PATH-ANALYTIC STUDY OF STUDENTS' HOME BACKGROUND, ACADEMIC MOTIVATION, SELF-CONCEPT ON ATTITUDE AND ACHIEVEMENT IN SENIOR SECONDARY SCHOOL MATHEMATICS IN OGUN STATE, NIGERIA

AJAYI KASSIM OLUSANMI

N.C.E. MATHEMATICS/CHEMISTRY (OSCE, OGUN STATE)
B.Sc. Ed. MATHEMATICS (LASU, LAGOS)
M.P.A. PLANNING, RESEARCH AND STATISTICS (LASU, LAGOS)
M.Ed. MEASUREMENT AND EVALUATION (UNILAG, LAGOS)

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ABSTRACT

Mathematics is a fundamental subject which functions as a basic index for understanding and mastery of various aspects of science as well as the complexity of modern technology. Thus, every individual needs some knowledge of mathematics in order to live a useful life and be an effective member of the society. Several studies in the past have focused on the factors associated with students' poor academic achievement in mathematics. However, very few of those have considered the influence of multiple indicators on students' achievement in mathematics at the secondary school level with a view to establishing their combined influence on students' academic achievement. This study, therefore investigated the causal-effects of home background variables, academic motivation and self-concept on students' attitude and achievements in mathematics among secondary school students in Ogun State, Nigeria.

The study employed *ex-post facto type* of research. The sample was selected using the multi-stage sampling technique. Two thousand four hundred students from 60 selected schools in nine local government areas within Ogun State, Nigeria were involved. Five research instruments namely; Attitude towards Mathematics Questionnaire; (r = 0.73), Self-concept Scale; (r = 0.71), Parents' Support Scale; (r = 0.66), Academic Motivation Scale; (r = 0.85) and Mathematics Achievement Test; (r = 0.84) were used. Four research questions were answered and data analysed using path analysis technique at .05 level of significance.

There were 22 significant and meaningful pathways through which the predictors caused variation in students' attitude to and achievement in mathematics. Out of the 22 pathways, three were direct while 19 were indirect. The original and the reproduced correlation coefficients were also compared and the discrepancies were found to be minimal. Out of the seven predictor variables hypothesised, only one (i.e, parents' education), significantly exerted direct influence on achievement. However, all the seven predictor variables significantly exerted direct and indirect influence on students' attitude thus; academic motivation (β = 0.321); self-concept (β = 0.187); parents' support (β = 0.105); number of children in the family (β = 0.011); parents' education (β = 0.007); parents' occupation (β = 0.005); and age of mother at birth of the child (β = 0.001).

Therefore, since home background variables (i.e, age of mother at birth of the child, parents' education, occupation and support, number of children in the family) as well as academic motivation and self-concept brought about greater improvement in students' attitude towards mathematics, it is pertinent that parents be encouraged to put on earnest efforts in motivating students towards the learning of mathematics. Such encouragement and support will thus supplement the efforts of the teachers at school and help students cultivate positive attitude towards mathematics. Additionally, since parents' education influences students' academic achievement in mathematics, the government and all stakeholders in the education sector should endeavour to implement its policy on basic education for all and thus create an enlightened society in which every parent would be educated enough to have a positive influence on their children especially in their attitude towards mathematics, which would in turn lead to better achievement in the subject.

Key words: Home background variables; Academic motivation; Self concept; Attitude; Achievement.

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DEDICATION

This work is dedicated to the blessed memory of my beloved father late Alhaji Lasisi Adeyemi Ajayi who passed on during the second year (2007) of my doctoral degree programme. He was the source of inspiration towards this admirable programme, may his gentle soul rest in perfect peace (Amen).

CERTIFICATION

I certify that this study was carried out by **AJAYI KASSIM OLUSANMI** in the International Centre for Educational Evaluation (ICEE), Institute of Education, University of Ibadan, Ibadan, Nigeria.

_____ _____

Date

Supervisor
Prof. S.O. Ayodele
N.C.E (Lagos),
B.Ed, M.Ed, Ph.D (Ibadan)
Professor of Language Education
Institute of Education,
University of Ibadan, Nigeria.

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CHAPTER ONE
INTRODUCTION

1.1 Background to the study

The importance of mathematics to an individual and the society is clearly beyond debate and this justifies its inclusion in the curricula at all levels of education. Mathematics has been highly rated among other subjects, and for that reason; it is considered a knowledge that is indispensable to humankind. It is also a fundamental subject which functions as a basic index for understanding and mastery of the sciences and the complexity of modern technology. According to Oladele (2004), mathematics is a compulsory subject at the primary and secondary school levels not because the students are expected to become mathematicians but because of its application in everyday life. Toumasis (1993) contends that mathematical knowledge is essential, not only for effectiveness in the society but also for making useful contributions towards the development of one's environment. According to Aluko (1990), every individual needs some knowledge of mathematics in order to live a useful life and be an effective member of the society. These needs include: commercial activities, business transactions, domestic activities, politics and decision - making. He concludes that every individual requires a certain level of competence in basic mathematics.

Fakuade (1977) in Onwuakpa (1999), describes mathematics as the queen of all sciences and servant to all disciplines while Obe (1996) conceptualises the subject as the master and servant of most disciplines and thus, a source of enlightenment and understanding of the universe. According to him, the importance of mathematics transcends all definitions and the prosperity of any country depends on the volume and quality of mathematics offered in its school system. He further opines that without it, the understanding of national problems would be superficial. Graeber and Weisman (1995) agree that mathematics helps the individual to understand his/her environment and to give accurate account of the physical phenomena around him/her. According to them, mathematics and science have made humans to understand the phenomena of the eclipse. To this end, Setidisho (2001) submits that no other subject forms a strong binding force among various branches of science as mathematics, and without it, knowledge of the sciences often remains superficial.

Emphasising the importance of the subject to the society, Robert (1987) stated that in the United States, mathematics has come to play important roles: in the engineering of highways, the search for energy, the designing of television sets, the profitable operation of most businesses, astronauts flying space-craft, the study of epidemics, the navigation of ships

at sea, etc., all depend on the study of mathematics. Ogunbanjo (1998) opines that all over the world, science has been accepted as a vehicle of technology, social and economic development. Mathematics is not only basic to these but is the language of science.

Stressing the importance of mathematics to the society, Igbokwe (2003) highlights the intricate link of mathematics to science and technology, and contends that without mathematics there will be no science and without science there will be no technology, and without technology there will be no modern society. In other words, mathematics is the precursor of science and technology; and an indispensable element in modern societal development. This implies that a strong background in it is critical for many career and job opportunities in today's increasingly technological society. These and many more reasons are why the Nigerian government believed that the subject should be taken seriously in our school system; and Nigeria, in her march towards technological development, has not only made mathematics a compulsory subject in the curriculum of the primary and secondary school levels of her educational system (Federal Republic of Nigeria, 2004) but also as a prerequisite to the study of science courses in her colleges, polytechnics and universities (JAMB Brochure 1992-2007).

This importance accorded mathematics in the school curriculum is recognition of the indispensable role it plays in contemporary society, especially when it is recalled that the broad aims of secondary education within our overall national objectives, is the preparation for useful living within the society and the preparation for higher education (FRN, 2004). However, many academically capable students prematurely restrict their educational and career options by discontinuing their mathematical learning early in the high school.

According to Oladele (2004), education is a veritable tool for the rapid development of any nation but is not meaningful without effective evaluation of students' academic achievements vis-à-vis the nation's educational objectives. In the same vein, examination (either internal or external) is undoubtedly the most frequently used evaluation tool or index of students' achievements. He therefore concludes that the success or failure of an educational practice can be decided to a large extent by the degree of students' achievement. Thus, to measure students' academic achievement, it is most common nowadays for schools to administer achievement tests at the middle or end of the school year to determine what students have learned across the different academic areas. This is especially true in mathematics and supported by the examination performances of all Nigerian students in mathematics for the year 2002 to 2009, for which data were available in Tables 1.1 and 1.2.

Table 1.1: EIGHT YEAR ANALYSIS OF WAEC RESULTS IN SENIOR SCHOOL CERTIFICATE EXAMINATIONS IN NIGERIA BETWEEN 2002-2009: STATISTICS OF ENTRIES AND RESULTS

Year	Total Entry	Credits A1-C6		Pass D7-D8		Failure F9	
		No	%	No	%	No	%
2002	909,880	201,442	22.14	311,985	34.29	396,453	43.57
2003	939,509	258,996	27.57	343,205	36.53	337,309	35.90
2004	844,542	234,741	27.79	279,648	33.11	330,153	39.09
2005	1,148,182	334,963	29.17	397,438	34.61	415,781	36.21
2006	1,181,508	394,385	33.38	419,587	35.51	367,536	31.11
2007	1,270,136	584,024	46.75	333,844	26.72	302,774	24.24
2008	1,292,890	726,398	57.27	302,266	23.83	218,618	17.23
2009	1,373,009	634,382	47.04	344,635	25.56	315,738	23.41

Source: WAEC Test Development and Research Unit, Lagos

As shown in Table 1.1, the success rate for mathematics (credit and above, i.e. A1-C6) in SSCE between 2002 tox 2009 ranges between 22.14% and 57.27% while the pass rate (pass, i.e. D7-D8) ranges between 23.83% and 36.53%. The outright failure rate (failure, i.e. F9) ranges between 17.23% and 43.57%. From the Table it could also be observed that in an average of eight year period, fewer than 40% of the students who enrolled for mathematics in SSCE attained credit pass in the subject.

Table 1.2: SEVEN YEAR ANALYSIS OF WAEC RESULTS IN GENERAL CERTIFICATE EXAMINATIONS IN NIGERIA BETWEEN 2002-2008: STATISTICS OF ENTRIES AND RESULTS

Year	Total Entry	Credit A1-C6		Pass D7-D8		Failure F9	
		No	%	No	%	No	%
2002	1,004,308	357,603	37.67	319,771	33.69	271,765	28.63
2003	550,029	237,377	45.78	152,382	29.39	101,606	19.59
2004	513,446	272,477	55.75	98,686	20.19	98,159	20.08
2005	398,686	139,451	37.63	111,623	30.12	97,361	26.27
2006	421,977	179,313	46.06	120,465	30.95	67,330	17.29
2007	367,439	185,107	55.46	75,871	22.73	54,545	16.34
2008	1,372,546	141,940	40.90	85,229	24.55	84,309	24.29

Source: WAEC Test Development and Research Unit, Lagos

As shown in Table 1.2, the success rate for mathematics (credit and above, i.e. A1-C6) in GCE between 2002 to 2008 ranges between 37.67% and 55.75% while the pass rate (pass, i.e. D7-D8) ranges between 20.19% and 33.69%. The outright failure rate (failure, i.e. F9) ranges between 16.34% and 28.63%. From the Table it could also be observed that in an average of seven year period, fewer than 50% of the students who enrolled for mathematics in GCE attained credit pass in the subject. This supports the findings of previous researchers

like Bajah and Okebukola, 1984; Obemeata, 1992, Obe, 1996 and Adeleke, 2007 who contend that the performance of students in mathematics has been observed to be below expected standard.

In a study, Obemeata (1992) examines the Senior School Certificate Examinations (SSCE) results for three consecutive years, 1988, 1989 and 1990 in nine subjects including mathematics, and finds that the percentage of students who passed at credit level in all the selected subjects was as low as between 3% and 6% in some of the subjects. Also, in another related study, Adeleke (2007) compared the level of performance of Nigerian students in mathematics with four other countries (Gambia, Ghana, Liberia and Sierra Leone) exploring Senior Secondary School Certificate Examination conducted by West Africa Examination Council (WAEC) between 1992 and 1999. He notes that Nigeria has the lowest percentage of students that scored between A1 and C6 (13.7%) in an average of a nine year period while others scored 37.6%, 30.1%, 17.8% and 17.0% respectively. This statement was supported by the analysis of the results of all Nigerian students who sat for Senior Secondary School Certificate Examination and General Certificate Examination in mathematics conducted by WAEC for a period of eight (2002-2009) and seven (2002-2008) consecutive years respectively.

Examining the academic achievement of students in mathematics across the country, it was discovered that the poor performance of students becomes more striking and alarming; an indication of a danger signal in our educational system. The poor results in this subject have continued to be stumbling-blocks in the realisation of the educational and employment desire of many candidates because it is a gatekeeper for many careers. It is also a known fact that many candidates are denied admissions because of poor results in mathematics at the Senior School Certificate Examination (SSCE) or GCE ordinary level. What then could be responsible for this poor performance despite its recognition in the society and various efforts made by the Federal Government since the inception of the new policy on education? This is one of the questions to be answered in this study. Over the years, the investigations of the factors that affected academic achievement of students in mathematics have attracted the interest and concern of teachers, psychologists, researchers, parents and school administrators in Nigeria (Sogbetan, 1981). This is because of the public outcries concerning the low standard of education in the country (Imoge, 2002).

