaifullah, and Bowo (2016) that motivation is s stimulus which boost learning interest.

The Classroom Environment and Home Background

Home and classroom backgrounds have also an influence on students learning and achievement in a subject matter. The environment comprises of the location of tables and chairs in class, lighting and suitable temperature, classroom super vision, discipline techniques, and appealing lesson plans (Suleman & Hussain, 2014). Another study was conducted to focus on low-achieving states, Botswana, Kenya, and South Africa on the basis of PISA results (e.g., Ali et al., 2016; Carnoy, Ngware, & Oketch, 2015). In this study they found that the factors which are responsible for low achieving countries are, school assets, teacher skills and excellence, and classroom environments.

Learning Habits and Homework

Maloney, Ramirez, Gunderson, Levine, and Beilock (2015) determined that that parent-student relationship has a positive effect on student's achievements in mathematics; however, the further study exposed that if parents are found anxious regarding math education, then the students will not be benefited from their parents.

Students' Cognitive Style and Performance

Kiray, Gok, and Bozkir (2015) conducted a study to find out the relationship between mathematics achievement with the reading expertise, problem solving competencies, and the effect of cognitive and antecedent variables among students. In another study performed by Zakaria, Chin, and Daud (2010), student-centered methodologies such as shared learning increase mathematics success and attitudes towards learning mathematics among pupils and thus shifting the practice of teacher-centered teaching techniques to student-centered teaching techniques. Cognitive elements comprising individual's ideas that an attitude object would yields wanted or detrimental effects (Ayob & Yasin, 2017; FAZIO & OLSON, 2007; Mensah et al., 2013). In the perspective of teaching and learning mathematics, cognitive factor specifies students' self-confidence in their mathematical capabilities(Di Martino & Zan, 2011).

The Position of Practices and Examinations

Teacher Role

The precise textbook that a teacher regularly uses can influence not only what students learn and the way they learn it (Stein, Remillard, & Smith, 2007). As a long term approach to enhance mathematics performance there is a need of using educational technology. The National Council of Teachers of Mathematics recommended that, ''Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning'' (National Council of Teachers of Mathematics. 2011) cited in Cheung and Slavin (2013). It is also assumed that the opinions teachers expresses about a subject, if unopposed generally leads to the failure of curriculum restructurings (Goldin, Rösken, & Törner, 2009; Halai, 2009). Students' optimistic arrogance towards the subject of mathematics, method of teaching and teacher temperament are prominently causing high success in the subject of mathematics(Salman et al., 2012). Moreover, teaching practice, which has a link with instructional method, is also imperative in influencing students' attitudes towards the subject of mathematics (Mensah et al., 2013). Effective formative evaluation (i.e. inform students about their improvements and performance ranks in mathematics, and inform students regarding their weaknesses and strengths in the subject), and teachers will try to enhance students' motivation in terms of their learning, and this way help the students to enhance their interest towards mathematics (Ayob & Yasin, 2017; Gherasim, Butnaru, Boza, & Iacob, 2011). Similarly, low

achievement in math is also closely linked with teaching style of the instructor, since extensive mismatches between the teaching style and learning style in the classroom can contribute to poor educational achievement and pessimism towards a topic (Breckler, Teoh, & Role, 2011; Naik, 2013). The afore-mentioned suggests that Mathematics teachers need understanding of the course contents, pedagogics, and suitable teaching techniques which deliberate learning styles (Bosman & Schulze, 2018). One of the exterior factors influencing student achievement is the inspiration of teacher's starring role(Dada, 2016; Sezgin, 2017). Because there is an effect of teacher's role as a instigator on student learning inspiration (Sezgin, 2017; Sugiasih, 2015). Teachers project better learning, because his method of learning has sound effects on the development of student's success (Ariani & Mirdad, 2016).

Educational reforms in Pakistan to improve achievement in math

Nearly all the nations including Pakistan make an struggle to improve the quality of education through launching suitable education reforms, a diversity of steps like curriculum and resource development has been started and through pre-service and in-service teacher education programs teachers are stimulated to use diverse teaching approaches and assets to bring change in their teaching for better learning chances to students. New mathematics set of courses stresses on learning mathematics for well understanding and to encourage logical reasoning and problem solving abilities, therefore, teachers require to change their present mathematics teaching that emphasizes knowledge acquisition, drill and practice(Ali, 2000; Halai, 2009).

