Mental Ability, Academic Self-Concept and Scientific Attitude as Predictors of Pre-Service Teachers' Achievement in Basic General Mathematics in Oyo State, Nigeria

[1]Bolaji, O. A, [2]Ayanwoye, O. K., [3]Adesina, A. E., [4]Oyeniran, O. J., [5]Wahab, R. A.
General Studies Education Department
School of Education.
Emmanuel Alayande College of Education,
Oyo, Oyo State, Nigeria
[1]akinik1@yahoo.com,[2]ayanwoyeolubunmikayode@yahoo.com, [3]adexezek44@yahoo.com,
[4]oyeniranoj@yahoo.com, [5]wahabra@yahoo.com

ABSTRACT

Pre-service teachers in Oyo State, have been recording poor achievement in Basic Mathematics. Literature has identified attitude to Mathematics as a strong factor to students' performance in schools, dearth of research on the predictive and composite effects of factors influencing students' achievement in the course necessitated this study to investigate mental ability, academic self-concepts and scientific attitude as predictors of pre-service teachers' achievement in Basic Mathematics in Oyo State, Nigeria. Four hypotheses guided the study. An   ex-post facto design was adopted for the research using two thousand 200 Level pre-service teachers selected through random sampling technique. Four research instruments were developed and validated, namely: Students Mental Ability Test (SMAT, r = 0.83), Students Academic Self-concept Scale (SASCS, r = 0.79), Students Scientific Attitude Questionnaire (SSAQ, r = 0.81). MRA, t-test, Analysis of Variance were used to test the set hypotheses at 0.05 level of significance. The results indicated a significant composite contribution of the predictor variables on the dependent measure (F $_{(3, 1996)}$ $_=$ 19.994; R= 0.885; R^2 = 0.783; p < 0.05). The independent variables significantly predicted the students' attitude to Basic Mathematics with mental ability having higher predictive value (β = .517; t = 12.266; p < 0.05) followed by scientific attitude (β = .381; t = 6.940; p < 0.05) while students academic self-concept contribution had the least (β = .132; t = 2.821; p < 0.05). it was therefore recommended among others that mathematics lecturers should use eclectic teaching strategies that would increase students mental ability.

Keywords: *Mental ability, Scientific attitude, Academic Self-concept, Basic General Mathematics in Oyo State, Nigeria*

Introduction

Mathematics has been tremendously useful in many aspects of human activities. Mathematics started with an ordinary counting, much later, the idea of reckoning and computing developed, at a much later age, statement of arguments, proof of theorems and logic entered into it, this was how from little beginning and through slow but systematic development, one of the most useful intellectual discoveries of humankind came into existence and to be known and called MATHEMATICS. Looking through the aims of teaching Mathematics as reported by the National Committee (Nigeria) on Mathematics Education coupled with the National Education

Aims and Objectives, one will clearly point out the importance of Mathematics in general education. To achieve these aims, issues about the teaching and learning of Mathematics should be handled with seriousness. Mathematics teachers should create such a situation   that, students will cultivate the habit of learning Mathematics. Teaching and Learning of Mathematics all over the world, most particularly in the developing countries like Nigeria, has been of great concern to the generality of the people. This is not far from the fact that a number of events in the educational world have made people to realize the indispensable role that the knowledge of Mathematics can play in the life of every individual in the world today.

Salawu (2001) maintained that Mathematics is indispensable because it has substantial application in all subjects, more especially in science and Technology. This is responsible for the status of the subject as a core and compulsory subject for students of primary and secondary schools in Nigeria. Mathematics is a necessary tool needed to be able to function effectively in the present technological age, (Aremu, 1998). Fajemidagba (1991) stated that the teaching of Mathematics is very important to all human existence because Mathematics is all about finding solutions to problems. Studies (Alli and Anakwe, 1997; Olowojaiye, 1998) indicated the role that Mathematics can play in the study of other school subjects. Salawu, 2001 maintained that the depth of Mathematical knowledge of an individual dictates the post-secondary educational and career options one would take. The study of Mathematics is very important in virtually all aspects of human endeavors. In fact none of human endeavors can dissociate itself from Mathematical inclination. In the context of Science Education, Mathematics has been identified as a very important school subject whose importance in the scientific and technological development of any nation has been widely reported (Akinsola and Tella, 2001; Adeniran, 2006; Adedayo. 2007). Consequently, efforts have continuously been made to improve on its teaching and learning especially at the pre-service teachers' level so as to ensure a sound foundation for its teaching at all levels of education. The skills such students are expected to acquire are suppressed and this potent is not only a problem for the Nigeria educational system, but also deprives the nation of the reality of her vision 2020 objectives. To achieve these aims, the art, act, process etc. of teaching and learning of Mathematics should be handled with seriousness.