Several attempts have been made by researchers to identify factors associated with students' academic performance in mathematics. Some of the factors identified are low socio-economic status of the family (Hassan, 1983), students' attitude (Fishbein and Adjzen, 1981;

Maple and Stage, 1991), poor family structure (Sogbetan, 1981), poor study habits (Steinberg, 1993), intellectual ability (Lamberts, 2001), parents' education (Keeves, 2000), income and occupation (Keeves, 2000; Lankard, 1995), school variables (Jaffe, 1985; Eccles, Wigfield and Schiefele, 1998; Ellis, 1996), teachers' variables (Ezezobor, 1986; Hackett and Betz, 1981), availability of equipment (Georgewill, 2000), peer influence (Frazer, 2002), self-efficacy (Bandura, 1986 and 1993; Clark, 2000; Gesinde, 2000; Eccles, Wigfield, Harold and Blumenfeld, 1993), teaching strategy and methods (Enemark and Wise, 1981), self-concept (Moore, 2003; Kloosterman, 1991; Tuckman and Sexton, 1990; Shavelson and Bolus, 1982), motivation and self confidence (Aiken, 1998; Atkinson, 1985 and 1995), anxiety (Aiken, 1976), shortage of qualified mathematics teachers (Alex, 2003; Okoye, 2001), poor facilities and instructional materials (Oshibodu, 1984; Akpan, 1987; Odogwu, 1994), large pupils to teacher ratio (Alele-Williams, 1988) as well as the age of the mother at the birth of the child (Brooks-Gunn and Chase-Lansdale, 2001; Satin, Leveno and Sherman, 1994; Reichmann and Pagnini, 1997). Emeke (1984) has attributed the cause of poor academic performance to a combination of personal and institutional factors. Personal factors relate to the individual's intelligence, knowledge and ability while the institutional factors are family or parental influences, societal influences and school related factors among others. Ajila and Olutola (2000) categorise problems responsible for students' poor performance as their environment, which include availability of suitable learning environment, adequacy of educational infrastructure like textbooks and society at large among others.

According to Enemarck and Wise (1981), Parsons, Adler and Kaczala (1981), and Ma and Kishor (1997) the variable "attitude" is one of the most potent factors that relates to achievement. Regardless of these studies, the researcher believes that there is still a need to study further factors that relate to achievement in terms of home background variables like age of the mother at birth of the child, parents' education, occupation and support, number of children in the family, academic motivation, self-concept and attitude.

There is also a need to provide an explanation on how mathematics achievement relates to students' attitude, since achievement is cognitive in nature while attitude is affective. According to Maker (1982), there is a gap between knowledge in the affective domain and cognitive domain. This implies that the interplay between the cognitive and affective domains has to be further explained. This interplay is deemed important since it is a process that students undergo most of the time. As Maker (1982) emphasises, it is impossible to separate the cognitive from the affective domain in any activity. Moreover, according to McLeod (1992), attitudes, beliefs and emotions are the major descriptors of the affective

domain in mathematics whereas knowledge and thinking are considered descriptors of the content and process of human mind. According to Steinkamp (1982), Cheung (1988), Ma and Kishor (1997), and Middleton and Spanias (1999), mathematics educators have traditionally accepted the positive relationship between attitude towards mathematics and achievement in it.

Apart from attitude, a growing body of research has shown that students perform better academically when parents are involved in their child's schooling (Astone and McLanahan, 1991; Feuerstein, 2000; Rumberger and Palardy, 2005). In another study, Parcel and Dufur (2001), evaluates the effects of family and school on students' achievement and found that parental involvement in school activities had a positive impact on students' mathematics achievement. Deplanty, Coulter-Kern and Duchane (2007), note that parents' involvement in academics at home is more important to a child's academic achievement than their involvement at school. Zhao (2007), shows that parents are instrumental to their children's academic success and that parental involvement has a positive impact on students' achievement.

In addition, Dubey (1999) shows that parents' support of and involvement in their children's schooling is an important determinant of school performance and achievement. The extent to which parents show concern about the child's progress and accomplishments, support and supervise home-works and school assignments and even merely communicate about school with their children have been shown to determine students' tendency to successfully complete school and to maintain good grades (Parcel and Dufur, 2001).

Socio-economic status according to (Jaffe, 1985; Rani, 1998; Simon, 2004) shown that students from middle to upper class families tend to outperform those from less advantaged background. There are a number of paths through which high socio-economic status may affect educational outcomes. First, children from high income families will tend to be children of more highly educated parents, who often place more value on school and become more involved in their children's schooling than children of poorly educated parents. Second, children living in poor communities may have fewer resources and materials available to them (books, equipment, computers, etc) and so may receive a poorer quality education than children from better-off communities. In addition, children from less advantaged homes are likely to face additional barriers such as: single parents, with less time and resources to care for the family, additional family responsibilities, poor living, studying and sleeping conditions, and poor nutrition.

Baker and Sodem (1997) said that the most important effect of socio-economic pressure is that it generally makes parents less available to support and encourage their children in their schooling. Also, literatures from (Onocha, 1985; Crane, 1993; Rani, 1998; Dubey, 1999; Mitchell, 1999; Musgrave, 2000; Neil and Keddie 2001; Grissmer, 2003; Teese, 2004; Sharma, 2004) revealed that the home background variables have a great influence on the students' psychological, emotional, social and economic state. This means the family background and context of a child affect his/her reaction to life situations and level of performance. Thus, Ichado (1998) concludes that the environment from which a student comes can greatly influence his/her performance in school. The family lays the psychological and moral foundations in the overall development of the child while the mother's significant role in this cannot be overemphasised (Agulanna, 1999).

Students' academic achievement has been studied within different frameworks. Many of them have a focus on their achievement motivation. Theories with different topics such as intrinsic motivation, self-concept, attribution, goal orientation, self-efficacy, and expectations have been established in previous studies. Many studies have examined the relationships among those constructs and students' achievement. Schunk, Pintrich and Meece (2008) affirm the fact that there is a consistent finding of motivation being related to achievement behaviours. The impact of motivation on learning of mathematics by a child cannot be undermined. Hall (1989) believes that there is a need to motivate students so as to arouse and sustain their interest in learning mathematics. He further opines that mathematics academic achievement should be considered a continuous process until there is evidence of improvement in interest and performance of the learners in the subject.

According to Gesinde (2000), academic motivation could be seen as self-determination to succeed in academic work. He posits that the urge to achieve varies from one individual to the other, while for some individuals, the need for achievement is very high and for others it may be very low. What could be responsible for the variation could be the fact that academic motivation is believed to be developed during socialisation processes and learning experiences.

Another influential motivational theory involves expectancy and task value constructs. The expectancy value model focuses on the role of students' expectancies for academic success and their perceived value for academic task. The model links achievement with constructs of expectation success on a task and the subjective value of the task influencing the attitude of students. According to this model, students' academic performance, persistence and choice of achievement tasks are most directly predicted by their

expectancies for success on those tasks and the subjective task value they attach to success on those tasks (Wigfield, 1994). He states further that students' expectancies and values are most directly determined by other achievements that are related to beliefs, including students' achievement goals and their task-specific beliefs.

According to Moore (1993), income, family size and the mother's age at child birth were modestly related to students' academic achievement. This implies that the age at which a mother gives birth to their young ones affect their academic performance either positively or negatively. Thus, early age or old age has its significance in students' academic achievement. Hayes and Bronzaft (2006) contend that factors such as the mother's age at birth of the child, number of siblings, genetics and environment have more to do with academic achievement. Moore (1993) opines that early birth has been disadvantageous to a young mother's children as well as the woman herself. One key reason is that early childbearing interferes with the process of schooling and human capital development which means that the mother's ability to gather resources will be reduced. She is therefore likely to be poorer than a woman who delays childbearing. For this reason, Moore (1993) concludes that the age at first childbirth may prevent a teenage mother from providing resources that promote cognitive development, such as a high-quality child-care arrangement and a stimulating home environment that can improve a child's academic performance especially in mathematics.

Findings from Brooks-Gunn and Chase-Lansdale (2001) on families' participation in the upbringing of their children reveals that mothers play more prominent role in the intellectual development of their children during their formative years. William and Chelser (2005) view the mother as the first child educator and the age at which she gives birth to the child matters in her life. This allows her to have a stable or unstable mind which affects the mother's instinct and love towards the child. Ninio (1979) and Benjamin (1993) observe that mother's age enhances the cognitive development of her child.

According to Brooks-Gunn and Chase- Lansdale (2001), young mothers are socially and emotionally immature; we would expect them to have limited parenting ability. They said further that coping with the demands of an infant is likely to be far more challenging for a teenager than for an older woman. Inconsistent and arbitrary discipline which is more common among young mothers has a negative impact on children's behaviour and on their social and emotional development. As a result, Brook -Gunn and Chase-Lansdale (2001), expect a young age at first birth to adversely affect children's social and emotional adjustment. Even if a teenage mother has additional children when she is older, she may

continue the patterns of parenting she established with her first child. Teenage mothers also tend to provide their children with less cognitive stimulation and less emotional support than do older mothers.

Grissmer (2003) found that parents' education will affect students' academic achievement in mathematics. According to him, parents' level of education is the most important factor affecting students' academic achievement. Taiwo (1993) submits that parents' educational background influence the academic achievement of students. This, according to him, is because the parents would be in a good position to be second teachers to the child; and even guide and counsel the child on the best way to perform well in education and provide the necessary materials needed by him/her. Musgrave (2000) states that a child that comes from an educated home would like to follow the steps of his/her family and by this, work actively in his/her studies. Onocha (1985) concludes that a child from a well educated family with high socio-economic status is more likely to perform better than a child from an illiterate family. This is because the child from an educated family has a lot of support such as a decent and good environment for academic work, parental support and guidance, enough textual and academic materials and decent feeding. He or she is likely to be sent to good schools where well seasoned teachers will handle his/her subjects.

Coleman (1998), Karnel (2001) and Teese (2004) reveal that students whose parents are employed in professional and managerial occupations (higher socio-economic status) had the highest average scores and students whose parents were production workers or labourers (lower socio-economic status) had the lowest. Similar results were found by Teese (2004), in his analysis of the students' performance where he found clear and consistent trends for children from lower socio-economic background. Coleman (1998) and Karnel (2001) state that the relationship between socio-economic disadvantage and learning outcomes has been accepted almost as an article of faith by educators. This was supported by the Children's Defence Fund (1995) "Year Book" on the State of America's children which made the following observations:

- In 1993, there were 15.7 million poor children in the United States. This was the highest number in 30 years;
- The inflation-adjusted median income of young families with children declined to 34% between 1973 and 1992;
- In 1992, 66.2% of the children who lived in a family headed by a person who dropped out of school were in poverty. Poverty rates for other levels of education

were as follows: high school graduates, 40.2%; some college graduates, 22.4%; and university graduates, 7.5%.

- In 1993, almost one in every seven children, 9.4 million, had no health insurance. This represented an increase of 800,000 from 1992; and
- The birth rate among unmarried teens was 15.5 births per 1,000 in 1959. The figure in 1992 was 44.6.

From the above "Year Book", the economic factor which refers to family characteristic is the most powerful predictor of school performance. Careful consideration of the socio-economic status of parents reveals that the higher the standard of living of the parents, the higher the academic performance of the child. These relationships have been documented in countless studies and seem to hold, no matter what measure of status is used (occupation of principal bread winner, family income, parents' education or a combination of these).

A family's socio-economic status is based on parents' income, education and occupation. Thus, a family with high socio-economic status is often more successful in preparing its young children for school because they typically have access to a wide range of resources to promote and support their development. They are able to provide their young children with high quality child care, books and toys to encourage them in various learning activities at home. This in turn, will affect the students' academic achievement in mathematics.

For families in poverty, basic necessities are lacking, parents may place top priority on housing, clothing and health care. Educational toys, games and books may appear to be luxuries. This point was supported by Bookcock (2000) and Lloyd (2002) on the relationship between school performance and parental socio-economic condition where they conclude that students with high achievement values tend to come from families that are more educated and with higher status of occupation. Howley (1989) and House (2002) contend that students learn better if they are from above average or average income family, with well-educated parents who participate in the school's education process and encourage their children to learn.

Brown (1999) posits that socio-economic status is one of the primary factors responsible for low achievement in general science. Lloyd (2002) shows that socio-economic status influenced the total achievement of students in theory and practical when taken separately. Gyles (2000) and Frazer (2002) conclude that an urban atmosphere is more

conducive to better achievement than a rural environment. The latter highlights the effect of environmental facility on both general academic achievement and achievement in English Language, which he considers to be significant.