3.0 Methods:

The first part of this section of study briefly describes the research design. Subsequently, the population for this study, the sampling procedure and the development of survey instrument. Moreover, this part of the study clarifies testing the validity of the survey instrument. The next part summarizes the methods applied to analyze the data and finds answers of posed research questions.

Contemporary study practices a quantitative method for data collection. The quantitative method is used here for generalizations of the results for the entire populace. In such type of research, the investigator first and foremost adopts postpositive proclamations for increasing knowledge such as the use of the measurements and observations or by examining particular theories and then

take on a strategy such as experimentations or surveys. The investigator further bring together data by using a selected or developed scale that yields statistical data(Creswell, 2013) p. 18.

The investigator in present study has hypothesized six constructs i.e.; Student cause (STC), parents cause (PC), teacher cause (TC), Government cause (GC), school cause (SCC) and examination bodies cause measurement (EBC). STC has measured by 5 items, PC has measured by 3 items, TC has measured by 5 items, GC has measured by 4 items, SSC has measured by 4 items, and EBS has measured by 2 items. For the measurement of all these exogenous dimensions/variables a 7-point Likert scale used ranging from *1-(Totally disagree), 2-(Disagree), 3- (Somewhat disagree), 4- (Neither agree nor disagree),* 5-(Somewhat agree), 6-(Agree), 7-(Strongly agree). All* these (23) items comprising in instrument has been self-developed in light of accessible literature.

 Additionally, the demography of the respondents has also been included in the model. A closed ended questionnaire, capturing the dimensions of aforesaid variables, distributed for data collection. A total of 15 Secondary schools which are functional in mountainous area of Tehsil Wari district Dir Upper and affiliated with Board of Intermediate and Secondary Education (BISE) Malakand Khyber Pakhtunkhwa, Pakistan, are operating by provincial Government and has been taken as population for the current study. This study had a total population of 160(Mathematics Teachers), from the sample size of 113, based on a confidence level 95% and a margin error of less than 4%. While (Krejcie & Morgan, 1970) say that, for a population of 170, a sample of 120 would be adequate with the confidence level of 95% and a margin error of 5%. There is a pre-requisite for the correlation between Cronbach Alpha, sample size, effect size and power is a complex matter but the number of scores found can be considered (Hair, Black, Babin, & Anderson, 2009). Therefore, this study took a sample size of 113 to ensure these pre-requisites. Further, this study has applied Structural equation modeling (SEM) technique approach. This approach requires a larger sample size(Kline, 2010). Further (Barrett, 2007) suggest that articles originating from a sample size less than 200 have always been rejected. However,(Jackson, 2003) and Kline(2010) have given a rule of thumb for sample size suitable for using SEM, as N: q ratio (where N is the number of cases and q is number of statistical estimates). In this study 23*6= 138, respondents would be sufficient, however researcher followed Krejcie and Morgan (1970) schedule for sample selection.

Influential Factors Affecting Math Achievements in the Secondary Schools Functioning in Northern and Mountainous Part of Khyber Pakhtunkhwa, Pakistan

4.0 Results:

A total of 100 respondents returned the questionnaire in complete form, among these seventy (70%) were male, while the rest of 30 (30%) teachers were female. In terms of age, 6% respondents were ranging of age between 25 years to 30 years, while next 35% were between 31years to 35 years, another 41% were ranging between 36 and 40 years, and the remaining 18% were of age of more than 40 years. While their professional qualification was such that, 5% sample was Certified Teacher (CT), another 31%was having Bachelor of Education (B.Ed.), another 56% sample was having Master degree in education (M.Ed.),while 8% sample having M.Phil. Or others diploma in education. Among these 100 respondents in term of experience in education field, 3% sample was less than one year experience, 33% sample was 1-5 years' experience, 31% sample was 6-10 years' experience, 17% sample was 11-15 years' experience, 9% sample was 16-20 years' experience, 7% sample was more than 20 years' experience in education field. Among these 100 respondents in term of academic qualification, 1% sample was undergraduate, 24% sample was Graduate, and 67% sample was master's degree, while 8% sample was having higher degrees. Majority of the sample (67%) have master's degree with another 8% having even higher degree.