Despite the invaluable contribution of mathematics to the overall development of human beings, feelers from the Nigerian educational scene show that pre-service teachers' performance in mathematics examinations is poor. The poor performance of pre-service teachers' in mathematics has been attributed to many factors that include mental ability, academic self-concept, scientific attitude and poor quality of teaching and learning of the subject at the pre-service teachers' preparatory level which invariably have been held accountable for poor result turned in by the pre-service teachers' at examinations on yearly basis .This is affirmed by the report of 2011 to 2014 results of the pre-service teachers' in GSE 212 (Basic General Mathematics III) at Emmanuel Alayande College of Education, Oyo as shown in the tables below.

Table 1: 2011/2012 Pre-service teachers' performance in GSE 212

Schl.	No. Examined	No. of A's	No. of B's	No. of C's	No. of A's - C's	% of A's – C's	No. of D's	No. of E's	No. of F's	No. of D's – F's	% of D's – F's
Sc.	577	33	74	156	263	45.58	107	182	25	314	54.42
ASS	377	31	61	79	171	45.36	68	102	36	206	54.64

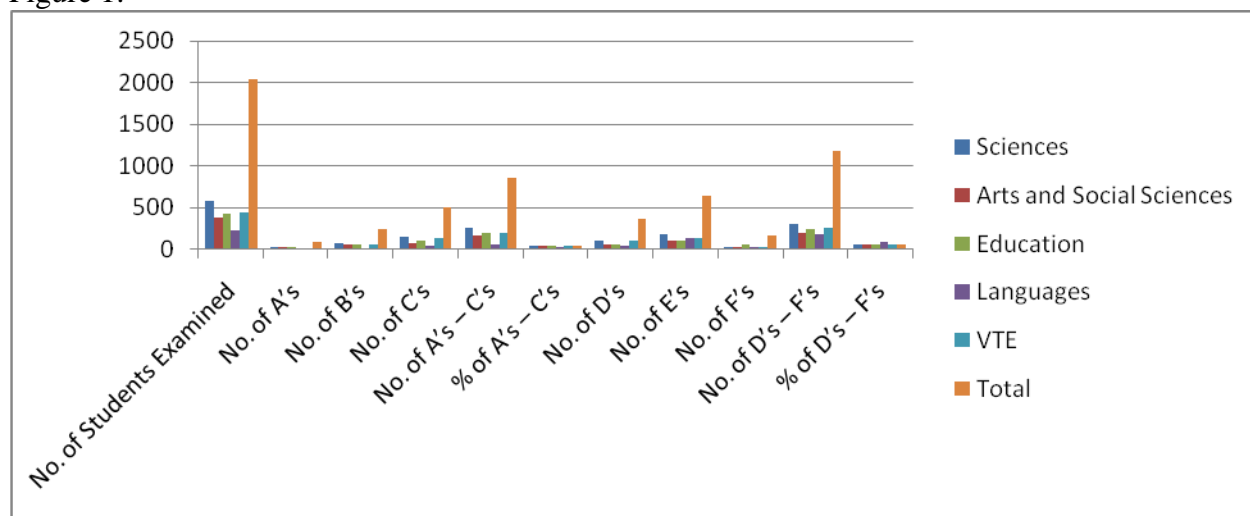| Edu. | 435 | 25 | 59 | 108 | 192 | 44.14 | 69 | 113 | 61 | 243 | 55.86 |
Lang	213	1	8	35	44	20.66	30	117	22	169	79.34
VTE	442	9	48	135	192	43.44	97	130	23	250	56.56
Total	2044	99	250	513	862	39.83	371	644	167	1182	60.17

Figure 1:

Table 2: 2012/2013 Pre-service teachers' performance in GSE 212

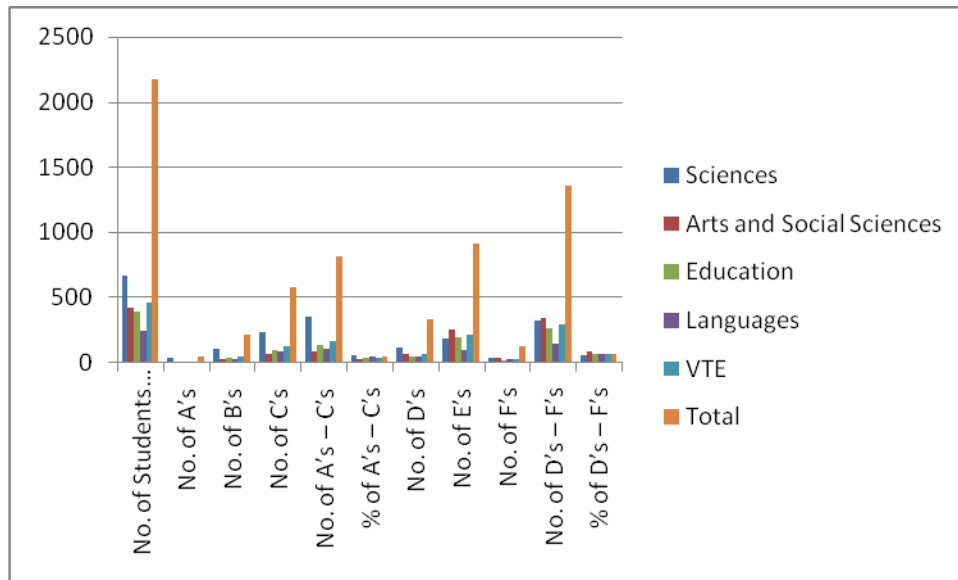| Schl.	No. Examined	No. of A's	No. of B's	No. of C's	No. of A's – C's	% of A's – C's	No. of D's	No. of E's	No. of F's	No. of D's – F's	% of D's – F's
Sc.	660	25	95	223	343	51.97	108	177	32	317	48.03
ASS	417	2	19	57	78	18.71	62	246	31	339	81.29
Edu.	394	6	31	93	130	32.99	50	196	18	264	67.01
Lang.	243	1	22	78	101	41.56	40	85	17	142	58.44
VTE	455	2	40	121	163	35.82	64	206	22	292	64.18
Total	2169	36	207	572	815	36.21	324	910	120	1354	63.79

Table 3: 2013/2014 Pre-service teachers' performance in GSE 212

Sch.	No. Examined	No. of A's	No. of B's	No. of C's	No. of A's – C's	% of A's – C's	No. of D's	No. of E's	No. of F's	No. of D's – F's	% of D's – F's
Sc.	703	6	53	204	263	37.41	89	328	23	440	62.59
ASS	506	12	47	94	153	30.24	81	247	25	353	69.76
Edu.	188	4	12	68	84	44.68	48	37	19	104	55.32
Lang.	189	0	12	49	61	32.28	36	75	17	128	67.72
VTE	455	2	40	121	163	35.82	64	206	22	292	64.18
Total	2041	24	164	536	724	36.09	318	893	106	1317	63.91
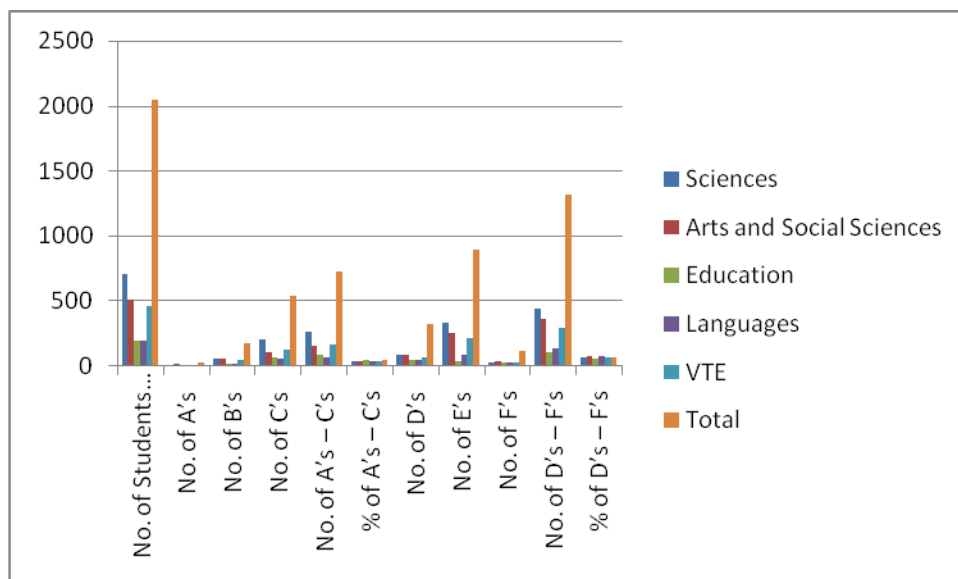
The results in Tables 1 – 3 reveal that in each of the three consecutive years, less that

46% of Pre-service teachers who sat for the Examination passed at credit level, while those below average performance were not less than 50%. The small number of Pre-service teachers who got credit scores throughout the three years under consideration, poses a challenge to teachers and other stakeholders in the teaching and learning of the subject to intervene in order to curb the trend of poor academic performance. The implications of such poor results are that, if the negative trend continues, the nation will lack teachers who will possess the required knowledge and skills in mathematics that will qualify them to teach mathematics efficiently both at basic and secondary schools.

The difficulty experienced in the learning of Mathematics is traceable to the way mathematics teachers present the subject to the pupils, it need be borne in mind that one can only give what one has, the internalization and hence the understanding of Mathematics require the concerted effort of competent teachers that have what it takes to really teach. Mental ability, academic self-concept and scientific attitude of the pre-service teachers are therefore considered as the major predictors of pre-service teachers' achievement in basic general mathematics in colleges of education in the southwest, Nigeria.