The environment provided to the student by his/her home has drawn the attention of Comber and Keeves (2000), Iverson and Walberg (1992), Keeves (2000), Moore (1993), Song and Hattie (2004), Stigler (2002), Trusty (1999) and Walberg (2001). A significant difference between high achievers and low achievers on the home variables (namely parents' education level, environment, income, spatial environment, social background, provision of facilities and parents-child relationship) is shown in Lesser (2001). William and Chelser (2005) assert that in a family that can scarcely afford food, shelter and clothing, pressure is usually exerted upon the young to leave school early to secure employment and thereby help the family. The parents' ability to provide books and necessary equipment for education, combined with a positive attitude, stimulates the children to learn. It is also assumed that children from the upper class homes have good health and proper welfare which assist them in their learning. Further, Comber and Keeves (2000) argue that many of the parents in the city or urban areas are professional people who understand the value of education; such parents motivate their children to learn effectively and also provide a lot of incentives that can reinforce the desire to learn.

A considerable number of studies on family size have also revealed that the number of children, age spacing of children, and birth order are correlates of students' cognitive abilities (Iverson and Walberg, 1992; Keeves, 2000; Moore, 1993; Song and Hattie, 2004; Stigler, 2002; Trusty, 1999; Walberg, 2001). In particular, students from large families of children had low potentials for academic success than students from smaller families of children. On the basis of this finding, there is some support for the notion that the smaller the family size, the higher the level of student's achievement.

In the same light, Rutter (1985) identifies parental nurture as a feature of parent-child interactions that enhance cognitive development. Rutter (1985) is of the opinion that in a single-child family, the child might be receiving at least half the nurture available from any one parent but as the number of children in the family increases, less nurture is available for each child. Thus, the significance of the variable as a measure of the home environment stems from the fact that the number of children of the same family affects attention and stimulations which a child receives in the family. The amount of parental attention is including academic motivation and provision of learning opportunities which decreases as the number of children increases.

Adebowale (2000), stated that another factor that may contribute to the low levels of mathematics attainment by the students at every segment of the educational system in the country is students' attitude towards the subject and desire for such knowledge. According to him, students' lack of interest in mathematics makes it difficult for teachers to impart pertinent knowledge to them on the subject. Research findings by (Aghenta, 1982; Soyibo, 1985) show that Nigerian students have negative attitude towards science and for those who have chosen to study science subjects, Medahunsi (1985) and Ezezobor (1986) among others, observe that their performance in mathematics and science has been poor. McBee and Luke (1996); Brodie (2001); Finger and Schlesser (2002); and Williams (2004) find significant relationships between attitude to a subject and achievement in that subject. Akinola (2003), similarly, stresses that attitude has a greater influence on aspects of learning which are emphasised in the classroom. Dulton (2004) concurs that attitudes are related to academic performance when measured on promotion grades.

The study of self-concept has awakened growing interest in psychological research in recent years. According to Clark (2000), self-concept is considered to comprise various dimensions, areas or facets of academic and non-academic components. Academic self-concept is then divided into self-concept in particular subject areas (Mathematics, English, and so on) while non-academic is divided into social, emotional, and physical self-concepts. Marsh (2000) later tests the academic self-concept portion of the Shavelson, Hubner and Stanton (1976) model and concludes that the model is supported when it is limited to self-concepts in academic core subjects such as English and Mathematics.

Self-concept, according to Hamachek (1981) quoted by Machargo (2004), "is the set of perceptions or reference points that the subject has about himself/herself; the set of characteristics, attributes, qualities and deficiencies, capacities and limits, values and relationships that the person knows to be descriptive of himself/herself, and which he/she perceives as data concerning his/her identity". He explains further that it is a set of knowledge and attitudes that we have about ourselves; the perceptions that the individual assigns to himself/herself and characteristics or attributes that we use to describe ourselves. It is understood to be fundamentally a descriptive assessment and has a cognitive nuance.

According to Akinsola (1993), there is a significant and positive relationship between mathematics achievement and mathematics self-concept ($r^2 = 0.66$, $n = 127$, $r = 0.84$). This result accords well with that of Brookover (1985). Akinsola (1993) found further that there is a high positive correlation between who sees himself as capable of accomplishing a task and the realisation of such a goal. If the goal is realistic, he will accomplish it successfully and

thereby receive those positive evaluations which serve to enhance his view of himself. The student with an adequate mathematics self-concept, feeling that he can succeed in mathematics, will put forth the necessary academic effort, however, the student with an inadequate mathematics self-concept, feeling that he cannot succeed in mathematics will not put necessary academic effort to achieve in the subject. He therefore concluded that, improve self-concept in a subject will lead not only to greater happiness but to greater academic achievement.

The importance of self-concept stems from its notable contribution to personality formations. Self-esteem has to do with social competence since it influences how a person feels, how he or she thinks, learns, values himself or herself, relates to others, and ultimately, how he or she behaves (Clemes and Bean, 1996; Clark, Clemes and Bean; 2000). Byrne (1984) notes that much of the interest in the relationship between self-concept and achievement stems from the belief that academic self-concept have motivational properties such that changes in academic self-concept will lead to changes in subsequent academic achievement. Marsh (2000) submits that in reality, the relationship between self-concept and academic achievement is likely to be reciprocal, that is prior academic achievement affects subsequent academic self-concept and prior academic self-concept also affects academic achievement.

1.2 Statement of the Problem

Observations and reports from examining bodies revealed that a high percentage of secondary school students continue to perform poorly in mathematics examinations. This poor performance continues to generate much concern among parents, teachers, students and other stakeholders in the education business. The failure is likely to be caused by some factors like low socio-economic status of the family, students' attitude, poor family structure, poor study habit, intellectual ability, parents' education, income and occupation, school variables, teachers' variables, availability of equipment, peer influence, self-efficacy, teaching strategy and methods as well as the age of the mother at the birth of the child. As a result of these factors, this study sought to investigate the extent to which some home background variables, academic motivation, self-concept determine attitude and achievement of secondary school students in mathematics in Ogun State, Nigeria. The study also sought to find the causal-effects of these variables on students' cognitive achievement in mathematics at the senior secondary school level.

1.3 Research Questions

In carrying out this study, the following research questions were addressed:

Q1: What is the most meaningful causal model involving the listed home background variables (age of the mother at birth of the child, parents' education, occupation and support, number of children in the family), academic motivation, self-concept on students' attitude and achievement in mathematics?

Q2: What are the directions, as well as, estimates of the strength of the causal path of the variables in the model?

Q3: What are the direct and indirect effects of the variables on students' attitude and achievement in mathematics?

Q4: What proportions of the total effects are:

(a) Direct; and

(b) Indirect?

1.4 Significance of the Study

In view of the importance accorded mathematics as a subject in the society, this study is an area worthy of academic attention in the course of our struggle to actively participate in the technological growth of the world. It should also be noted that the end of the secondary school is the beginning of identification of potential and how far a student can go in pursuit of his/her academic career.

It would be an understatement to say that much has not been done in previous studies on academic achievement of students in mathematics (Abrego, 1966; Aiken, 1970, 1971, 1976; Beattie, Deichmann and Lewis, 1973; Aghenta, 1982; Aiken, 1986; Eccles, 1989; Fennema and Sherman, 1995; Brodie, 2000; Dave, 2003; Campbell and Connolly, 2004; Adeleke, 2007), but, there has not been a single research study which considered many indicators of mathematics education at the secondary school with a view to establishing their combined influence on students' academic achievement.

Mathematics achievement involves a complex interaction of factors that have specific direct and/or indirect effects through other factors on school outcome. Although, the relationship between mathematics achievement and factors such as self-concept, home background and students' attitude has been widely studied, it is important to explore other factors that contribute significantly to the students' mathematics achievement such as academic motivation, mother's age at the birth of the child and parents' supportiveness. This would help fill the existing gap in the research works carried out in this area. In addition, it

could pave the way for more comprehensive research on this area of study. Also, most of the empirical studies conducted in mathematics focused on the topic difficulties, problems encountered in the teaching of the subject, perception of teachers teaching the subject and attitude of students without giving due attention to such factors conceived in this study which underscore the study's significance.

The outcome of this study with respect to the selected variables investigated would therefore be significantly used as a pointer by researchers, since it provides additional empirical data for a better understanding of some of the factors that account for different levels of students' performance in mathematics. It also adds to the field of research on academic motivation, self-concept and mathematics achievement. Further, the continued poor performance of students in mathematics in the country with the centrality of the subject to science, technology and indeed basic living skills in a modern society are factors on which the significance of the study could be predicated. More importantly, this study differs from related studies in that it adds academic motivation, mother's age at the birth of the child and self-concept to the study of mathematics. It also serves as an insight for policy makers and educational planners in the State. Finally, it increases the knowledge of stakeholders in the education business on how the aforementioned factors affect learning outcomes in school mathematics.

1.5 Scope of the Study

The researcher was strictly interested in investigating the influence of some predictors believed to be affecting students' academic achievement in mathematics and in providing a causal explanation of variation in attitude and achievement in the senior secondary school mathematics. Thus the study only accounts for the extent to which home background variables (age of the mother at birth of the child, parents' education, occupation and support, number of children in the family), academic motivation, self-concept determine students' attitude and academic achievement in senior secondary school (SSS) mathematics. Other extraneous factors were not considered as units of analysis. The study was limited to SSS 1 students from selected secondary schools in Ogun State, Nigeria. It used the path analytic technique to establish and estimate the paths of inter-causal direct and indirect linkages between home background variables, academic motivation, self-concept, attitude and achievement in mathematics.

1.6 Definition of Terms

Attitudes: Attitudes are a position taken or an opinion with respect to a construct, object or an event. Attitudes are considered to have cognitive, affective and behavioural components. The cognitive component refers to ideas, beliefs and convictions about objects or situations. The affective components refer to feelings, which though are internal and personal, manifest in visible behaviour. The behavioural components on the other hand refer to visible physical response to specific attitudinal object or situation, based on the cognitive and affective attitude.

Attitude towards mathematics: An opinion or position taken with respect to a construct, object or an event in the specific area of the subject (mathematics). That is, one's disposition towards mathematics as a subject. In this study, the tendency of an individual to act, respond or react either positively or negatively towards mathematics was measured by Attitude Towards Mathematics Questionnaire (ATMQ).

Achievement in mathematics: These are scores obtained by the students in multiple-choice cognitive tests based on aspects of the Junior Secondary School Three (JSS 3) mathematics curriculum covered by the participating schools. In this study, achievement of mathematics tasks was measured by Mathematics Achievement Test (MAT).

Socio-economic status: Socio-economic status involves a combination of social and economic factors, relating to income and social position considered as a simple factor. The socio-economic status therefore is a way of dividing members of the society in terms of wealth, prestige and life chances. In this study, socio-economic background means the type of home the students come from, parents' educational qualifications, occupation and support, number of children in the family and academic material possession at home.

Learning outcomes: These are the objectives to be achieved by the end of an educational enterprise. The learning outcomes considered in this study are the cognitive domain of Bloom's taxonomy of educational objectives. It is used to denote measurable behavioural expectations from the students in terms of:

(i) students' attitude to mathematics

(ii) students' achievement in mathematics.

Mathematics self-concept: Self-concept theory consists of interpretation of human personality and consequently of human behaviour. In this study, mathematics self-concept is used as the perceptions, beliefs, feelings, attitudes and values which the individual posses as part or characteristics of himself in relation to learning mathematics.

Educational environment: These are the complex physical factors that make up our surroundings and in turn affect us. The environment consists of objects, materials or persons which interact in a complex way to influence the behaviour, development and academic attainment of a child. For the purpose of this study, educational environment include the forces of family as well as social and economic issues that students may deal with on a day-to-day basis.

Senior school students: Students who passed all the necessary requirements and finished the junior secondary school stage. Their ages range from 12 to 16, in this study. They are male and female who are in their senior secondary school one (SSS 1) in Ogun State, Nigeria.

Rural area: Rural area is a remote part of a local government of a state where social infrastructures, amenities and utilities like water, electricity, hospital have not been adequately provided.

Infant mortality: The infant mortality rate is the number of deaths of infants under one year of age per 1,000 live births in a given population.

Neonatal mortality: The neonatal mortality is the number of deaths of infants less than 28 days of age per 1,000 live births.

Perinatal mortality: The perinatal mortality encompasses both neonatal deaths and fetal deaths per 1,000 live births (Fetal death is death in uterus at 20 weeks or more gestation).

Post-neonatal period: This is the period from 28 days to 11 months of age.

