

PREDICTORS OF STUDENTS' ATTITUDE TOWARDS MATHEMATICS IN OBIO-AKPOR LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA

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ABSTRACT: *The study investigated predictors of students' attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State Nigeria. Three research questions and three hypotheses guided the study. The study adopted a correlational design. A sample of 350 senior secondary students was drawn from the population through stratified proportionate random sampling technique. The four instruments used for data collection were Mathematics Self-concept Questionnaire (MSCQ), Mathematics Self-Efficacy Scale (MSES), Teachers Competency Questionnaire (TCQ) and Attitude Towards Mathematics Inventory (ATMI) which were validated by experts in measurement and evaluation. The reliability coefficients of MSCQ, MSES, TCQ and ATMI were 0.75, 0.87, 0.80 and 0.85 respectively which were determined through Cronbach alpha technique for internal consistency of the instruments. Linear regression analysis was used to answer the research question while the t-test associated with the regression analysis was used to test the hypotheses at 0.05 alpha level. The results revealed that mathematics self-concept, mathematics self-efficacy and teachers' competency significantly predicted students' attitude towards mathematics. These results and their implications were discussed. Among other things, it was recommended that teachers and counsellors should enlighten the students more on mathematics self-concept and self-efficacy which will guide them in having positive attitude towards mathematics. Also mathematics teachers should continue to practice the use of different approaches and techniques in the teaching of mathematics concepts and principles.*

KEYWORDS: Students' attitude, self-concept, self-efficacy, teachers' competencies and Mathematics

INTRODUCTION

Mathematics is the oldest of all sciences that have developed through the ages having a direct impact on the quality of human life on our planet. It is unanimously agreed that mathematics is the language of science and technology and also in some other disciplines like art and culture. It holds

the key to development and progress of the country as well as humanity as a whole. The mathematics is a backbone of students to achieve and develop the skill in reasoning and thinking level Mathematics is a science of magnitude and number that is very useful virtually in all subject areas. This is because all fields of studies are dependent on it for problem solving and prediction of outcomes. Competency in mathematics learning is vital to any individual and nation in domestic and business deals, scientific discoveries, technological breakthrough, problem-solving and decision making in different situations in life. The knowledge of mathematics is an essential tool in our society. It is a tool that can be used in our daily life to overcome the difficulties faced.

Akinoso (2011) viewed mathematics as the basis for science and technology and the tool for achieving scientific and technological development. It may be in consideration of these and other vital usefulness of mathematics that Federal Government of Nigeria made it a core and compulsory subject at all the levels of 9-3-4 system of education in Nigeria as contained in the National Policy on Education (F.R.N., 2004) which still remains the rallying point for all educational objectives in Nigeria. Due to this mathematics has been considered as one of the most important core subject in a school curriculum. More mathematics lessons are likely to be taught in schools and colleges throughout the world than any other subject (Orton, Orton, & Frobisher, 2004). However, the standard tests and evaluations reveal that students do not perform to the expected level. The student under achievement in mathematics is not just a concern for particular countries, but has become a global concern over the years (Pisa, 2003). Despite its great importance, it is the only subject that is most dreaded to learners among all subjects offered in schools (Ashcraft and Faust, 1994; and Akinoso, 2011). Students therefore tend to respond to it with less self-confidence, negative feeling and anxiety. This situation is worsened by the compulsory nature of the subject at primary and post primary schools levels, leading to students' poor performance in the subject.

Attitude towards mathematics plays a crucial role in the teaching and learning processes of mathematics. It affect students' achievement in mathematics. The teaching method, the support of the structure of the school, the family and students' attitude towards school affect the attitudes towards mathematics. Usually, the way that mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from mathematics (Barton, 2000; Furinghetti & Pekhonen, 2002). Attitude as a learned predisposition or tendency of an individual to respond positively or negatively to some object, situation, concept or another person. This positive or negative feeling is of moderate intensity and reasonable stability; sometimes it is especially resistant to change. In the variety of definitions of attitudes towards Mathematics (ATM) proposed in research studies, two main categories can be identified. Using a simple definition, ATM is just a positive or negative emotional disposition towards Mathematics (McLeod, 1994). Using a multidimensional definition, ATM comprises three components: an emotional respond to Mathematics, positive or negative, a conception about Mathematics, and behavioral tendency with regard to Mathematics (Hart, 1989). Mathematics education researchers have taken the relationship between attitude towards mathematics and achievement in mathematics as a major concern in their research work.