Onabanjo (2007) states that mental ability is related to mental perception, capacity for abstract thinking and capacity to recognize patterns in things. It is also related to sequence and order in nature, and ability to do logic and interpret data, culminating in the production of useful information. She further affirmed that different topics in Science and Mathematics require different abilities such as: Ability to form Mathematical gestalts, Ability to perceive formalized mathematical materials; Ability to relate general modes of description to concrete situations; Spatial ability; Ability to comprehend and construct complex structure; Ability to perceive details embedded in irrelevant material "perceptional speed", Ability to get information and understand the properties of given objects ''cognition''; Ability to arrange element in a visual structure; Ability to draw conclusions to reason logically; Ability to perceive a problem as a generation of a problem already solved; Ability to decode on how given information should be treated "evaluation"; Ability to synthesize or separate data-''globalization; Ability to assess adequately varied information.

All these skills are necessary for would-be efficient teachers which ought to be imbibed in teacher preparation programmes. Thus, for effective understanding of various topics or concepts in Mathematics, mental abilities in listed above are quite essential. L'eson, Clarrochi and Heaven (2008) correlated cognitive (mental) ability, personality and academic performance in adolescents, adopted path analysis design, involving six hundred and thirty nine high school students in a longitudinal study. Three validated research instrument were used for data collection while collected data were subjected to structural equation model (SEM). The results indicated significant paths from cognitive ability (mental) on student academic performance.

Aremu and Tella (2009) investigated the relationship between gender, age, mental ability, anxiety, mathematics self-efficacy and achievement in secondary school mathematics, adopted an ex-post facto study involving 1099 ss2 students in the research, five validated research instruments for data collection, collected data analysed using Pearson product moment correlation and multiple regression analyses [step wise]. The result showed a weak positive relationship between students mental ability and achievement in secondary school mathematics.

Veltmann, Raudfepp and Pullmann (2011) predicted general mental ability on achievement in mathematics adopting an export factor design involving 969 adolescents in the study and two validated research instruments. The collected data were analysed using spearman

rank order correlation, regression analysis. Results revealed that mental ability correlated significantly with students' achievement in mathematics and that general mental ability predicted significantly adolescents' achievement in mathematics.

Vock, Preckel and Holling (2011) determined relationship between mental abilities and schrool achievement adopting path analysis design, involving 1135 adolescents in grades seven to ten, administered a comprehensive test battery on the subject of the study, the structural equation modeling was used for data analysis. The results showed that mental speed and short-term memory as ability factors reflecting basic cognitive processes exert an indirect significant on academic achievement by affecting reasoning and divergent thinking and that short term memory also directly affects students achievement

Sangodoyin (2011) found students' mental ability to have significant effect on achievement in Biology as students with high mental ability performed better than those with low mental ability. Banglog and Tabords (2010) worked on influence of mathematical competency, mental ability and experience in procedural programming (C++) on the performance of BSIT freshmen and sophomore students in object-oriented programming (Java). Among all the variables in the study, mental ability alone was found to have significant relationship with the performance of the respondents in Java programming. Olatoye and Aderogba (2011) determined the role of students' verbal and numerical abilities on performance of senior secondary school science students in aptitude tests. Two hundred senior secondary school science students participated in the study using three validated research instruments to collect data and regression analysis tool for data analysis. Findings revealed an existence of a strong correlation between students' numerical or mental ability and overall students' performance.

Oyedeyi (2011) studied the predictive effects of mathematics skills on students' achievement in science in junior secondary schools. A sample of 500 students was randomly selected from 10 junior secondary schools (JSS 3) in Benin metropolis, Edo State, Nigeria. The research adopted a Mathematics Test titled: "Test of Mathematics skills" and the subjects' mock scores in science and the regression analysis revealed significant correlations between the mathematics skills and science achievement.

Olagunju, Duyilemi and Adesina (2013) in an ex-post facto study titled 'the relationship between pre-service teachers' attitudes, self-concept, mathematics mental ability and knowledge of agricultural economics in selected Nigerian Colleges of Education' involved one hundred and fifty 200 Level Agricultural Education students selected through stratified random sampling technique. Four validated research instruments and linear regression analysis was also used for data analysis. The results showed that mental ability predicted significantly the pre-service teachers' knowledge of agricultural economics.

In a related study, Duyilemi, Olagunju and Adesina (2014) conducted a study on 'pre-service teachers' variables as determinants of their skills in agricultural economics: A case study of two colleges of education in Oyo State, Nigeria.' An ex-post facto type of causal-comparative research design was adopted using one hundred and fifty 200 Level Agricultural Education students selected through stratified random sampling technique from two colleges of education, four validated research instruments, linear regression analysis to analyze collected data. The results showed that the pre-service teachers' mental ability significantly predicted the students' agricultural economics skills.