Parental support and involvement: In this study, parental support and involvement is the degree to which parents value school (education) and provide support and encouragement for education.

Path-analysis: Path-analysis is a causal modeling that examines whether a pattern of inter correlations among variables "fits" the researcher's underlying theory of which variables that are causing others are postulated to be the potential determinants of the effects, and then attempting to isolate the separate contributions of the effects made by each cause or predictor variable. In this study, path-analysis model is designed to shed light on the tenability or otherwise of a theoretical causal model formulated by the researcher on the basis of knowledge and theoretical considerations.

Pathways: These are the routes to the two criteria variables, attitude and achievement. They traced out the direct and indirect influence of some selected variables on students' attitude and achievement. The method is based on the construction of a diagram in which every included variable, measured or hypothetical, is represented by arrows either as completely determined by certain order or as an ultimate factor having causal connections to the criteria variables. In this study, the method of path-analysis is applied to complete the linear relationships among the variables with the direction of causation taken into account.

Specification of the model: The specification of the model is a formal declaration of the researcher's beliefs regarding the causal links among the variables.

Exogenous variable: This is the variable whose variability is assumed to be due to causes outside the causal model. No attempt is made to explain the variability of an exogenous variable or its relation with other exogenous variables. In this study, variables X_1 (age of mother at the birth of the child) and X_2 (parents' education) are the exogenous variables. A curved line usually depicts the correlation between exogenous variables X_1 and X_2 with arrowheads at both ends. This indicates that neither of the variables is conceived as being the cause of the other.

Endogenous variable: This is the variable whose variation is explained by exogenous or other endogenous variables in the causal model. An endogenous variable treated as dependent variable in one set of variables may be conceived as an independent variable in relation to other variables. It is not usually possible to account for the total variance of such a variable.

Direct effect: The direct causal effects of the exogenous variables are the paths in the form of unidirectional arrows which are drawn from the variables taken as causes (independent) to the variables taken as effects (dependent).

Indirect effects: An indirect effect occurs when a variable affects an endogenous variable through its effect on another variable known as an intervening variable. In a path diagram, indirect effects are identified by a chain of two or more straight arrows all going in the same direction. The value of an indirect path coefficient is determined by finding the product of all path coefficients in the chain.

Reproduced correlations: These are the bivariate correlations that would be produced if the causal model is to be correctly specified. If the observed and the reproduced correlations are reasonably close (say, within 0.05 of each other), it can be assumed that the model is consistent with the empirical data. Larger discrepancies indicate that the model is not consistent with the data and model revisions should be considered. Before the obtained estimates of path coefficients can be used to describe the causal effects among the variables, one should determine whether or not the model is consistent with the observed empirical correlations among the variables. This is typically accomplished by obtaining the reproduced correlations; that is, those logically implied by the hypothetical or theoretical model and comparing them to the empirical correlations.

Trimming of paths: Trimming means cleaning or removing the causal paths that are not meaningful and significant at the specified alpha level.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

When students achieve poorly in academic work, everybody gets concerned; parents, teachers, the institutions and students blame one another as being responsible. It is worthwhile to note that each of these has a part to play in effecting students' achievement. Attempt is made here to review studies on related literature. Literatures related to this study are discussed under the following headings:

2.1 Students' attitudes and achievement in mathematics.

2.2 Socio-economic background and students' academic achievement.

2.3 Age of mother at birth of the child and the child's academic achievement.

2.4 Parents' support and the educational academic achievement of senior secondary school students in mathematics.

2.5 Social theories related to students' academic motivation and self-concept.

2.1 Students' Attitudes and Achievement in Mathematics

One of the most important causes of variation in achievement is attitude (Lawrenz, 1986). Attitude is said to be the basis of cognitive development and motivation; and these greatly affect performance. The view that attitude is very important in learning and that it affects achievement has been investigated by many researchers. According to (Fishbein and Adjzen, 1981), attitudes are learnt prepositions to respond in a consistently favourable or unfavourable manner with respect to a given object. It represents covert feelings of favourability or unfavourability towards an object, person, issue or behaviour (Hatzois, 2002). According to Fishbein and Adjzen (1981), attitude is related to academic achievement since attitudes are learnt over time by being in contact with the subject area. Information about the subject area is received through instruction and consequently attitude is developed. Moreover, if a person is favourably predisposed toward an academic course, that favourable disposition should lead to favourable behaviours like academic achievement. Achievement on the other hand, is a measure of what a person has learnt within or up to a given time (Atkinson, 1995). It is a measure of the accomplished skills and it indicates what a person can do at present (Atkinson, 1995).

According to Bandura (1977), attitude is often used in conjunction with motivation to achieve. It is a key factor in the extent to which people can bring about significant outcomes

in their lives. The relationship between attitude and academic achievement is best summed up by Bandura (1977)

> *"The evidence is relatively consistent in showing that efficacy beliefs contribute significantly to level of motivation and academic achievement. They predict not only the behavioural changes accompanying different environmental influences but also differences in behaviour between individuals receiving the same environmental influence, and even variation within the same individual in the tasks performed and those shunned or attempted but failed (Bandura, 1977)*".

Aiken (1970) referred to attitude as "a learnt predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept, or another person". McLeod (1992) added that the positive or negative feeling is of moderate intensity and reasonable stability. Neale (1996) defined attitude towards mathematics as an aggregated measure of "a liking or disliking of Mathematics, a tendency to engage in or avoid Mathematical activities, a belief that one is good or bad at Mathematics; and a belief that Mathematics is useful or useless".

In a more objective term, attitude may be said to connote response consistency with regards to certain categories of stimuli (Anastasi 1990). In actual practice, attitude has been most frequently associated with emotionally toned responses (Anastasi 1990). Zimbardo and Leippe (1991) defined attitude as favourable or unfavourable evaluative reasons whether exhibited in beliefs, feelings, or inclinations to act towards something.

According to Myres (1996), attitude is commonly referred to as beliefs and feelings related to a person or event and their resulting behaviour. This means that when individuals have to respond quickly to something, the feeling can guide the way they react. Psychologists agree that knowing people's attitude is to predict their actions. Attitude involves evaluations. Attitude is an association between an object and our evaluation of it. When this association is strong, the attitude becomes accessible. Encountering the object calls up the associated evaluation towards it. One acquires attitude in a manner that makes one sometimes potent, sometimes not. She concluded that attitudes predict actions if other influences are minimised, if it is specific to the action and it is potent.

In considering the academic achievement of students as being greatly influenced by their attitude towards different subjects, findings revealed that attitude affects achievement either positively or negatively. Greenwald, McGhee and Schwarts (2002) define mathematics attitude as how an individual feels about mathematics. Javis and Pell (2004) contend that

when students were taken to a science centre and given exposure to space science, the students' attitude towards mathematics was positively affected. Babatunde (1982) studied the attitude of students and their academic achievement in biology and found that there was a positive attitude to biology but weak correlation between attitude and achievement in biology. This indicates that students can have a positive attitude towards a subject and yet not achieve well in it. Jegede (1987) also studied the effects of science related attitude on achievement in high school and found a positive relationship between attitude and cognitive achievement. Dulton (2004), found that high achievers have more positive attitude towards mathematics than the under-achievers. He said further that when students were asked to list their subjects in the order of preference, the achievers gave mathematics a significantly high ranking than their other counterparts. Lawal (1993) also studied the effects of attitude on achievement in high school mathematics and found a positive relationship between attitude and cognitive achievement.

There is considerable evidence to support the contention that attitude beliefs contribute to academic achievement by enhancing the motivation to achieve (Bandura, 1977). Schunk (1989) in a number of studies had shown that children with the same level of intellectual capability differ in their performance as a function of their level of attitude. Enemark and Wise (1981) demonstrated that the attitudinal variables were significant indicators of mathematics achievement, and few of the attitudinal variables also showed strong relationship with mathematics achievement even after background and academic orientation variables were controlled. Steinkamp (1982) concluded that primary among the variables that determine achievement in mathematics is attitude to it. These conclusions represented the view of a strong relationship between achievement and attitude.

Cheung (1988) prepared a study to examine the relationship between mathematics achievement and attitude towards mathematics in junior secondary schools in Hong Kong and found that the correlation between attitude and mathematics achievement were positive. It showed that the more positive the students' attitude towards mathematics, the higher the achievement. These conclusions represent the view of a strong relationship between attitude towards mathematics and achievement in it, with correlations above 0.40, as supported by a number of researchers (Kloosterman, 1991; Minato, 1983, Minato & Yanase, 1984; Randhawa & Beamer, 1992). Still, other findings show that although the attitude towards mathematics and achievement in its relationship is statistically significant; it is not very strong from a practical perspective, with correlations ranging from 0.20 to 0.40 in absolute value (Aiken, 1971; Jacobs, 1974; Quinn, 1978). The work of Tuckman (1999) compared the

task performance of students at high, intermediate, and low levels of attitude with regards to the task. The results reflect a clear relationship between attitude beliefs and academic productivity.

Attitude contributes substantially to the difficulties encountered by students in learning and understanding of mathematics. A learner's attitude relates to all the facets of his or her education. According to Ellis (1996), the attitude of a learner towards science or mathematics will determine his attractiveness or repulsiveness to science or mathematics. This, invariably, will influence the learner's achievement in that subject. He concluded that the attitude of students towards science subjects is related to the achievement in science. Dekrefflin (2003) found that individual learners who have higher self-concept aim more at success in academics than those with low self-concept. He also found that students with low self-concept maintain a low level of confidence, negative self perception and low level of performance.

In both theory and practice, a strong relationship between attitude towards mathematics and achievement in it has long been assumed. As illustrated by Suydam and Weaver (1975), teachers and other mathematics educators generally believe that children learn more effectively when they are interested in what they learn and that they will achieve better in mathematics if they like it. Therefore, continual attention should be directed towards creating, developing, maintaining and reinforcing positive attitudes. A number of researchers have demonstrated that the attitude towards mathematics and achievement in its correlation is quite low, ranging from zero to 0.25 in absolute value, and they have concluded that the attitude towards mathematics and achievement in its relationship is weak and cannot be considered to be of practical significance (Abrego, 1966; Deighan, 1971; Vachon, 1984; Wolf & Blixt, 1981). Robinson (1975) concluded that achievement in mathematics accounts for, at best, 15% of the variance in attitude towards mathematics, indicating that the relationship has no useful implications for educational practice.

Aiken (1970) stated that "the correlations between attitude and achievement in elementary school, though statistically significant in certain instances, are typically not very large". Later, Aiken (1976) noted that the attitude towards mathematics and achievement in its relationship is usually positive and correlations ranging from 0.20 to 0.40 can be considered practically meaningful in behavioural sciences (Cohen & Cohen, 1983; Rosenthal & Rubin, 1982). Wilson (1983), meta-analysed the relationship between attitude towards science and achievement in science and found that the overall relationship was small, but positive (e.g. about 0.15). According to him the relationship between attitude and

achievement were greater in single sex classes than in mixed sex classes. Shrigley (1990) similarly concluded that there was a modest positive correlation between attitude and achievement. According to Fishbein and Ajzen (1975 and 1981), there are at least two factors that might contribute to the level of relationship found in attitude and achievement. In their models on how attitude and behaviour interact, they argued that only specific behavioural intentions assessed shortly before behaviour are likely to show strong relationship with behaviour. In their models, behavioural intentions are influenced by attitudes, social support and other contextual factors.

General measures of attitude cannot be expected to strongly predict future behaviour. A second factor may be that relative attitude is as important as the absolute level of attitude in influencing achievement behaviour. For example, devoting time to Biology homework versus English homework on a given evening might be influenced by the relative strength of a student's attitude whether his/her attitude is positive or negative overall. Of course, external factors will influence such choices as well. Most researches on attitudes towards science and achievement have not examined the relative strength of attitudes towards subject matters.

Significant research effort has focused on analysing the attitudes of male and female students towards science and mathematics. Fleming and Malone (1983) have conducted a meta-analysis of research on students' characteristics and science achievement and attitudes for studies conducted between 1960 and 1981. Their findings show that males at the elementary and high school levels showed greater preferences for science than did females, but the Effects Sizes (ES) indicate weak relationships (0.18 and 0.12 respectively). At the middle school level, females displayed more positive attitudes than males (ES = -0.11).

In a review of meta-analyses, Anderson (1983) reported that gender differences in achievement and attitude were small, but did indicate that achievement differences seemed to be greatest at the middle school level. Haladyna and Shaughnessy (1982) similarly reported a weak relationship between gender and attitude towards science. In their meta-analysis of studies conducted between 1960 and 1980, gender accounted for approximately three per cent of the variance in attitudes towards science. Females typically have been regarded as having more negative attitudes towards the physical science and mathematics (Kahle & Lakes, 1983; Mullis & Jenkins, 1988; Nelson, Weiss and Capper, 1990; Kahle and Meece, 1994; Lawries and Brown, 1992).