Table 4.1 shows the values of Skewness and kurtosis. Based on the values, all six factors of this study STC, PC, TC, GC, SCC and EBC are normally distributed.

Next the frequently used 'Kaiser-Meyer-Olkin' (KMO) measure of sampling appropriateness and 'Bartlett's Test' of Sphericity (Bartlett, 1950) was run to see that whether the sample size is fitting for factor analysis and the strength of the relationship among the variables is significant (Blaikie, 2003).

Table 4.2 displays value of KMO and value of p. Threshold value for the KMO should be >0.60 and value of p should be <.05(Kaiser, 1974). Both values (KMO=0.66, p=0.00) are up to the mark, showing that data is normal and fit for further analysis. Scree Plot is attached as appendix-B.

Analysis:

In order to analyze this relationship, structural equation model (SEM) was applied and the results of the proposed and estimated models are depicted in **Figure 4.1.** Before proceeding for

relationship analysis, it is mandatory in SEM to affirm the fitness of individual and overall measurement model. Results [CFI=.88, RMSEA=.07, Chi-sq/df=1.4] show that the overall model is fit for further analysis. Table 4.4 shows the results of hypotheses testing. Significant p-vale at 5% illustrates that various factors has a significant effect on math achievement (MAC) has while an insignificant p-value depicts that gender has no influence on math achievements of schools.

In order to have an in-depth analysis, the Pearson correlation test was conducted and the results are as in **Table 4.4**. Inter items correlations shows that there is high correlation between dependent variable MAC and independent variable STC(r=.718, p< 0.01) followed by a high correlation between variable MAC and SCC(r=.645, p< 0.01), chasing by a high correlation between MAC and TC(r=.632, p< 0.01), the last high correlation found between MAC and EBS(r=.513, p< 0.01). Looking towards the same correlation analysis it can be noted that there is a moderate correlation between MAC and PC(r=.461, p< 0.01), followed by a moderate correlation between MAC and GC(r=.455, p< 0.01). However, it is worthy to note that there is an insignificant relationship between independent variables.

This question was analyzed using SEM technique, results of standard multiple regression are presented in **Table 4.5,** Results displays such that p values are less than .05, strongly suggests that all the six exogenous variables (predictors) has a significant effect on the perceived math achievement. Showing that these factors affecting achievement in math subject. Refer **Table 4.5,** it is highlighted that parents cause (PC) has a significant effect (β=**4.81,** p=0.00) on math achievement. So it is the best predictor among all the six variables.

When sex(gender) was used as a demographic variable to be tested for moderation, then from SEM analysis in case of direct effect (**Table 4.6**) between MAC and six factors(STC, PC, TC, GC, SCC and EBC) the value of p (**0.17**) is greater than 0.05, which is not a significant value. This shows that gender does not affect the relationship between MAC and (STC, PC, TC, GC, SCC and EBC).

SEM-AMOS version 22 has been used to check that whether the proposed model fits the collected data. For model fitness, (Hair, Black, Babin, Anderson, & Tatham, 2009) suggested three type of fitness: Absolute fit, increment fit and parsimonious fit. All these three fitness tests have their own indices. But in contemporary study one index has been chosen from each

test to confirm the suggested model. To find absolute fit index, value of root mean square error of approximation (RMSEA) was checked, for the increment fit purpose, the value of comparative fit index (CFI) was checked, while for parsimonious fit, the value of chi-sq/df was checked, as shown in **Table 4.7** Along with its critical/ threshold values. All these statistical indices (In Table 4.7) suggest that the proposed model fits the data in this study.

5.0 Discussion:

Parents are not able to provide a hale and hearty educational environment due to lack of education. They cannot understand the prominence of education. Mostly the low mental level students suffer for this reason. Due to this problem student lacked behind in day to day affairs and causes of failure in examination (Kalhotra, 2013). While Thompson and Senk (2010) hypothesize that the influence of curriculum on student learning generally depends on how teachers ratify the curriculum in their own lecture theater. So teacher's style of teaching has an effect on the student's achievements. A Research study conducted by Ganyaupfu (2013) point out that merging mutually teacher-centered and student-centered instruction procedures is the best effective tactic that results best student outcomes. This study similarly recommends that teacher has a starring role in math success. Moreover, the specific textbook that a teacher uses for contents and methodology affect not only what schoolchildren pick up but also how they learn it (Stein et al., 2007).