Quite a number of definitions exist for self concept which is synonymously used as self

regard, self-esteem and self-efficacy. It is the confidence in one's own worth or abilities. (Ahmed and Bruinsma, 2006). Areepattamannil and freeman (2008) described self concept as one dimensional construct i.e. the global self concept while researchers like Shavelson; Hubner and Stanton (1996), Kumar (2001), Ahmed and Bruinsma, 2006) propounded that self concept consist of academic and non academic self concept . it was observed that although global self concept is important in an academic context, academic self concept is found a better predictor of academic achievement.

Academic self concept is the overall self perception of the individual in an academic context. It comprises a set of attitude, believe and perceptions held by the students about their academic skills and performance. A high academic self concept has been associated with better academic achievement (Olagunju, Duyileme, and Adesina, 2013). Educators according to Puricey in Loise, 2011 need to understand and appreciate the importance of self concept in education in affirmation of the fact that a strong relationship exist between self concept and academic achievement and suggests strongly that self concept can no longer be ignored by parents and teachers. It is however important according to Dambudzo (2009) to investigate the relationship between self concept and academic achievement in order to rescue those students who are victims of their own negative believe about themselves. This is in view of the fact that self concept is a valuable educational objective which can help in improving other learning outcomes (Olatoye, 2006). He emphasized further that students should be counseled on the fact that their academic achievement may not be an expression of their abilities alone but also of the perceptions of their abilities which may help them to feel confident and able but when negative, cause them to feel hesitant and uncertain. The above fact is supported by Adams, 1978 in Arowolo (2007) when he identified that self concept mirrors past achievement of the student in relation to successes and failures.

Sanchez and Roda (2003) conducted a study on 245 primary school students in Spain and established that academic self concept powerfully and positively predict both general achievement in Sciences, Mathematics, Languages and the Arts. They also found out that non-academic self-concept like body color and body image negatively predict school achievement. A significant correlation between academic achievement self concept was also established in a quantitative study done by Sikhwari (2004) on 200 randomly selected second year students at the university of Venda. Bolaji (2015) investigated mental ability, academic self concepts and attitude as predictors of secondary schools students' achievement in basic science in Oyo state, Nigeria. Two research questions and two hypotheses guided the study and an ex-post facto research design was adopted, using seven hundred and twenty (720) J.S.S two students selected through random sampling technique. Four research instruments were developed and validated. Multiple regression analysis was used to test the set hypotheses at 0.05 level of significance. The results indicated a significant composite contribution of the predictor variables on the dependent measure. All the three independent variables significantly predicted students' academic achievements in basic science with mental ability making the highest predictive value, while student's academic self concept and attitude equally and significantly contributed to the students' achievement in basic science.

Kaba and Talek (2015), Liu and Wang (2005) as well as Olagunju, Duyilemi, and Adesina (2013) all conducted various studies on academic self concept and students academic achievement and their results showed that academic self concept is positively related to students academic achievement. Conversely, Trusty et al (1996) investigates on 563 African- American

elementary learners. The study revealed that school- related self concept did not account for significant amount of variability in achievement test scores. Similarly, in a study conducted by Areepattamannil and Freeman (2008) on 573 grade II and 12 students from two   public secondary schools in greater Toronto area, they found only to moderate correlations between academic self concept and academic achievement variables for both the non- immigrant groups.

Attitude, another variable of the study, entails an existing predisposition to respond to social objects or issues that guide and direct the avert behavior of an individual. It is an enduring predisposition that makes individual behaves in a consistent way towards a given object. Attitude is a degree of positive or negative feeling or effect associated with psychological objects, symbols, ideas, persons, groups towards which people differs, Bandura (1986) demonstrated that attitudes (behaviours) are acquired by watching others (the models, teacher, parent, mentor, friend) that performs the behavior. The model displays it and the learner observes and tries to imitate it. Teachers are invariably the role models whose behaviours are easily copied by students. What teachers like or dislikes, appreciates and how they feel about their learning or studies could have a significant effect on their students.

Unfortunately, however, many teachers seldom realize that how they teach, how they behave and how they interact wish students can be more paramount than what they teach. In a nutshell, teachers' attitudes directly affect students' attitudes, teachers attitudes are in turn influenced by their culture, belief system and experiences. Teachers' attitudes towards their students in school must be favourable enough to carry students along. When the learner exhibits the expected behavior or response the value attached determines very significant the effectiveness of the learning process in any aspect of education. Igwe (2002), Olagunju, Duyilemi and Adesina (2013), Okebukola (2013), Duyilemi, Olagunju and Adesina (2014); Babayemi (2014), Adesina (2015), Bolaji (2015) stipulated that for teaching and learning of science to be interesting and stimulating, there has to be motivation on the part of both the teacher and the learner along supportive enabling environment so as to ensure the development of positive attitude and subsequently maximum academic achievement.