Gross (1988) reported on a study done on the attitudes towards Mathematics of 4^{th}, 6^{th}, 8^{th}, and 12^{th} grade students in Montgomery County, MD. Females liked mathematics somewhat less than males. They perceived less utility in mathematics and that their mothers

have less ability in mathematics than their fathers. Friedler and Tamir (1990), reviewed 15 years of research on gender differences in achievement and attitudes towards science among Israeli students. Gender differences were minimal in elementary school but increased from middle school onward. Increasingly throughout secondary school, males had more positive affection towards science topics, elected more science courses, and displayed greater interest in science careers.

Attitude-achievement relationship must be dynamically reciprocal and continually evolve as the individual develops. Prior achievement is likely to be one of many influences on attitude development; attitudes are one of many influences on subsequent achievement. In support of this position, Schibeci and Riley (1986); Pederson and Carlson (1997) found that, in a cross-lagged panel analysis of 70,000 students, evidence supported a substantial causal link between achievement and attitude. In contrast, Schibeci and Riley (1986), in a structural modeling study of National Assessment of Educational Progress data, found evidence of a causal link from attitude to behaviour. Taken together, these studies suggest complex and developmentally dynamic relationships. As noted above, examining relative attitudes may be important in understanding the attitude-achievement relationship. According to Marsh (1990), students' relative attitudes towards subject matter affect specific achievement, behaviour and motivation. These arguments support the need to investigate developmentally the patterns of subject matter and specific attitudes.

There are considerate evidences from research on attitudes and their relationship with education, which show that the attitude of a child is often a satisfactory predictor of his/her performance in school. Biggs (1994) also found that the correlation between attitude and Arithmetic was significantly higher than that between any other attitude and its corresponding achievement. Lawal (1993) carried out an investigation on the attitude of secondary school students to programme learning tasks and found positive correlation between attitude and achievement of students. Katz (1998), points out that favourable attitudes are developed towards objects which facilitate the attainment of individual needs. According to him, the achievement of a child in science may eventually determine the attitude he/she develops towards the subject.

The proposition, therefore, is that a child who is achieving highly in science, no matter how bad the laboratory, teacher, method and other factors are, will still be favourably disposed towards the subject. If, on the other hand, all the other factors mentioned above are adequately taken care of, and the achievement is low, such a student owing to this (low achievement) may dislike the subject. Studies like those of (Okpala and Onocha, 1985;

Yoloye 1994) show that there are relationships between attitude towards science and achievement in science. They found also that parents who show more interest in their child's studies often get involved in their child's homework and the child often performs better in the subject.

Over time, researchers have found that attitudes towards Mathematics are often related to performance. To measure attitudes and performance in mathematics, Greenwald, McGhee and Schwartz (1998) used a procedure called the Implicit Association Test (IAT) to provide the degree of association between attitude and achievement in subjects like Mathematics and Arts. They discovered that the IAT measures a relative difference score between performances of students towards Mathematics when compared to the Arts based on attitude.

2.2 Socio-economic Background and Students' Academic Achievement

Among the various social groups, the home occupies the first and the most significant place for the development of the individual. Dubey (1999), Lorenzo (2003), Neil and Keddie (2001), and Sharma (2004) concluded that early home environment is a significant predictor of mental development and at the same time the home is of extraordinary importance in the development of social intelligence. It does not only provide the hereditary transmission of basic potential for the child's development but also provides environmental conditions and personal relationships (Valenzuala, 2003). The foremost duty of the parents is to provide their child with need satisfaction by creating a home, a climate conducive for his/her healthy social adjustment. If the overall home environment favours the development of good social attitudes, there are chances that those children will become socially more intelligent. Children from favourable home environments are found to be warm-hearted, outgoing and socially more intelligent than children from unfavourable homes (Rani, 1998).

One of the favourable home conditions is living with both parents. According to Shinne (1978), rearing in father-absent families is often associated with poor performance on cognitive tests. Anxiety and financial hardship in father-absent families may also contribute to the observed effects. Milne (1986), found that the number of parents in a household did not have a statistically significant effect on the achievement of the child directly, but, has a large proportion of the total effect on subsequent home background variables, particularly income and occupation. Thus, he concludes that being raised in a single-parent family is associated with low achievement and the predominant effect results from the low income of the single parent and not the mere absence of a parent.

Socio-economic status is a very important and basic parameter to study any characteristic prevailing in the society because this is what determines and influences one's place in any social setup. The socio- economic status influences not only the physical setting where the home and neighbourhood are located but also the intelligence process. Thus, the intelligence behaviour could be the product of the socio-economic status to which an individual belongs (Gottfried, 2001). Children from high socio-economic status because of their superior environment are more confident and sure of themselves as compared to children who come from lower class families. Children from low socio-economic status start out with feelings of inferiority and inadequacy and these in turn affect their social intelligence. Comber and Keeves (2000) also found that high socio-economic group demonstrated more sociability, emotional stability and thoughtfulness in comparison with low socio-economic group. This finding was in agreement with that of Simon (2004) who found that adolescents who come from homes characterised as authoritative are better adjusted and socially more intelligent, they are confident about their abilities, competent in areas of achievement and less likely to get into trouble like their other counterparts. This shows that with the increase in protectiveness, there would be an increase in confidence.

Some home background variables like parents' education, parents' occupation, family income and language of the home have been observed as those that can contribute to the achievement of the child in the school. Carlson (1997) identifies most of these home variables that can affect achievement of the child as language, activities of the family and work methods. There is however no doubt that such variables as the parents' aspiration and attitude to education could also affect the child's achievement. Viewing the activities of the family as a variable that could enhance a child's achievement in science, Carlson explained further that in homes of parents with high socio-economic status, toys and gadgets which the child can manipulate are found. Many skills can be developed by the child while interacting with these materials.

Children's academic achievement was found to be affected by varying family processes. Campbell and Wu (1994) said that the home environment and family processes provide a network of physical, social and intellectual forces and factors which affect the students' learning. According to them, the family's level of encouragement, expectations, and educational activities in the home are related to socio - economic status, while Song and Hattie (2004) agreed that families from different socio-economic groups create different learning environments that affect the child's academic achievement. It has been accepted that the environment (both in and outside the school) in which the child grows has a great

influence on the academic achievement of the child. Researchers like Ellis (1996), Bookcock (2000), Brodie (2001), and Lloyd (2002) showed a positive relationship between socio-economic status and academic achievement of the students. In the study conducted at the Monash University, House (2002) found that the effect of socio-economic status on achievement in mathematics and social studies was significant.

Peterson (1989) found that socio-economic status significantly affected achievement in Biology of higher secondary pre-medical students when taught through a linear programme. In the study by Hurd (2001), it was found that the coefficient of correlation between achievements and socio-economic status was positive and significant when the effect of pupils' attitude towards science and towards science education was compared. According to Marjoribanks (2003), the high achievers had a high socio-economic status and they hailed from highly educated families. Lockheed, Fuller and Nyirongo (1989) show that students belonging to upper socio-economic status groups showed better academic achievement than students belonging to lower socio-economic status groups. With reference to achievement in Mathematics, Howley (1989) establishes that the socio- economic status of students affected their achievement. Though the high socio-economic status and average socio-economic status groups did not differ, the high socio-economic status and low socio-economic status groups did differ significantly on achievement in mathematics.

In the study by Brown (1999) which was conducted in West Bengal, the socio-economic status was one of the primary factors responsible for low achievement in general science. Studying the relationship between certain psycho-sociological factors and achievement of student-teachers in teacher training institutes of Andhra Pradesh, Lloyd (2002) showed that socio-economic status influenced the total achievement, as well as achievement in theory and practical, taken separately by the student-teachers. Gyles (2000) and Frazer (2002) studied the influence of environment as a factor to promote academic achievement among students. The former concluded that an urban atmosphere was more conducive to better achievement than a rural environment. The latter brought out that the effect of environmental facility on both general academic achievement and achievement in English Language was significant. The environment provided to the student by his/her home has drawn the attention of Keeves (2000), Stigler (2002), Walberg (2001), Moore (1993), Comber and Keeves (2000), Trusty (1999), Iverson and Walberg (1992) and Song and Hattie (2004). A significant difference between high achievers and low achievers on the home variables (namely educational environment, income, spatial environment, social background, provision of facilities, and parent- child relationship) was shown in Lesser's (2001) study.

There is no doubt that parents' attitudes help to condition their children's attitudes. A parent who shows complete disregard for education might have some effect upon his/her children's educational progress. Hurd (2001), in his studies on attitude says "parents' socio-economic status is one of the factors influencing a child's academic performance". According to him, the home builds the foundation for a child's formal education, the society's attitudes, beliefs and behavioural expectations which can be said to affect the child's personalities are introduced to the child within the family circle. Popham (2005), reported that students' intelligence, socio-economic status, teachers' characteristics and usefulness of information taught were significant factors in students' achievement.

The importance of family in shaping the educational goal and scholastic performance of its members has been emphasised by sociologists, psychologists and other elites. Chessmann (2002), argues that students' responses are strongly coloured by the attitudes and expectation which they bring with them from their family and neigbourhood. In the same light, Musgrave (2000), stated that influence of parents on the standard, values and behaviour of their children (even in the teens) is generally supreme. The attitude and values that children bring from various homes usually reflect in their performance in the school. He said further that a child that comes from an educated home would like to follow the steps of his/her family and by this, work actively in his/her studies. Taiwo (1993), showed that parents' educational background could influence the academic performance of students. This is because the parents would be in a good position to be second teachers to the child and even guide and counsel the child on the best way to perform well in education and provide the necessary materials needed by him/her. He said further that parents who have more than a minimum level of education are expected to have a favoured attitude to the child's education and to encourage and help him/her with school work. They provide library facilities to encourage the child to show examples in activities of intellectual type such as reading of newspapers, magazines and journals. They are likely to have wider vocabulary by which the children can benefit and develop language fluency.

The parents' interest and encouragement have a great impact on student's performance in the school. More so, children's school achievement is specially accounted for by the variation in parental attitudes than by the variation in the material circumstance of parents. Habel (1986) said that the psychological make up of individual parents has a great influence on the behaviour, attentiveness and performance of a child in the school. Lankard (1995) points out that where parental encouragement is low, relatively few students, regardless of their intelligence or socio-economic status levels, plan to go to college. On the

other hand, where parental encouragement is high even when socio-economic status and intelligence are relatively low, more students plan to go to school. They concluded that the way and manner in which the family is organised and the direction in which the family system is changing is important as this reflects on the child's performance in school.

The social and economic environments that may affect the child's educational attainment include the level of income and wealth of the parents and the occupational status. The parental attitudes towards education, the aspirations of both parents and the children in education also influence the child's academic attainment. Analyses of parents' education have noted varying programme emphases on the child's physical health, mental health and academic competence. According to Yee and Eccles (1988), different disciplines engaged in by parents through their various education have different emphases on the education of their children. It thus appears that career modelling from parents could make a noticeable impression on children's intellectual development. For example, mothers who engage in menial jobs like hair dressing, sewing, petty trading, farming, catering among others, are more likely to have less contact hours with their children. This can affect the vocabulary and communication skills of their children. These mothers will most likely want their children to toe the line of their trade and as a result may not bother to lay much emphasis on the early intellectual development of their children.

Lankard (1995), indicated that motivation, norms, beliefs, values, habits and attitudes of people with the environment and the expectations the parents have for their children influence the latter's educational performances. Lamberts (2001), asserted that parents who are well educated and who have average income to select residence in areas that provide well for the education of their children will stimulate them more than the low income families who live in areas that provide less stimulation for the education of their children. Karnel (2001), confirmed that the more highly educated parents value education, the more they will support their children's educational endeavours and the more likely the children succeed in their academic achievement. They argued further that children from a given family background, when put in school of different social composition, will achieve at quite different levels. This effect is, however, less for the students of lower family.

William and Chelser (2005), assert that, in a family that can scarcely afford food, shelter and clothing, pressure is usually exerted upon the young to leave school early so as to secure employment and thereby help the family. The parents' ability to provide books and necessary equipment for education; combined with a positive attitude stimulates the children to learn. It is also assumed that children from the upper class homes have good health and

proper welfare which assist them in their learning. Further, Comber and Keeves (2000), argued that many of the parents in the cities or urban areas are professional people who understand the value of education; such parents motivate their children to learn effectively and also provide a lot of incentives that can reinforce the desire to learn. Here, it needs be classified that the result of intelligence test which tends to place the upper class children at an advantaged position may be used in grouping the children according to their ability and intelligence. This division of children into groups does not necessarily connote that children from a particular socio-economic class are more intelligent, but it may be that the intelligence test have greatly reflected the learning of the children. In this wise, the children that are placed at more advantageous position in the social environment get better marks due to their opportunities for learning.