Students' approach towards math and their faiths also affect success in math subject. Results of the present study also verify this reason for achievements in math subject. Students' attitude for having a command over math subject and their views also affect achievement in math subject (Ayob & Yasin, 2017).

There is a great relationship found between math achievement and examination's board sources. As sometime board print and provide ambiguous papers and there is no training for checkers for marking these papers, which is correspondingly a reason of below the mark achievement. There is a moderate relationship between parents cause (PC) and math attainment, Maloney et al. (2015) focused on why some students cannot be successful in mathematics courses. The researchers concluded that parent-student correlation influenced in the mathematics achievement certainly; conversely, further study displayed that if the parents feel anxious regarding math, then

in such cases pupils" mathematics success affected adversely. Moller, Mickelson, Stearns, Banerjee, and Bottia (2013) conveyed that mathematics achievement of schoolchildren are interrelated to school culture, race, socio-economic status (SES), and teacher's instructional culture and their mutual relationships. Contemporary study also affirms these factors.

Researchers recommend that demographic features affect intellect, attitude, choice making ability, and also the results (Johnson, Schnatterly, & Hill, 2013). Emerson Peteros et al. (2020) Study concludes that male and female learners have the similar level of self-concept when they try to learn mathematics. In some circumstances gender shows sound effects and in some circumstances it produces undesirable effects while there are circumstances like the present-day study where gender has no effect. Since respondents (teachers) of this study are employed in provincial Government schools, there is no difference found in job description, availing incentives or in supply of resources. This could be the straightforward reason why there was no exceptional effect of gender detected on the relationship between six exogenous variables/predictors (STC, PC, TC, SCC, GC, EBC) and MAC in this study.

Data collected from Khyber Pakhtunkhwa, province of Pakistan strongly support the proposed conceptual model. The existing study give the impression that step towards the self-development of education system of Pakistan indispensable. It is bring into being that the funds allocated every year for the education sector(2% of GDP) cannot be considered satisfactory to bring improvements; it does not accomplish even the existing necessary requirements(Pakistan, 2010). While Niqab, Sharma, Ali, and Mubarik (2015) highlighted that, "If Pakistani schools have to cope to the existing problems, they will need extraordinary educational leaders with extra ordinary leadership skills, such as interactive skills that have become an essential part of valuable leadership.p:35" If there are more talented, creative, enthusiastic and painstaking teachers available, as pointed out by Barney (1991), then the school is unquestionably proficient of improving its student achievements in the subject of math.

6.0 Conclusion:

This study has added more colours to the body of knowledge, portraying a guide line for the policy makers, educators, pupils, and examinations boards. Keeping in view the outcomes of this study it is recommended that there should be a regular check on the revision and publication of

text books. There is dire need of curriculum after a regular span of time. Examination boards should prepare error free papers, checkers should guide prior to marking the papers. Students should prepare themselves for arithmetical and geometrical problems as it belongs to day to day life. Parents should search for the sources to clear the concepts of their wards.

7.0 Recommendations:

This study has brought interesting results and are useful for future research in the field. Future researcher should find out other factors affecting math achievement in local context.

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Appendices

Table 4.1 Descriptive statistics (N=100)

Variable	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Students cause(STC)	1.80	6.60	4.25	1.03	-0.52	-.365
Parents Cause (PC)	2.00	6.67	4.60	1.20	-.237	-.835
Teachers Cause(TC)	1.80	6.80	4.03	1.10	.282	-.200
Government Cause(GC)	2.50	6.50	4.54	0.85	.027	-.231

School Cause(SCC)	1.75	6.50	4.43	1.22	-.282	-.883
Examination Body Cause(EBC)	1.00	7.00	4.19	1.50	-.060	-.601

Table 4.2: Normality Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	KMO=.662
Bartlett's Test of Sphericity	Approx. Chi-Square=57.11 df= 15, Sig= .000

Table 4.3: Hypothesis testing.