Hussain, Alam, Bukhari, Ahmad (2011) designed a study to investigate the effectiveness of scientific attitude toward physics teaching through inquiry method versus traditional teaching lecture method of female student at secondary school level in Pakistan. One hundred and twenty (120) female science students in grade 9 were selected from two schools into experimental and control treated with instructional strategies for twenty-two weeks using equivalent group quazi experimental design, Scientific Attitude Test was used for data collection, analysed using SPSS 16.0 software with mean, standard deviation and t-test statistical tools. The experimental group shows better scientific altitude to physics than the control group. Narmadha and Chamundeswari (2013) investigated attitude towards learning of science and academic achievement in science among students at the secondary level involving 422 validated instrument titled Attitude toward Learning of Science Scale. The collated data were subjected to statistical tools of mean, standard deviation, t-test, F-ratio, Pearson product moment correlation co-efficient . The findings revealed a positive correlation between attitude towards learning science and academic achievement in science among the students.

Olasehinde and olatoye (2014) examined scientific attitude, attitude to science and science achievement of senior secondary school students in Kastina State, Nigeria adopting the descriptive survey research design. Random sampling technique was employed to select 204senior secondary school from the three geographical zones of the state. Three validated

instruments viz: Scientific Attitude Questionnaire (SAQ); Attitude To Science Questionnaire (ASQ) and Science Performance Test (SAT) were used for data collection. Data were analysed using multiple regression, linear regression, Pearson product moment correlation and t-test. Findings revealed that scientific attitude accounts for 0.06%of total variance in scientific achievement.

Muckhopadyay (2014) reviewed literature on scientific attitude some psychometric consideration identifying scientific attitude as an important factor among several determinants of achievement in science. The study did contextual difference between attitude to science and scientific attitude using the various operational dimensions of the constructs with reference to detailed review of related literature emphasising on scientific attitude of secondary school learners and different available validated tools to measure scientific attitude with sound psychometric basis and suitable for further research were identified.

Statement of the Problem

Baseline data revealed that pre-service teachers in colleges of education have low level of achievement in Basic General Mathematics in Oyo State, Nigeria. This poor achievement in Basic Mathematics has strong potency to engender negative attitude to the subject, delimit the rate of use of Mathematics concepts and tools in their respective field of study which invariably produces low scientific and technological manpower and a resultant effect on dwindling social and economic development in the state and nation at large. Research findings have continued to indicate that students' psycho-cognitive attributes like scientific attitude, academic self-concept and mental ability have significant influence on general achievement of students in schools. These three variables have not been jointly investigated to determine their predictive effect on pre-service teachers Basic Mathematics achievement in Colleges of Education in Southwest, Nigeria. Gender issues remain paramount in the world of research likewise the pre-service teachers schools of studies. Therefore, this study investigated mental ability, academic self-concept and scientific attitude as predictors of pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria. It equally assessed the effects of gender and school type on pre-service teachers' achievement in the course.

Hypotheses

Based on the problem stated above, the study tested the following hypotheses at 0.05 level of significance:

Ho 1: There is no significant composite effect of mental ability, academic self-concept and scientific attitude on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria;

Ho 2: There is no significant relative effect of mental ability, academic self-concept and scientific attitude on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria;

Ho 3: There is no significant effect of gender on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria;

Ho 4: There is no significant effect of school type on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria.

Methodology

It adopted an ex-post facto design. As all the independent variables-mental ability, academic self-concept and scientific attitude and the dependent measure- pre-service teachers'

achievement in Basic General Mathematics were already at the field for collection without experimental manipulation. (Lelinger, 2000; Abimbade, 2011; Singh, 2013).

Population and Sample of the Study

The population of the study comprises all the 200 Level public pre-service teachers in Colleges of Education in the Oyo State, Nigeria. Cluster random sampling technique was used to proportionately select the subject of the study from male and female categories and the five schools. Hundred pre-service teachers were selected from each cluster totaling two thousands (2000) sample size.

Table 2.0: Proportionate Sample Selection for the Study

Arts & Social Sciences		Early Childhood Care & Primary Education		Languages		Sciences		Vocational & Technical	
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
100	100	100	100	100	100	100	100	100	100

Instrumentation

Four instruments were used for the study. These are:
i. Students Mental Ability Test (SMAT);
ii. Students Academic Self-concept Scale (SASCS);
iii. Students Scientific Attitude Questionnaire (SSAQ);
iv. Pre-service Teachers' Achievement Scores in Basic General Mathematics III (PTASBGM).

Students Mental Ability Test (SMAT) was adapted from OTIS-LENON (1967) which was used by Aina (2006). It contains 30 items multiple choice with 4 options, one correct option (stem) and three distracters for each item. Sixty of the instruments were administered on pre-service teachers in the college of Education in the North Central part of the country to determine the difficulty level and instrument reliability. Twenty (20) items with difficulty indices of 40% - 70% were selected for the study. Kuder-Richardson 20 (KK-20) yield 0.83 for the test internal consistency.