Parents also remain a main contributor to their children's socialisation, attitudes and career aspirations (Steinberg, 1993). Steinberg and Silverberg (1986), found that adolescents' educational aspirations were more related to their parents' educational goals for them than to their best friends' goals. Simpson, Koballa, Oliver and Crawley (1994), concluded that attitude is a "crucial factor" in career choice. In a meta-analysis of factors that influence science achievement, Staver and Walberg (1986) argue that parental factors such as interest in the child's school work, facilitation of homework and control of television watching, along with other external-to-school factors, contributed more to student achievement than did school controllable factors. Maple and Stage (1991) similarly found that parental variables such as parental education and interest in the child's school work contributed to choice of Mathematics / Science related majors.

Schbeci and Riley (1986), using National Assessment of Educational Progress data, confirmed the importance of parents' involvement in their child's education and student's academic achievement, but their study did not separate socio-economic status from parental variables. Wang and Wildman (1995) posit that parental support behaviours related to science significantly contributed to science achievement in the Longitudinal Study of American Youth. Lockheed, Fuller, and Nyirongo, (1989) demonstrated that family background variables significantly contributed to students' achievement in the third world countries. Yee and Eccles (1988) contend that parents' perceptions and attributions about their children's success and failure in mathematics influenced their children's attributions. Thomas (1986) indicated that encouragement from parents, as well as peers, related to both interest in science classes and science career goals. In another literature, Kahle and Meece (1994) reported that parents seem to encourage boys more in the mathematics and science

areas than they do girls; but did not report studies of the direct relationships of parents' and children's attitudes towards science.

Much of the research on students' attitudes and perceptions of competence have involved students older than the elementary school years (Kahle and Lakes, 1983; Kahle and Meece, 1994). Stronck (1998) summarise research on children toy preferences and parental variables related to them. As young as age 3-4, boys prefer playing with toy vehicles, balls and blocks; girls prefer dolls, domestic items, dressing up and art. He concluded that across studies, parents reinforce such gender-typed play activities especially for boys. Such differences in play patterns may relate to later observed differences in preference for physics versus biology.

Parents' involvement has a significant positive impact on students' outcomes throughout the elementary, middle school and secondary years. Several of these studies indicated that parents / family involvement have a lasting effect throughout the educational careers of students (Frendrich, 1999; Kasprow, 2001; Trusty, 1999; Weissberg, 2001). According to Lawrie and Brown (1992), parents' perceptions of the abilities of their children may be a powerful developmental influence on how the children will come to view their ability. In turn, children's perceptions of their abilities will influence expectations for success, achievement, interest in school subjects, and future careers (Eccles, 1989; Gross, 1988; Haladyna and Shaughnessy, 1982). Parents appear to recognise the importance of mathematics and reading for both boys and girls. Mathematics and reading are the two major focus subjects throughout elementary school and parents clearly have recognised the importance of these basic skills.

In the study by Trusty (1999), home environment was found to be an important variable which could cause underachievement among the gifted. Studying the effects of home environment on the cognitive styles of students, Habel (1986) avers that the factors of home environment, like recognition of the child's achievement, parental aspiration, forbearance for the child's wishes, parental affection, encouragement for initiative and freedom, etc., had positive and significant correlation with each of the four modes of cognitive styles studied. Hess, Chihmei and McDevitt (1999) indicated some influence of aspirations of father and mother over children's academic achievement. Stigler (2002) showed that birth order did not affect the speed of reading, comprehension and vocabulary of students.

Bamidele (1987) asserts that parents' aspiration for the child could affect his/her achievement in school while Morish (1995), believes that well educated parents will wish their own children to benefit as they have done from their good education and will provide

the necessary cash in order that this may be accomplished. Expressing this in terms of high socio-economic home, Ezewu (1983), said that in order for high socio-economic status' families to maintain their status, they do everything possible to ensure that their children attend the best nursery and primary schools which guarantee admission to highly placed secondary schools. These highly placed secondary schools provide the best routes to university education, thus guaranteeing access to a prestigious occupation and high income for their children.

The importance of home environment variable in the academic success of pupils has generated some controversy. For instance, Henderson and Merritt (2000) and Miller (1991) reported that a greater proportion of school dropouts are from low economic home environment, while Neil and Keddie (2001) argued that the difference in achievement between pupils is mainly genetic. In the light of this contention, Lankard (1995), Mizokawa (1998) and Popham (2005), advocated a theory of the combined effects of genetic and home environment factors as accounting for the variance in pupils' achievement.

Dave (2003) using a sample of primary school children and their parents in the United States, investigated the relationship between the home environment and academic scores. Six environment process variables were identified. These are achievement motivation, language models, academic guidance, activeness of the family, intellectuality of the home and work habit of the family. Dave reported that the home environment accounted for 50 per cent of the variance in the intelligence test scores. In support of the findings, Lankard (1995), indicated that the trend in environmental research related to the home is shifting from rather crude socio-economic variable such as occupation, education and sibling size, towards more subtle intra-family and interpersonal psychological variables such as the nature of intellectual expectations of the child, parents' intellectual aspiration for the child and opportunities provided for learning in the home.

Research by Rothman (2004), showed that the most important factor associated with the educational achievement of children is not race, ethnicity or immigrant status. Instead, the most critical factors according to him appear to be socio-economic factors. These factors as stated by him include parental educational levels, neighbourhood poverty, parental occupational status and family income. He thus concluded that if we do not consider how educational policies complement or conflict with policies related to family welfare, work, poverty, housing and neighbourhood conditions, then we will continue to face significant obstacles in attaining the goal of narrowing the achievement gaps. This conclusion clearly

points to the fact that differences in socio-economic background of students breed achievement gaps.

Coleman (1998) and Karnel (2001) observe that the relationship between socio-economic disadvantage and learning outcomes has been accepted almost as an article of faith by educators. Lloyd (2002), states that students whose parents were employed in professional and managerial occupation (higher socio-economic status) had the highest average scores and students whose parents were production workers or labourers (lower socio-economic status) had the lowest. Similar results were found by Teese (2004), in his analysis of the students' performance. He found clear and consistent trends for children from lower socio-economic background.

According to Campbell and Connolly (2004), the home plays a significant role in the early developmental year of a child. It can, therefore, be expected that the conditions at home exercises considerable effect on a child's experience. The kind of mental challenges to which a child is exposed at various periods is likely to determine the kind of mental abilities which he/she displays. Mullis (2002), notes that parents can take many positive steps to help their children, including the following: they can encourage students to pursue advanced course work, to invest significant amount of time in their homework and to devote more time to reading than to television. An interest in reading and learning can be fostered by reading aloud to children; holding family discussions about reading materials, school work and current events and encouraging frequent trips to the library to gather more information about interesting topics.

It is a generally known fact that children from different social classes do not generally achieve the same degree of academic success. The Robins' report of (2000) noted that generally, children from upper socio-economic status have 60 per cent greater chance of completing their education cycle than children from lower socio-economic status. Lamberts (2001) also believed that families with low socio-economic status often lack the financial, social and educational supports that characterise families with high socio-economic status. Due to poverty, these groups of families may have inadequate or limited access to resources that can promote and support children's development and school readiness. Zill, Collins and Howesken (1997), also agreed that children from families with low socio-economic status are at greater risk of entering schools unprepared than their peers from families with median or high socio-economic status. Comber and Keeves (2000) identified father's education and parents' education as predictors of science achievement. Stronck (1998), found a positive correlation between achievement in science tests and parental educational level. In his

studies, students of highly educated parents obtained high scores while those of uneducated parents obtained low scores in a science test. Similarly, Keeves (2000) reported that parents of high educational level had positive attitudes and ambitions towards school science, which had significant contribution to the level of the science achievement of pupils.

2.3 Age of Mother at Birth of the Child and the Child's Academic Achievement

A review of some research findings on families' participation on the upbringing of their children reveals that mothers play more prominent role in the upbringing of their children during their formative years. William and Chelser (2005) view the mother as the first child educator and the age at which she gives birth to the child matters in her life. They said further that that pregnancy is a challenging time for all women as they adjust to the challenges they experience and prepare to assume a new role as mother of one or more children. Even if a woman chooses to terminate her pregnancy, the very fact that she has been pregnant has a lasting effect on her. Age at the time of pregnancy may be a factor in a woman's adjustment, both physically and psychologically. Thus, the age at which she gives birth to the child allows her to have a stable or unstable mind which in turn affects her instinct and love towards the child.

Owing to this, teenage pregnancies have become a matter of public health issue because of their negative effects on perinatal outcomes and long term morbidity. According to Moore (1993), teenage pregnancy has been identified as a risk factor for adverse perinatal and long-term outcomes. The occurrence of low birth weight has been observed to be much higher among children of teenage mothers than among children of women beyond adolescence, and giving birth during the teen years has been found to be associated with a higher risk of pre-maturity, high prevalence of poverty, low birth weight, small for gestational age (SGA), low level of education, neonatal mortality as well as single marital status. These were also highlighted among other factors by researchers (Frazer, 2002; Satin, Leveno and Sherman, 1994; Olausson, Chattingius and Goldenberg, 1997). Some of the proposed explanations for these adverse birth outcomes are biological that is, a pregnant teenager who is still growing may be competing for nutrients with the fetus and pregnancy within two years of menarche increases the risk of preterm delivery.

Psychological factors may also be involved since many teenage pregnancies are unplanned, unwanted or discovered late. A pregnant teenager may lack the emotional maturity to take responsibility for a pregnancy even after she has decided to carry it to term. All these affect the composition of the child's brain which eventually affects the academic

performance of the child. William and Decoufle (1999) asserted that teenage pregnancy is a multifaceted problem with no single cause or cure. According to them, for a teenager, pregnancy comes at a time when her physical development is incomplete and available support systems may be limited. Again, pregnancy interrupts her education and makes it tremendously difficult for her to complete the developmental tasks of adolescence as well as those related to pregnancy and parenthood.

Another key reason for the negative influence of teenage childbearing is that it interferes with the process of schooling and human capital development which means that the mother's ability to gather resources will be reduced. She is more likely to be poorer than a woman who delays child bearing. Moore (1993) in his study on age at first child birth and later poverty said that poverty may prevent a teenage mother from providing resources that promote cognitive development such as high – quality child-care arrangement a stimulating home environment. Brooks-Gunn and Chase-Lansdale (2001) compared the birth outcomes of teenage mothers and older mothers and concludes that the teenage mothers are most likely to be at risk both biologically and socially for poor birth outcomes. This is because the older mothers are more likely to be married and to have a wanted pregnancy which makes them psychologically balance than the teenage mothers who have unplanned pregnancy and who are likely to be undereducated or live in areas with limited access to resources and services.

Brooks-Gunn, et al (2001) also affirmed that young mothers are socially and emotionally immature; we would expect them to have limited parenting ability. Coping with the demands of an infant is likely to be far more challenging for a teenager than for an older woman. Inconsistent and arbitrary discipline, which is more common among young mothers, has a negative impact on children's behaviour and on their social and emotional development. As a result, Brooks-Gunn and others (2001), expect a young age at first birth to adversely affect children's social and emotional adjustment. Even if a teenage mother has additional children when she is older, she may continue the patterns of parenting she established with her first child. Teenage mothers also tend to provide their children with less cognitive stimulation and less emotional support than do older mothers. In another related study, Rothenberg and Varga (1981) found that scores on a global measure of parenting were lower for the homes of children of teenage parents than for the homes of other children.

According to Brockert and Ward (2004), adolescent child bearing is risky because they are not yet matured both physically and psychologically to go through rigors of pregnancy. As the maternal age increased, the number of very preterm and moderately preterm deliveries decreased, the number of very low and moderately low birth weights

decreased, and neonatal and infant mortality also decreased. They noted further that teenagers are not the only age-group at high risk for poor birth outcome, but they have only received the most public attention. According to them, even though, women who give birth relatively late in their reproductive lives have fewer socioeconomic disadvantages than teenagers; they nonetheless share increased risks for poor birth outcomes as they stands the risk of having difficulties in conceiving and delivery.

Delayed childbearing poses its own biological risks, such as an increased likelihood of medical conditions like hypertension and diabetes which in turn may affect the brain composition of the child leading to congenital aberrations like hydrocephaly (mental retardation resulting from accumulation of fluid in the brain); microcephaly (mental retardation associated with a small skull and brain) and down's syndrome which are common with mothers over 35years especially when the mother has not borne her first child at that age and these may eventually affect the child's academic achievement. They therefore concluded that psychologically, the best time to have a child is probably between the ages 22 and 29.