Effect	Variables	Beta estimates	S.E	C.R	P-Value	Result
Direct effect	MAC← gender	-0.29	0.21	-1.37	**0.17**	Insignificant

Table 4.4:Correlations between variables

	STC	PC	TC	GC	SCC	EBS	MAC
STC	1	.322**	.291**	.104 .303	.288**	.390**	.718**
PC	.322**	1	.062 .541	.132 .192	.113 .263	.127 .209	.461**
TC	.291**	.062 .541	1	.157 .120	.257**	.167 .098	.632**
GC	.104 .303	.132 .192	.157 .120	1	.261**	.109 .280	.455**
SCC	.288**	.113	.257**	.261**	1	.204*	.645**

	.263						
EBS	.390[**]	.127	.167	.109	.204[*]	1	.513[**]
		.209	.098	.280			
MAC	**.718**[**]	**.461**[**]	**.632**[**]	**.455**[**]	**.645**[**]	**.513**[**]	1

Note: $p^{**} < 0.01$, $p^{*} < 0.05$.

Table 4.5: Multiple regression weights

			Beta Estimates	S.E	C.R	p-value	Result
MAC	←	STC	4.63	.289	16.00	0.00	significant
MAC	←	PC	4.81	.203	23.66	0.00	Significant
MAC	←	TC	4.23	.187	22.64	0.00	Significant
MAC	←	GC	4.64	.118	39.19	0.00	Significant
MAC	←	SCC	4.68	.226	20.75	0.00	Significant
MAC	←	EBC	4.53	.294	15.39	0.00	Significant

Table 4.6: Direct effect for control variable sex (gender)

Effect	Variables	Beta estimates	S.E	C.R	P-Value	Result
Direct effect	MAC ← gender	-0.29	0.21	-1.37	**0.17**	Insignificant

Table 4.7: Model fitness measurements

Absolute fit			Incremental fit			Parsimonious fit		
Fitness index	Critical value	Test value	Fitness index	Critical value	Test value	Fitness index	Critical value	Test value
RMSEA	<0.10	0.07	CFI	>0.88	0.95	ChiSq/df	<5	1.4

Influential Factors Affecting Math Achievements in the Secondary Schools Functioning in Northern and Mountainous Part of Khyber Pakhtunkhwa, Pakistan
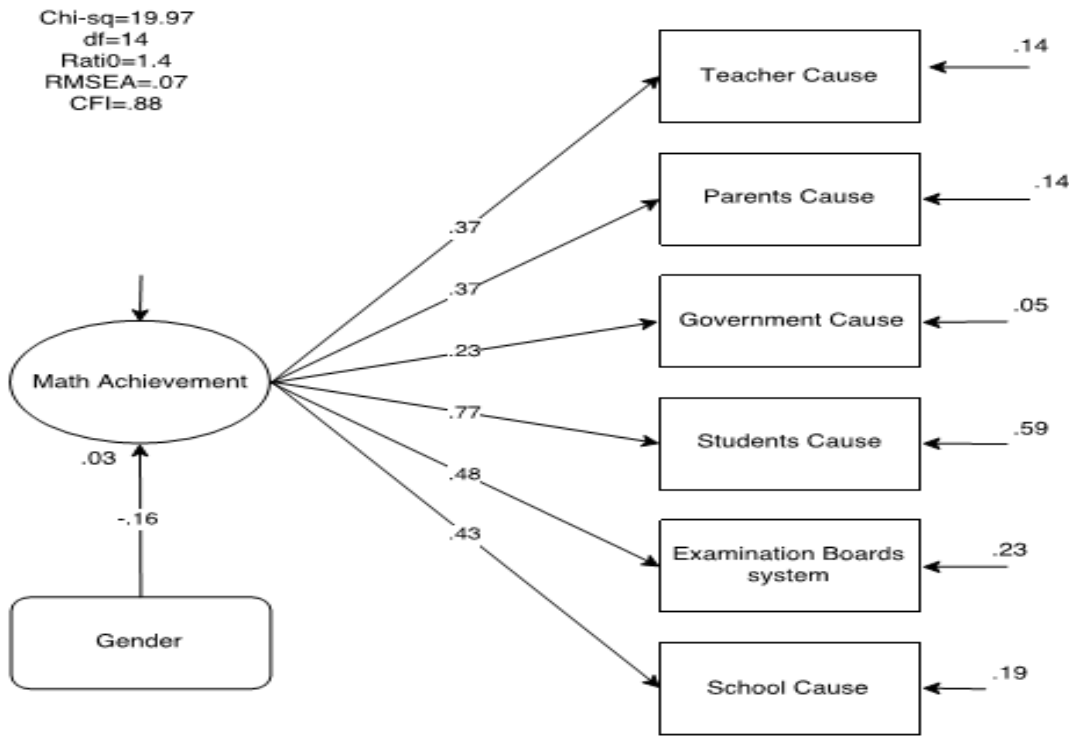

Figure 1: Proposed Moldel

Appendix-A

I am conducting a survey to find out different aspects of organizational learning capabilities of the secondary school teachers. You are invited to respond to the following items by keeping in view your school situation. Your response will be kept strictly confidential.