Attitude is a central part of human identity. Everyday people love, hate, like, dislike, favour, oppose, agree, disagree, argue, persuade. Attitudes develop and change with time (Rubinstein, 1986). According to Multicomponent model of Attitude (Eagly & Chaiken, 1993); attitudes are

influenced by three components. They are cognitive (beliefs, thoughts, attributes), affective (feelings, emotions) and behavioral information (past events, experiences). When reviewing literature on students' attitude towards mathematics, it reveals that several factors play a vital role in influencing students' attitude. These factors can be categorized into three distinctive groups. Firstly, factors associated with the students themselves. Some of these factors include students mathematical achievement score (Kogce, Yildiz, Aydin & Altindag 2009) students' self-efficacy and self-concept, and experiences at high school (Klein, 2004; Bobis & Cusworth, 1994).

Secondly, the factors that are associated with the school, teacher and teaching. Some of these factors that influence attitudes are teaching materials used by teacher, teachers classroom management, teachers content knowledge and personality, teaching topics with real life enriched examples, other students opinions about mathematics courses (Yilmaz, Altun & Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2000), receiving private tuition. Thirdly, factors from the home environment and society also affect students' attitude towards mathematics. Factors such as educational background of parents, occupation of parents and parental expectations play a crucial role in influencing students' attitude towards mathematics. Due to these several factors students have different attitude towards mathematics. Many factors have been identified in literature as reasons associated with students' lack of interest in learning mathematics. These include Students' factor, teachers' factor, mathematics self-concept and self-efficacy, class size, government factor, infrastructural problem, instructional strategy, among others (Okonkwo, 1998; Akinoso, 2011; and Goolsby, 2013).

Self-concept is an important construct in education because of its linkage to academic achievement (Byrne, 1984; Valentine, Dubois, & Cooper, 2004). Nonetheless, a general self-concept might not be solely confined in the academic orientation (Skaalvik & Skaalvik, 2006). According to Oyserman (2001) self-concept also relates to self-cognition, which means that individuals could interpret experiences such that it can affect their judgments and reactions towards academics. He stated that there are two types of self-concept which include academic self-concept which is the perception about personal academic abilities affecting particularly mathematics areas and the non-academic self-concept which includes the perception formed by individuals about his behavior in the emotional, social and physical field. Again, Mckee (2002) opines that there is growing evidence in the students' negative attitude and belief about mathematics and that, through various teaching and learning styles, adopted by guidance counselors to aid students understanding, by making the students talk to themselves positively, the students' positive attitude and self-esteem becomes actualized.

According to Gargus (2002), when students encourage themselves with positive self-talk, on issues or areas that have been a burden to them, they tend to increase their level of determination to succeed, in that particular area of interest. This helps the student to attain the aspired level to achieve success.

Achievement is gotten by the acquisition of skills and using these acquired skills to the best of the individual's abilities and capabilities to enhance his/her performance in life. Bandura (1997) stated that, people's personal expectations for achievement is important in enhancing their desire to succeed. This belief helps to mobilize the individuals' energy in performing a lot better. This is

why students, who constantly solve mathematics problems, with a mind-set to achieve success will excel. Academic achievement has been described as the scholastic standing of a student at a given moment. It refers to how an individual is able to demonstrate his or her intellectual abilities (Opara & Nwaukwu, 2016).