Several studies (Frazer, Brockert and Ward, 2004; Humenick, 2003; Jacobson, 2006; Lee, Ferguson and Corpuz, 1988; Santelli, 2004; Wadsworth, Osborn and Taylor, 1984) indicate that young age by itself is not a risk factor for poor outcome of children from young mothers, but those young mothers who are from lower socioeconomic backgrounds may eventually leave their children in the hands of grand mothers who do not understand much about education. Thus, Brooks–Gunn and Fursternberg (1986) concurred that young mother is at higher risk for social and economic disadvantages than her teenage counterpart who is not pregnant and lives in the same social environment. According to them, being forced into adult roles before completing adolescent developmental tasks cause a series of events that affects the teenage mother's entire life. These events may result in a prolonged dependence on parents, lack of stable relationships, and lack of economic and social stability. In addition, many teenage mothers drop out of school during their pregnancy. This tendency may have as much to do with low academic achievement and low academic commitment as it does with the pregnancy. This is because many teenage mothers never completed their education and lack of education reduces the quality of jobs available to these individuals which in turn affects the academic achievement of their child.

Rosenheim and Testa (2006) asserted that childbearing at an early age is a strong predictor for need for assistance, especially in lower socioeconomic groups and when the pregnant teenage family will not support her. Schooling is critical to a young woman's prospects throughout her life. The amount of schooling a woman obtains affects her

occupation, her income, her chances of marriage, her risk of poverty and welfare dependence, and more generally, the quality of her own life and that of her children. Failure to be self-supporting logically follows lack of education and lost of career goals. In general, children of teenage mothers are found to be at a developmental disadvantage compared to children whose mothers were older at the time of their birth.

Many factors contribute to these differences, but the strongest evidence indicates that the adverse social and economic conditions facing teenage mothers are significant factors. These factors result in high rates of family instability, disadvantaged neighbourhoods, and poor educational experiences for their children. They said further that the stigma attached to teenage mothers who get pregnant out of wedlock is such that they are considered by the people in the society as bad influence; causing shame to them and their family, and this eventually leads to their social maladjustment.

Researchers have acknowledged the influence of maternal education on poverty, marital status, and more generally, family background. Often, even after controlling such factors, negative effects have been observed (Card, 1981; Frazer, Brockert and Ward, 2004; Lee, Ferguson and Corpuz, 1988; Wadsworth, Osborn and Taylor, 1984). While in other studies, the negative effects have been found to completely disappear and some positive effects of younger age have even been found (Geronimus, Korenman & Hillemeir, 2005; Lee, 1998; Scholl, Hediger and Huang, 1992; Reichmann and Pagnini, 1997; Rothenberg and Varga, 2004). In contrast to teenage mothers, older maternal age has an adverse effect on a child's educational outcome regardless of whether other factors are controlled or not. Hence there is still much controversy regarding the true effects of teenage pregnancies (Card, 1981; Rothenberg and Varga 1981; Satin, Leveno and Sherman, 1994; Williams and Decoufle 1999).

Falbo (1996), in his study compared the effects and the impacts of a variety of perinatal and socio- demographic variables on students' academic achievement. He used a variety of models to assess the confounding influences of risk factors for educational problems and investigate the effect of maternal age among sub-populations of teenage mothers. According to him, maternal age was a four-category variable with a young teenage group (age 11-17 years), a late teenage group (ages 18 – 19 years), mid-age (ages 20 – 35) and older mothers (ages above 35 years). The mother's age was determined from the child's birth certificate. Several socio-demographic risk factors were considered, amongst which were parents' education, mother's marital status, race, sex and poverty level.

All of these predictors except poverty level were obtained from the birth records. The definition of poverty was based on whether the child was eligible for afternoon lunch at school or not. Parents' education was defined as less than high school, high school, and greater than high school education. Race had three categories: Black, White and others, with the category others being predominantly high. Marital status was defined as single or married. All socio-demographic predictors except child's sex are potential confounders for the relation between giving birth during the teen years and the response because they are significantly related both to the main predictor of interest and to the response. He concluded that there is some evidence that a large number of children of teenage mothers show academic problems not because of the effect of having a teenage mother *per-se* but because of the confounding influences of other factors. Thus, when all of the factors were included in the model, maternal teenage appeared to have some protective effects. Children of mothers aged 11-17 years were found to be at a significantly lower risk of academic problems and children of mothers aged 18-19 years were found to be at a significantly lower risk of learning disable, educable mentally handicapped and academic problem. In the model, the children of older mothers were found to be at a significantly increased risk of academic problems. The findings of the study conformed to those of Berenson, Wiemann and McCombs, 1997; Brooks-Gunn and Furstenberg, 1986; Coley and Chase-Landale 1998; Wadsworth, Taylor and Osborn, 1984; Zuckerman, Walker and Frank 1984.

Geronimus and Korenman (2002), noted that an increasing number of women are choosing to have their first baby after age 35. Many factors contributed to this trend, including the following:

(i) Ability of women to choose to delay child birth because of the availability of effective birth control methods.

(ii) A changed emphasis on the maternal role because of the women's liberation movement and its stress on expanded roles for women.

(iii) The desire of women to delay pregnancy until they have obtained advanced education and established themselves professionally.

(iv) The reality that some women are older when they first consider child birth because of the increased incidence of late marriage and second marriage.

(v) The higher cost of living and need for two salaries, which cause some young couples to delay childbearing until they are more secure financially.

(vi) The increased number of women in this older age group coupled with the fact that the number of women expected to conceive at a younger age is decreasing, resulting in an increased number of women over age 35 who are conceiving.

(vii) The increased availability of specialised fertilisation procedures, which offers opportunities for women who had previously been considered infertile.

According to them, there are advantages to having a first baby after the age of 35. Single women or couples, who delay childbearing until they are older, tend to be well educated and financially secure. Usually, their decision to have a baby at that time is deliberately and thoughtfully made. Given their greater life experiences, they are much more aware of the realities of having a child and what it means to have a baby at their age. Many of the women have experienced fulfillment in their careers and feel secure enough to take on the added responsibility of a child. However, medical professionals considered women who are over 30 years at the time of their first pregnancy, and especially those who are 35 or older, at higher risk for maternal or fetal complications than younger women.

Rothenberg and Varga (1981) pointed out that although teenage birth did not appear to have a detrimental effect *per-se* on educational outcome, it may contribute to low maternal education, unmarried status, and/or poverty, which may have an indirect effect through the intermediate socio-demographic factors with known, large, negative effects on educational performance. Hence, they concluded that socio-demographic factors such as maternal education are remedial and intervention programmes targeted at teenage mothers have been known to make better some of the negative consequences of teenage parenting. These findings underscore the importance and value of high school graduation programmes for teenage mothers.

According to Coley and Chase-Landale (1998), unlike teen age, older maternal age was found to be a risk factor for certain types of educational performances, regardless of whether other risk factors were controlled or not. Hence, children of older mothers are more likely to have academic problems in schools, possibly as a direct result of the older age of the mothers. While the effect on physically impaired and trainable mentally handicapped may be due to structural damage and biological disadvantage. A number of studies (Barrat, 1991; Brooks-Gunn and Fursternberg, 1986; Card, 1981; Geronimus, Korenman and Hillemeier, 1994; Wadsworth and others, 1984) attribute lower cognitive scores among children of teenagers to decreased vocalisation and poor parenting practices.

Hechtman (1989), studied all predictor variables that can be considered at birth. The true effect of factors such as maternal education and marital status may be underestimated.

He further said that the risk of educational problems for a child whose teenage mother completed high school after the child's birth is likely to be smaller than that of a child whose teenage mother did not continue her education after the birth. Among the socio-demographic predictors studied by Coley and Chase-Landale (1998), maternal education appeared to be the strongest confounder, but marital status, poverty and race were also very important. Moore, Morrison and Greene (1997), find that children of teenage parents are at greater risk than children of older parents for a host of health, social and economic disadvantages. As a result, they score lower on standard intelligence tests and achievement evaluation. Their risk is elevated partly because their mothers are disadvantaged to attain less schooling, to remain single or to have unstable marriages, and to have more children than average. This was supported by the study of Geronimus and Korenman (2002). They suggested that the exact mechanisms that affect children may differ at different times and for different outcomes; for example, biological factors may operate on health at birth, while environmental factors may affect cognitive and social development.

2.4 Parents' Support and the Educational Achievement of Senior Secondary School Students in Mathematics

The idea that parental support has positive influence on students' academic achievement is so intuitively appealing that society in general, and educators in particular, have considered parental support an important ingredient for the remedy of many problems in education. Among the empirical studies that have investigated the issue quantitatively show that mathematics achievement is influenced by this factor. Becher (1984) in the study of Henderson and Berla in 1994, considers one factor that contributes to mathematics achievement as the support and participation of families in their children's education in positive ways. Through this support children achieve higher grades and test scores, have better attendance at school, complete more homework, demonstrate more positive attitude, graduate at higher rates and are more likely to enroll in higher education.

It was noted by Smith and Hausafus (1997) that parents can support mathematics and mathematics teachers' efforts. This is done by helping their children see the importance of taking advanced mathematics courses, emphasising the importance of mathematics in today's careers, limiting television set watching, and visiting science/mathematics related exhibition and fairs with their children. Family support is a factor in mathematics academic achievement and in children's expectation of themselves. It was explained further by Smith and Hansafus (1997) that interest in mathematics career begins or ends at an early age.

Believing that mathematics is the most important subject for their children and encouraging their children to take advanced mathematics courses affect mathematics scores.

Parents remain a main contributor to their children's socialisation, attitudes and career aspirations (Steinberg, 1993). Steinberg and Silverberg (1986) noted that adolescents' educational aspirations were more related to their parents' educational goals for them than to their best friends' goals. Simpson, Koballa, Oliver and Crawley (1994), concluded that attitude is a "crucial factor" in career choice. Their research findings show that parental involvement in children's learning activities positively influence their levels of achievement and motivation to learn. Sharma (2004) in his study indicates that the influences of parental involvement upon students' primary education make a difference and concluded that parental support in a students' academic success in secondary school may be a factor that cannot be ignored.

In a meta-analysis of factors that influence science achievement, Staver and Walberg (1986) argue that parental factors such as interest in the child's school work, facilitation of homework and control of television watching, along with other external-to-school factors, contributed more to student achievement than did school controllable factors. Maple and Stage (1991), similarly found that parental variables such as parental education and interest in the child's school work contributed to choice of mathematics/science related courses. Schibeci and Riley (1986), using National Assessment of Educational Progress data, confirmed the importance of parental support on achievement, but their study did not separate socio-economic status from parental variables.

Wang and Wildman (1995) reported that parental support behaviours related to science significantly contributed to science achievement in the Longitudinal Study of American Youths. Lockheed, Fuller, and Nyirongo, (1989), demonstrated that family background variables significantly contributed to students' achievement in third world countries. Yee and Eccles (1988), reported that parents' education influenced parents' perceptions and attributions about their children's success and failure in Mathematics. Thomas (1986), indicated that encouragement from parents, as well as parental support remain important for children's success throughout secondary school education. William and Chelser (2005), in their study, concluded that the most important effect that is consistent across studies is that of parents' educational aspirations for their children. High parental aspirations tend to positively influence students' level of achievement in primary and secondary education. In a review of another literature, Kahle and Meece (1994) posit that parents seemed to encourage boys more in the mathematics and science areas than they do

girls; but did not report studies of the direct relationships of parent and children's attitudes toward mathematics.

Parents play a significant role in shaping the direction or path their children follow in their later years. Otto (2000), investigated young people's perceptions of parental influence on their career development and concluded that both boys and girls look to their parents when they make career choices. Bouchey and Hartley (2005), in their studies concluded that the achievement gap is caused by the general influence of parents. They theorised that a student's mathematics performance is determined by a combination of reflected appraisals (importance of school work to others, perceived support from others and others' beliefs about academic competence) and self-perceptions (importance of school work to self, scholastics behaviour and perceived academic competence). They said further that many parents promote the study of the humanities to female students and the study of mathematics and science to male students.

Parent supportiveness has been shown to be an important variable that positively influence children's education. Much of the research that examines the relationships between parent support and children's education assesses home related activities that encourage children's education. Home related activities included parents working with children on the homework, parents talking to children about school related topics and parents taking their children on field trips. A comprehensive view of parent support is presented by Epstein's model. Epstein, Coates, Salinas, Sanders and Simon (1997) discussed how children learn and grow through three overlapping spheres of influence; family, school and community. These three spheres must form partnerships to best meet the needs of the child. Epstein, et al (1997), defined six types of parent support based on the relationship between the family, school and community: parenting (skills), communicating, volunteering, learning at home, decision making, and collaborating with the community. Other studies utilise measures that consist of a few closed-ended questions that target a particular aspect of parent support and often focus on the number of times parents participate in particular events (Griffith, 1996; Goldring and Shapira, 1993; Grolnick and Slowiaczek, 1994; Zellman and Waterman, 1998).