Students Academic Self-Concept Scale (SASCS) has 20 items adopted from Liu and Wang's Academic Self-concept Scale (2005). It is a 4–likert scale type with possible response of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The positively worded items will be scored 4, 3, 2, 1 for SA, A, D and SD respectively, and the reverse scores for negatively worded items. The instrument was subjected to Cronbach's Alpha reliability measure yielding 0.79 value.

Students Scientific Attitude Questionnaire (SSAQ) is a 20 – item instrument adapted from Zubair and Nasir (2011) Attitude towards Science Learning (AtSL). It was administered on sixty (60) pre-service teachers in college of education at North Central part of the country. The collected data was subjected to Cronbach's Alpha reliability measure yielding a value of 0.81.

Pre-service Teachers' Achievement Scores in Basic General Mathematics III (PTASBGM) were collected from the Centre of Management Information System (CMIS) of each sampled institutions.

Procedure for Data Collection

The researchers and their assistants went to those sampled colleges of education to administer the three research instruments on two thousand (2000) pre-service teachers. They equally collected the achievement scores of these students in Basic General Mathematics III. The administered instruments were retrieved on the spot to ensure its hundred percent collections.

Method of Data Analysis

Socio-demographic attributes of the respondents will be presented in tables of frequency counts and percentages. Multiple regression analysis was used to predict the composite and relative effects of the independent variables on the dependent measures in hypotheses 1 and 2. t-test and Analysis of Variance (ANOVA) were used to determine the effects of gender and school type on pre-service teachers' achievement in Basic General Mathematics III in hypotheses 3 and 4.

Results

Hypotheses Testing

Ho₁:"There is no significant composite effect of mental ability, academic self-concept and scientific attitude on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria"

Table 4: Regression Analysis of Mental Ability, Academic Self-concept and Scientific Attitude on Pre-service Teachers' Achievement in Basic General Mathematics

Source of Variation	Sum of Square	Df	Mean Square	F-ratio	Sig.	R	R^2
Regression	1909.767	3	636.589				
Residual	63550.644	1996	31.839	19.994	0.020	0.885	0.783
Total	65460.411	1999					

From table 4.0, it could be observed that the composite effect of mental ability, academic self concepts and scientific attitude on pre-service teachers' achievement in Basic General Mathematics is significant ($F_{(3,1996)} = 19.994$; $p < 0.05$). Also from the table, there is a positive prediction of mental ability, academic self concepts and scientific attitude on pre-service teachers' achievement in Basic General Mathematics (R = 0.885). It also revealed that the three predictor (independent) variables can determine students' achievement in Basic General Mathematics ($R^2 = 0.783$) as the students' mental ability, academic self concepts and scientific attitude jointly accounted for 78.3% of the variance in the dependent measure (achievement in Basic General Mathematics). The remaining 21.7% could be due to other factors that were not considered in the study.

Ho₂: "There is no significant relative effect of mental ability, academic self-concept and scientific attitude on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria"

Table 5: Relative Effects of Mental Ability, Academic Self-concept and Scientific Attitude on Pre-service Teachers' Achievement in Basic General Mathematics

Independent (Predictors) Variables	Unstandardised Coefficient		Standardised Coefficient	Rank	T	Sig.
	B	Standard Error	Beta			

(Constant)	74.202	11.791				
Mental Ability	.531	.066	.517	1st	12.266	.001*
Academic Self-concepts	.386	.132	.262	3rd	2.821	.040*
Scientific Attitude	.407	.073	.381	2nd	6.940	.003*

From table 5.0, out of the three variables, students mental ability made the greatest contribution to pre-service teachers' achievement in Basic General Mathematics (β = .517; t = 12.266; p < 0.05), followed by scientific attitude (β = .381; t = 6.940; p < 0.05), then academic self-concept (β = .262; t = 2.821; p < 0.05). From the results in Table 5, it could be identified that the three independent variables can be used to predict significantly students' attitude to Basic Science.

Ho3: 'There is no significant effect of gender on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria'

Table 6: t-test Analysis of Difference in Pre-service Teachers' Achievement in Basic General Mathematics based on Gender

Gender	N	Mean	SD	Df	t-cal	Sig.	Remarks
Male	1000	52.859	13.283	1998	2.093	.055	NS
Female	1000	53.107	9.629				

Table 6 showed that the difference in pre-service teachers' achievement in Basic General Mathematics based on gender is not significant (t- cal = 2.093; df = 1998; p > 0.05). Therefore, Ho3 is not rejected.