Bong and Skaalvik (2003) state that academic-self-concept primarily indicates one's self-perceived ability within a given academic area, while academic self-efficacy primarily indicates one's self-perceived confidence to successfully perform a particular academic task. Their argument is based upon the comparison of typical items measuring both constructs. Bandura introduced self-efficacy beliefs as a key concept of his theory and defined it as a personal Judgment of one's capabilities to organize and execute courses of action to attain designated goals. This Judgment strongly influences the choices of people make, the effort they expend, and how long they persevere in the face of challenges (Bandura, 1986).

In the area of mathematics performance, various researchers (Pajares, 1996; Pajares & Miller, 1994) have reported that student judgment of their capability to solve mathematics problem are predictive of their actual capability to solve those problems. In mathematics achievements cognitive ability or mathematics ability are powerful variable that effect on mathematics performance directly or indirectly by mediating of self-efficacy mathematics. Academic self-efficacy refers to individuals' convictions that they can successfully perform given academic tasks at designated levels. Despite these clear and generally accepted definitions, educational researchers often struggle to identify the precise conceptual, operational and empirical differences between both judgments of self-perceived competence. In fact, some authors (Pajares, 1996) have suggested that, when studied within the same domain (e.g. mathematics), academic self-efficacy and academic self-concept might well be interchangeable concepts since both essentially measure the same cognitive construct (self-perceived competence). Other researchers argue that academic-self-concept and academic self-efficacy are clearly distinguishable concepts with differential impact on student behavior. Self-efficacy beliefs constitute a key component in Bandura's social cognitive theory. The construct signifies a person's beliefs, concerning her or his ability to successfully perform a given task or behavior.

Teachers have been universally accepted as one of the most important component of education (Sikora, 1997). And a competent teacher is sure to affect the educational outcomes of his or her students in many positive ways. Umoren and Ogbodo (2001) pointed out that emotional stability is one of the needed competencies of the teacher. They emphasized that teachers should be emotionally stable in order to change the students under their control. Specifically, Goolsby (2013) attributed factors influencing students' mathematics interest to attitude towards success in mathematics, confidence in learning mathematics, perception of teacher attitude, mathematics anxiety, and Locus of control. According to Idigo (2012), factors associated with mathematics interest include, students' factor, teachers factor, mathematics anxiety, government, lack of infrastructural facilities, lack of instructional materials and problem of large class size. Moreover, qualification of a teacher is the assurance of the teacher's impulse as well as the determinant of his knowledge, attitude and instructional strategy. A qualified mathematics teacher can easily use different approaches/ methods, styles, illustrations, examples, and improvise materials in teaching students mathematics concepts, principles or ideas which his counterpart (unqualified mathematics

teacher) cannot do. This suggests that student mathematics interest is dependent on qualification of the mathematics teacher. A qualified mathematics teacher can arouse students' interest in mathematics learning and ensure success in the learning of the subject through the use of appropriate instructional strategies in teaching the student. Teachers' effectiveness in any particular subject is an important determinant in that subject (Akinoso, 2011). Therefore, engaging qualified mathematics teachers who is equipped with various instructional strategies in teaching mathematics enhances students' interest to learn mathematics. This can be done through the teacher's application of his teaching styles, good trained mind and competencies which invariably eliminates anxiety in the students' learning of the subject. And qualified mathematics teacher uses varieties of mathematics games and improvise teaching materials to drive home mathematics concepts, ideas and principles competently.

The incessant poor achievement in mathematics in Nigeria Primary and Post Primary Schools levels may be attributed to students' lack of interest in learning mathematics. Interest has to do with preparedness or mastery of a subject-matter background knowledge that can enable the learner to cope with further or next higher level of learning of the subject- matter or related learning task (Idigo, 2010). This suggests that mathematics interest test for senior secondary level has to do with mastering the prerequisite skills in junior secondary school (JSS) level mathematics that can enable the JSS three students cope with further learning of mathematics at the next higher level of mathematics teaching in senior secondary school one (SSI) level. And mathematics interest test can be developed and used as an indicator of success in any mathematics course (Idigo, 2010, Goolsby, 2013). A teacher has to display high order of professionalism inside and outside the classroom. It is impossible for a teacher to possess all competencies in perfect amalgam though training and experience lead teacher towards proficiency. A competent teacher is temperamentally warm and cordial.