Respondent's code_____ Designation_____

Address of school_____

School Type   (Please tick (√) the relevant category).

Government ☐   Private ☐

Part-A

Teacher's Demography:

1) Sex: Male ☐   Female ☐
2) Age (Years):
   25-30 ☐   31-35 ☐   36-4 ☐   More than 40 ☐

3) Professional Qualification:
   C.T. ☐   B.Ed. ☐   M.Ed. ☐   Others ☐
4) Working Experience:

   Less than 1 Year ☐   1-5 years ☐   6-10 years ☐

   11-15 years ☐   16-20 years ☐   More than 20 years ☐

5) Academic Qualification:
   Undergraduate ☐   Masters ☐   Others ☐   Graduate ☐

Part-B

Factors Affecting Math Achievement (FAMA) at SSC Level
Instruction: *Please **circle** the number corresponding to the scale provided on the right of each statement that most closely matches your assessment for each item for the school in which you are posted.*

Students Cause (STC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
1	**STC1.**Students are not able to learn mathematics as it is taught in a language other than mother language.	1	2	3	4	5	6	7
2	**STC2**.Students have not enough time to practice math puzzles.	1	2	3	4	5	6	7
3	**STC3**.Students are unable to find a person who can clear their concepts regarding math.	1	2	3	4	5	6	7
4	**STC4.** Students do not take interest in learning mathematics.	1	2	3	4	5	6	7
5	**STC5.** Students do not complete their home work in the subject of mathematics.	1	2	3	4	5	6	7

Influential Factors Affecting Math Achievements in the Secondary Schools Functioning in Northern and Mountainous Part of Khyber Pakhtunkhwa, Pakistan

Parents Cause (PC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
6	**PC1.**Parents cannot sphere enough time to guide their wards.	1	2	3	4	5	6	7
7	**PC3.**parents are unable to hire a competent tutor for their wards.	1	2	3	4	5	6	7
8	**PC4.**parents do not search different sources to help their wards in learning mathematics.	1	2	3	4	5	6	7

Teachers Cause (TC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
9	**TC1.** Teachers are unable to cover mathematics course in due course of time.	1	2	3	4	5	6	7
10	**TC2.**Teachers do not take regular tests.	1	2	3	4	5	6	7
11	**TC3.**Teachers don not give encourage students to learn mathematics.	1	2	3	4	5	6	7
12	**TC4.** Teachers are unaware of the methods which are suitable for teaching of math.	1	2	3	4	5	6	7

13	**TC5.** Strategy adopted for teaching math is not appropriate.	1	2	3	4	5	6	7

Government Cause (GC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
14	**GC1.**courses are always developed according to the mental level of the students.	1	2	3	4	5	6	7
15	**GC2.**Sykllabus of math is very lengthy.	1	2	3	4	5	6	7
16	**GC3.**Review of the math syllabus rarely happen.	1	2	3	4	5	6	7
17	**GC4.**There is no refresher courses for teachers to train them to teach math effectively	1	2	3	4	5	6	7

School Cause (SCC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
18	**SCC1.**Over crowded classes is the main cause of failure in mathematics.	1	2	3	4	5	6	7
19	**SCC2**. Shortage of mathematics teachers is one of the cause of mathematics failure.	1	2	3	4	5	6	7

| 20 | **SCC3.** Environment of the school is not conducive to learn math. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21 | **SCC4.** There is no enough practice time in school to solve math puzzles. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Examinations Bodies Cause (EBC)

		Totally Disagree	Disagree	Somewhat disagree	Neither Agree nor Disagree	Somewhat agree	Agree	Strongly agree
22	**EBS1.** Ambigous papers is the major cause of failure in mathematics.	1	2	3	4	5	6	7
23	**EBS2.** Checkers of mathematics papers are mostly not experts.	1	2	3	4	5	6	7

Appendix-B

Scree Plot