Ho4: 'There is no significant effect of school type on pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria

Table 7: Analysis of Variance of Difference in Pre-service Teachers' Achievement in Basic General Mathematics based on School Type

Source of Variation	Sum of Square	Df	Mean Square	F- ratio	Sig.	Remarks
Between Groups	96947.592	3	32315.864			
Within Groups	1735196.652	1996	869.337	37.173	.002	*S
Total	1832144.244	1999				

From Table 7, the difference in pre-service teachers' achievement in Basic General Mathematics is significant ($F_{(3, 1999)}$ = 37.173; p < 0.05). Therefore, Ho4 is not accepted.

Schools	Mean scores	ASS	ECCPED	LANGUAGES	SCIENCE	VTE

ASS	53.008			*	
ECCPED	54.318			*	
LANGUAGES	51.164				
SCIENCE	63.427	*	*	*	*
VTE	57.059	*	*	*	

From the Duncan post-hoc analysis above, the significant difference in pre-service teachers' achievement in Basic General Mathematics is as a result of differences in the pre-service teachers' achievement across the schools. Pre-service teachers in school of science differ significantly from the other four schools followed those in Vocational and Technical (VTE), Early Childhood Care Primary Education (ECCPED), Arts and Social Sciences (ASS), while those in Languages had the least mean score.

Discussion

Based on the findings of this study on mental ability, academic self-concept and scientific attitude as predictors of pre-service teachers' achievement in Basic General Mathematics, the results on hypothesis one shows that there is significant composite effects of the predictor variables on the dependent measure. Mental ability, academic self-concept and scientific attitude significantly and jointly determined and predicted pre-service teachers' achievement in Basic General Mathematics. This result corroborates Oyedeyi (2011), Olatoye and Aderogba (2011), Sanchez and Roda (2003), Damprongpanit (2009), Olagunju, Duyilemi and Adesina (2013), Komolafe (2014) that found each of the independent variable as strong predictors of students achievement in science. Mental ability is a crucial ingredient of academic excellence in schools as it determines students' mental perception, capacity for abstract thinking, capacity to recognize patterns in things, sequence and order in nature, do logic and interpret data and production of useful information (Onabanjo, 2007). Students' strength or weakness in mental ability is a strong signal to extent of achievement in Mathematics.

Additionally, the second predictor variable, academic self-concept equally has significant and positive relationship with the pre-service teachers' achievement in Basic General Mathematics. It follows the axiom that "as a man thinketh so man becomes". Thus, as students think about their academic ability, their self-regard as well as self-estimation on pre-service teachers' achievement in Basic General Mathematics strongly determined their achievement in the subject. The result is not unexpected for the fact that a subsumed construct under self-concept is the attitude of the students. (Sanchez and Roda, 2003; Sikhwari, 2004; Damrongpanit, 2009; Olagunju, Duyilemi and Adesina, 2013). This finding was in variance with the conclusion of Trusty et al (1996) and Baadjies (2008) that found no significant correlation between self-concept and students' learning outcomes.

The pre-service teachers' scientific attitude significantly predicted their' achievement in Basic General Mathematics. The students' behaviour, likes, dislikes and mental disposition are strong precursors of their achievement in Basic General Mathematics. When the learner exhibits the expected behavior or response the value attached determines very significantly the

effectiveness of the learning process in any aspect of education. This findings found supports in Hussain, Alam, Bukhari, Ahmad (2011), Olagunju, Duyilemi and Adesina (2013), Okebukola (2013), Duyilemi, Olagunju and Adesina (2014); Babayemi (2014), Olasehinde and olatoye (2014), Muckhopadyay (2014),   Adesina (2015), Bolaji (2015) that stipulated that for teaching and learning of science to be interesting and stimulating, there has to be motivation on the part of both the teacher and the learners along supportive enabling environment so as to ensure the development of positive attitude and subsequently maximum academic achievement.

Conclusion

This study investigated mental ability, academic self-concept and scientific attitude as predictors of pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria. From the tested hypotheses, it can be concluded that students' mental ability, academic self-concepts and scientific attitude are significant predictors of pre-service teachers' achievement in Basic General Mathematics as the independent variables jointly determined up to 78.3% of the pre-service teachers' achievement in Basic General Mathematics in Oyo State, Nigeria.

Furthermore, each of the predictor variables significantly contributed to the dependent measure meaning that the students' mental ability, academic self-concepts and scientific attitude ought to be consciously developed to facilitate improvement in the pre-service teachers' achievement in Basic General Mathematics which invariably enhances their academic achievement.

Recommendations

Based on the findings of the study, the following recommendations are adduced:

1. Teachers should use eclectic strategies of teaching Basic General Mathematics to stimulate positive scientific attitude, academic self-concepts and mental ability of the students in the subject.
2. Government to motivate teachers to go extra mile in developing the mental ability of their students, psyche their thinking process, especially teachers with high level of commitment to the profession;
3. Government to refurbish schools with modern gadgets like computers and internet facilities to enhance improved service delivery at the secondary schools which in turn enhance students self-concept, mental ability, attitude to Basic Science and invariably better achievement.

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