The Nigeria nation and other nations of the world have shown tremendous concern about the poor performance of students in Science and Mathematics. This poor performance of students in Mathematics in Nigeria a country that needs Mathematics for its development deserves the total attention of educational planners, teachers and researchers in Nigeria for a possible turnaround of the poor performance of students in Science and Mathematics. However, this problem is not peculiar to Nigeria. Even the developed nations have similar worry and concern. For Nigeria, a developing country that needs Science and Technology for its development, the poor performance of students in Science and Mathematics and worse still, the very insignificant proportion of students who choose Mathematics as a course of study after secondary education have turned the concern of the government and people of Nigeria into anxiety. This situation does not favour Nigerian's move towards developing a science and technology culture. Poor achievement in mathematics may be traceable to students' lack of interest in studying the subject. Several factors (teacher, student, mathematics self-concept, self-efficacy class size, government, instructional strategy and infrastructural problem) may have been identified as potentially affecting students' mathematics interest. It is to this end that the researchers developed the interest, to investigate some predictors of students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

The following research questions guided the study:

1. To what extent do mathematics self-concept predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.
2. To what extent do mathematics self-efficacy predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.
3. To what extent do teachers' competence predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

The following null hypotheses which was tested at 0.05 level of significance guided the study.

1. Mathematics self-concept do not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.
2. Mathematics self-efficacy do not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.
3. Teachers' competencies do not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

METHOD

In this study, correlational research design was used. A correlational design is concerned with determining the degree of relationship between two or more variables, it indicates direction and magnitude or nature (positive or negative) of a relationship between the variables. A correlational research design is a design patterned after the statistical tools most suitable for eliciting the form and nature of relationship that exists among the variables under investigation (Kpolovie, 2010).

The population for the study consisted of 2464 public senior secondary one students' in Obio/Akpor Local Government Area of Rivers State. (Source: Rivers State Senior Secondary Schools Board, 2016). A sample of 350 public senior secondary one students' were drawn using proportional stratified random sampling technique. Simple random sampling technique was used to draw 10 public secondary schools out of 14 public secondary schools.

Four instruments were used for this study. They are; mathematics self-concept questionnaire (MSCQ), adapted from Liu & Wang (2005), Mathematics self-efficacy scale (MSES), adapted from Betz & Hackett (1993), Teachers Competencies Questionnaire (TCQ) adapted from Passi & Lalitha (2014) and Attitude Towards Mathematics inventory (ATMI) developed by the researchers. The instruments were given to three experts in the field of educational psychology, measurement and evaluation for vetting and assessment of the suitability of the contents and also to ensure face validity. The reliability of Mathematics self-concept questionnaire (MSCQ), Mathematics self-efficacy scale (MSES), Teachers competencies questionnaire (TCQ) and Attitude towards mathematics Inventory (ATMI) was determined through Cronbach Alpha method of internal consistency.

The reliability coefficient of Mathematics self-concept questionnaire (MSCQ) was obtained as 0.754. Similarly, the reliability coefficient of Mathematics self-efficacy scale (MSES) was obtained as 0.872, Teachers Competencies questionnaire (TCQ) reliability coefficient was obtained as 0.798 and Attitude towards mathematics inventory (ATMI) reliability coefficient was obtained as 0.850. The coefficient values obtained are high enough to guarantee the use of the instruments as reliable for this study. Linear regression analysis was used to answer the research

questions and t-test associated with the regression analysis was used to test the null hypotheses at 0.05 level of significance.

RESULTS AND FINDINGS

Research Question 1:

To what extent does mathematics self-concept predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State?

Hypothesis 1:

Mathematics self-concept does not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

In order to answer the Research Question, linear regression was used while in testing the null hypothesis, t-test associated with regression was employed.

Table 1: Linear regression analysis of mathematics self-concept and students attitude towards mathematics.

Model	R	R ²	Adjusted R ²	Standard Error of the estimate	N.	
1	0.277	0.077	0.074	5.18226	350	
COEFFICIENT.						
Model	Unstandardized Coefficient		Standardized coefficient	t	Sig	Result
	B	Std Error	Beta			
(Constant)	33.135	2.196		15.089	.000	Significant (P < 0.05)
Mathematics self-concept	.410	.076	.277	5.370	.000	

The table above shows the linear regression coefficient obtained as 0.277, the value for coefficient of determination (R^2) as 0.077 while the adjusted coefficient of determination (adjusted R^2) obtained as 0.074. Based on the coefficient of determination (R^2 value) of 0.077, it can be deduced that the prediction of mathematics self-concept only explains 7.7% of the variation on students' attitude towards mathematics.

To determine if the prediction is significant or not the t-value associated with regression analysis was used. The results in the table revealed that t-value was 5.370 which is significant at 0.000 and also less than the chosen probability level of 0.05 ($t=5.370$, $p<0.05$). Hence, the null hypothesis was rejected which implies that mathematics self-concept significantly predict students attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State.

Research question 2: To what extent does mathematics self-efficacy predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State

Hypothesis 2:

Mathematics self-efficacy does not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

In order to answer the Research Question, linear regression was used while in testing the null hypothesis, t-test associated with regression was employed.

Table 2: Linear regression analysis of mathematics self-efficacy and students attitude towards mathematics.

Model	R	R ²	Adjusted R ²	Standard Error of the estimate	N.	
1	0.280	0.079	0.076	5.17668	350	
COEFFICIENT.						
Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig	Result
	B	Std Error	Beta			
(Constant)	32.780	2.231		14.695	.000	Significant (P < 0.05)
Mathematics self-efficacy	.425	.078	.280	5.446	.000	

The table above shows the linear regression coefficient obtained as 0.280, the value for coefficient of determination (R²) as 0.079 while the adjusted coefficient of determination (adjusted R²) obtained as 0.076. Based on the coefficient of determination (R² value) of 0.25, it can be deduced that the prediction of mathematics self-efficacy only explains 7.9% of the variation on student attitude towards mathematics.

To determine if the prediction is significant or not the t-value associated with regression analysis was used. The results in the table revealed that t-value was 5.446 which is significant at 0.000 and also less than the chosen probability level of 0.05 (t=5.446, p<0.05). Hence, the null hypothesis was rejected which implies that mathematics self-efficacy significantly predict students attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State.

Research question 3: To what extent do teachers' competencies predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State

Hypothesis 3:

Teachers' competencies do not significantly predict students' attitude towards mathematics in Obio/Akpor Local Government Area of Rivers State.

In order to answer the Research Question, linear regression was used while in testing the null hypothesis, t-test associated with regression was employed.

Table 3: Linear regression analysis of teacher's competencies and students attitude towards mathematics.

Model	R	R ²	Adjusted R ²	Standard Error of the estimate	N.	
1	0.320	0.102	0.100	5.11005	350	
Coefficient.						
Model	Unstandardized Coefficient		Standardized coefficient			
	B	Std Error	Beta	t	Sig	Result
(Constant)	28.140	2.668		10.547	.000	Significant (P < 0.05)
Teachers competencies	.601	.096	.320	6.290	.000	

The table above shows the linear regression coefficient obtained as 0.320, the value for coefficient of determination (R^2) as 0.102 while the adjusted coefficient of determination (adjusted R^2) obtained as 0.100. Based on the coefficient of determination (R^2 value) of 0.102. It can be deduced that the prediction of teachers' competencies only explains 10.2% of the variation on student attitude towards mathematics.

To determine of the prediction is significant or not the t-value associated with regression analysis was used. The results in the table revealed that t-value was 6.290 which is significant at 0.000 and also less than the chosen probability level of 0.05 ($t=6.290$, $p<0.05$). Hence, the null hypothesis was rejected which implies that teachers competencies significantly predict students attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State.

DISCUSSION OF RESULTS

The result shows that mathematics self-concept significantly predict students' attitude towards mathematics in Obio-Akpor Local Government Area of Rivers states. It can also be deduced that the prediction of mathematics self-concept only explains 7.7% of the variation on students' attitude towards mathematics. This implies that students with high mathematics self-concept will generally have high attitude towards mathematics. Self-concept exercise a powerful influence on the level of accomplishment that individuals ultimately realize. Students who doubt their capabilities may behave that things are tougher than they really are. Many students have difficulty in school not because they are incapable of performing successfully but because they have learned to see themselves as incapable to handling academic work. The present study is in agreement with the findings of Obilor (2012) in his study relationship between self-concept and mathematics achievement of senior secondary students in Port Harcourt. The results show significant positive relationship between mathematics self-concept of students and students' achievement.

The result also shows that mathematics self-efficacy significantly predict students' attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State. It can be deduced that the prediction of mathematics self-efficacy only explains 7.9% of the variation on student attitude towards mathematics. This implies that students' individual conviction that they can successfully perform given academic tasks at designated levels can change their attitude towards mathematics. Also, the belief that an individual can perform a task can be an important predictor of performance. The findings of the present study is in line with the findings of Mahmood & Kadivar (2006) in his study the role of mathematics self-efficacy and mathematics ability in the structural model of mathematics performance. The result revealed that there is a statistical significant between mathematics self-efficacy and mathematics ability.

The result also shows that teachers competence significantly predict students attitude towards mathematics in Obio-Akpor Local Government Area of Rivers State. It can also be deduced that the prediction of teachers competencies only explain 10.2% of the variation on student attitude towards mathematics. The present study is in line with the findings of Anigbo (2016) in his study factors affecting students' interest in mathematics in secondary schools in Enugu state. The results shows that significant relationship exist between teachers factors and students mathematics interest. Also, Yara (2009) opined that attitude of students can be influenced by the attitude of the teachers and his method of teaching. These factors greatly account for the students' positive attitude towards mathematics. The result also shows that there is a positive significant prediction between students attitude and teachers competence.

IMPLICATIONS OF THE FINDINGS

From the results of this study, the following implications were highlighted.

The finding of the study which indicated that mathematics self-concept significantly predict students' attitude towards mathematics implies that students' with high mathematics self-concept will have high positive attitude towards mathematics. It also means that a change in mathematics self-concept facilitates a change in attitude towards mathematics.

Again, the findings of the study which indicated that mathematics self-efficacy significantly predict students' attitude towards mathematics implies that students' individual conviction that they can successfully preform mathematics at designated levels can change their attitude towards mathematics.

Lastly the finding of the study revealed that teachers' competencies significantly predict students' attitude towards mathematics. This implies that mathematics teachers that use different approaches or methods, styles illustration and examples in teaching students' mathematics concepts, principles and ideas enhance a positive change in attitude towards mathematic among students.

RECOMMENDATIONS

Based on the implications of the findings, the researchers have made the following recommendations.

- Teachers and counsellors should enlighten the students more on mathematics self-concept and mathematics self-efficacy which will guide them in having positive attitude towards mathematics.
- Students should try to develop and maintain a positive self-concept and self-efficacy towards learning of mathematics
- Mathematics teachers should continue to practice the use of different approaches and techniques in the teaching of mathematics concepts and principles
- Government and all educational stakeholders should ensure that teachers are constantly send to workshops, seminars, and conferences in order to enhance new innovations in mathematics teaching.

CONCLUSION

From the results of the study, the following conclusions were drawn

- Positive mathematics self-concept results to positive attitude towards mathematics. Mathematics self-concept significantly predict students' attitude towards mathematics.
- Positive mathematics self-efficacy results to positive attitude towards mathematics. Mathematics self-efficacy significantly predict students' towards mathematics.
- Mathematics teachers' competencies is helpful and relevant for understanding mathematics concepts and principles because it significantly predict students' attitude towards mathematics.

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