Research findings have indicated that family support improves facets of children's education such as daily attendance (Cotton and Wikelund, 2001; Sheldon and Epstein, 2001; Simon, 2000), student's achievement (Brooks, Bruno and Burns, 1997; Cotton and Wikelund, 2001; Henderson, 1987; Herman and Yeh, 1980; Sheldon and Epstein, 2001; Simon, 2000; Van Voorhis, 2001; Zellman and Waterman, 1998) behaviour (Cotton and Wikelund, 2001, Henderson 1987; Sheldon and Epstein, 2001; Simon 2000) and motivation (Brooks, Bruno

and Burns, 1997; Cotton and Wikelund, 2001; Grolnick and Slowiaczek, 1994). The studies concluded that parent support have a large role in children's academic achievement.

The benefits of parental support are well- documented; therefore, there is reason to believe that a high level of parental support could influence their chidlren's academic achievement. Research reviewed also indicated that parental support in homes make it more possible for children to do their homework (Henderson, 1987; Simon, 2000; Zellman and Waterman, 1998), improve their language skills (Cotton and Wikelund, 2001; Goldring and Shapira, 1993) have low school absentee rates (Griffith 1996) and even have good grades in mathematics test (Henderson, 1987).

A number of studies report that the academic achievement of secondary school student is also positively affected by other indicators of parental support, including parent-child discussion regarding school experiences and academic matters (Baker and Sodem, 1997; Becher, 1984; Biggs, 1994), general parental supervision and monitoring of student progress (Bookcock, 2000; Campbell and Wu, 1994; Chessmann, 2002) and to a lesser extent, parent participation in school related activities (volunteering and parent-teacher organisations) (Epstein, Coates, Salinas, Sanders and Simon, 1997; Sheldon and Epstein, 2001).

2.5 Social Theories Related to Students' Academic Motivation and Self-Concept

Academic motivation is a very important concept in classroom learning and student performance, whether it is mathematics or other subjects. Schunk, Pintrich and Meece (2008), define motivation as "the process whereby goal-directed activity is instigated and sustained". Motivation is an unobservable process and can be inferred from actions and verbalisations; it involves goals which may not be explicit and it requires activity which is instigated and sustained (Schunk, Pintrich, and Meece, 2008). One of the most influential motivational theories includes expectancy and value constructs and is from the work of Eccles, Wigfield, and their colleagues (Eccles, 1983, 1987, 1993, 2005; Eccles, Wigfield and Schiefele, 1998; Wigfield, 1994; Wigfield and Eccles, 1992, 2000, 2002; Wigfield, Eccles, and Rodriguez, 1998; Wigfield, Tonks, and Eccles, 2004).

According to the theory developed by Atkinson's (1995), on concept of achievement motivation, the two most important predictors of achievement behaviours are expectancy and task value. Schunk, Pintrich and Meece (2008), depict this theoretical model in a simplified figure. Task value addresses the question, "Why should I do this task?" (Eccles, 1983; Eccles, Wigfield and Schiefele, 1998) while expectancy focuses on the question, "Am I able to do

this task?" (Eccles, 1983; Eccles, Wigfield and Schiefele, 1998; Pintrich, 1988a, 1988b; Wigfield, 1994; Wigfield and Eccles, 1992, 2002). In the task value construct, four components are identified: attainment value, intrinsic value, utility value and cost (Wigfield, Eccles and Rodriguez, 1998).

Expectancy and task values are motivational beliefs which directly influence achievement behaviours and which have precedents. They are assumed to be influenced by task-specific beliefs such as ability beliefs, the perceived difficulty of different tasks and individuals' goals, self-schema, and affective memories. Those social cognitive variables in turn, are influenced by individuals' perceptions of their own previous experiences and other socialisation factors. Despite theoretical differences, children's and adolescents' ability beliefs and expectancies for success cannot be empirically differentiated (Eccles, Wigfield and Schiefele, 1998; Eccles and Wigfield, 1995; Wigfield and Eccles, 2000). The achievement behaviours in the expectancy-value model of achievement motivation include persistence, choice, quantity of effort, cognitive engagement and actual performance. Studies have shown that children's belief about their ability and expectancies for success are the strongest predictors of grades in mathematics while children's subjective task values are the stronger predictors of their intentions to keep taking mathematics and actual decisions to do so (Wigfield & Eccles, 2000).

A growing body of research has shown that students perform better academically when parents are involved in their child's schooling (Astone and McLanahan, 1991; Feuerstein, 2000; Rumberger and Palardy, 2005). In a recent study evaluating the effects of family and school capital on students' classroom achievement, Parcel and Dufur (2001) found that parental involvement in school activities had a positive impact on children's mathematics achievement. Another study found that parents' involvement in academics at home is more important to a child's academic achievement than parents' involvement at school (DePlanty, Coulter-Kern, and Duchane, 2007). Overall, research has shown that parents are instrumental to their children's academic success and that parental involvement has a positive impact on students' achievement. Zhao (2007), using TIMSS 1999 data, conducted a comparative study of school expectations and initiatives for parental involvement in 30 nations. Results show that students in the United States were more likely to achieve better if their schools had higher expectations for parents' direct involvement (Zhao, 2007).

Students' academic achievement has been studied within different frameworks. Many of them have a focus on students' achievement motivation. Theories with different topics

such as intrinsic motivation, self-concept, attribution, goal orientation, self-efficacy and expectations have been established during the past century. Schunk, Pintrich and Meece (2008), define motivation as, "the process whereby goal-directed activity is instigated and sustained". Different social theories lay emphasis on different measures/aspects of motivation. Despite the differences, one consistent finding is that motivation is related to achievement behaviours.

One of the most influential motivation constructs about self-beliefs originated from Bandura (1977, 1986, 1993, 1997, 2001) is self-efficacy. "Self-efficacy" is defined as "People's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances" (Bandura, 1986). Self-efficacy is considered to be situated within a social cognitive theory (Bandura, 1986; Pajares, 1997). Bandura (1986) describes the reciprocal interactions among personal, behavioural, and environmental factors in his framework of triadic reciprocality. In the social cognitive view people are neither driven by inner forces nor automatically shaped and controlled by external stimuli. Rather, human functioning is explained in terms of a model of triadic reciprocality in which behaviour, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other.

Self-efficacy can be used to explain the behavioural-personal factor interaction. Research has shown that self-efficacy influences such achievement behaviours as choice of tasks, persistence and effort (Betz and Hackett, 1981, 1983; Hackett and Betz, 1981; Schunk, 1989, 1995; Schunk and Pajares, 2002). When self-efficacy perceptions are high, individuals will engage in tasks that foster the development of their skills and capabilities, but when self-efficacy is low, people will not engage in new tasks that might help them learn new skills (Bandura, 1997).

Research findings have also demonstrated that self-efficacy is a better predicator than any other cognitive or affective processes and it is a valid predictor for students' motivation and performance (Schunk, 1991). On the other hand, social cognitive theory suggests that self-efficacy is not a global construct that can be measured with an omnibus instrument, but rather, it is a disposition that varies across activities and contexts (Marakas, Yi, and Johnson, 1998), that is, self-efficacy is task-specific. Further, Bandura (1989) argued that the predictive capability of self-efficacy estimate is stronger and more accurate when using a specific measure rather than using general, global measures.

During the past three decades, the construct of self-efficacy has been used in different disciplines and settings. For instance, Paraskeva, Bouta, and Papagianni (2008), examined the

relationship between general self-efficacy and computer self-efficacy of secondary education teachers and found that there was a significantly positive relationship between the two. Chan and Lam (2008), conducted a study with 71 seventh-graders in Hong Kong and found that students' self-efficacy might be threatened when they are engaged in vicarious learning in a competitive classroom. Pajares (1997), points out that self-efficacy beliefs have received increasing attention in educational research, primarily in studies of academic motivation and of self-regulation (Parcel and Dufur, 2001). There are three major areas of research focusing on self-efficacy.

The first area is the link between efficacy beliefs and college major and career choices, particularly in science and mathematics (Lent and Hackett, 1987; Pajares, 1997). The second is the relationship between self-efficacy beliefs of teachers and their instructional practices and various students' outcomes (Ashton and Webb, 1986; Pajares, 1997). The third is the relationships among students' self-efficacy and other motivation constructs and students' academic performances and achievement. Constructs involved in these studies include attributions, goal setting, modelling, problem solving, test and domain-specific anxiety, reward contingencies, self-regulation, social comparisons, strategy training, other self-beliefs and expectancy constructs, and varied academic performance across domains.

Another influential motivational theory involves expectancy and value constructs and is from the work of Eccles, Wigfield, and their colleagues (Eccles, 1983, 1987, 1993; Eccles, Wigfield, Flanagan, Miller, Reuman and Yee, 1989; Wigfield, 1994; Wigfield and Eccles, 1992, 2000; Wigfield, Eccles, and Rodriguez, 1998; Wigfield, Tonks, and Eccles, 2004). First proposed by Eccles in 1983, this expectancy-value model focuses on the role of students' expectancies for academic success and their perceived values for academic tasks. According to this model, children's achievement performance, persistence and choice of achievement tasks are most directly predicted by their expectancies for success on the tasks and the subjective task values they attach to success on those tasks (Wigfield, 1994). Children's expectancies and values are most directly determined by other achievement-related beliefs, including children's achievement goals and self-schemata, and their task-specific beliefs.

Children's interpretations of their previous performance and their perceptions of socialisers' attitudes and expectations influence their goals and task specific beliefs. Expectancies for success can be defined as children's beliefs about how well they will do on an upcoming task (Wigfield, 1994). Specifically, Wigfield and Eccles (2000) compared expectancies for success with Bandura's (1997) definitions of efficacy expectations and outcome expectancies and argued that "we have measured individuals' own expectations for

success, rather than their outcome expectations. Thus our expectancy construct is more similar to Bandura's efficacy expectation construct than it is to the outcome expectancy construct" (Wigfield and Eccles, 2000).

Although only interest value and utility value are included as separate constructs in Eccles (1983), Eccles and Wigfield (1995), Wigfield, Eccles and Rodriguez, (1998), define achievement task value in terms of four components. Attainment value is the importance of doing well on task. It denotes the extent to which task allows individuals to confirm or disconfirm salient or central aspects of their self-schema. To the extent that tasks allow more general values to be expressed, attainment value would be higher for these tasks (Wigfield and Eccles, 1992). Intrinsic value is the enjoyment people experience when doing a task or their subjective interest in the content of a task (Wigfield and Eccles, 1992). Conceptually, it is similar to intrinsic interest in the intrinsic motivation theory of Deci and Ryan (1985), as well as the work on personal interest and flow (Csikszentmihalyi, 1975; Renninger, Hidi, and Krapp, 1992; Schiefele, 1991; Tobias, 1994).

When intrinsic value is high, individuals will be more engaged in the task, persist longer and be more intrinsically motivated to work at that task (Wigfield and Eccles, 1992). Utility value is the usefulness of the task for individuals in terms of their future goals, including career goals. It is similar to some of the extrinsic reasons for doing a task in Deci and Ryan's (1985) model. The fourth value component is cost belief and is defined as the perceived negative aspects of engaging in the task (Wigfield and Eccles, 1992). Cost includes the lost opportunity of engaging in other tasks as well as perceived amount of effort required for this particular task and the anticipated emotional states such as performance anxiety, fear of failure, etc. Ability beliefs are assumed to be precedents of expectancies for success in the expectancy-value model because they are defined as the individual's perception of his or her current competence at a given activity while expectancies for success are futureoriented (Wigfield and Eccles, 2000). However, ability beliefs and expectancies for success cannot be empirically differentiated (Eccles, Wigfield, Harold and Blumenfeld, 1993; Eccles and Wigfield, 1995; Wigfield and Eccles, 2000).

Self-Concept

Self-concept is defined as "Individuals' belief about themselves in terms of their academic, social, athletic, and personal capabilities and characteristics" (Schunk, Pintrich and Meece, 2008). Originally, it was treated as a general factor and the theoretical formulation of the construct was imprecise. Shavelson, Hubner, and Stanton (1976) developed a

multifaceted, hierarchical structure of self-concept. In their model, self-concept had academic and non-academic components. Academic self-concept was then divided into self-concepts in particular subject areas (e.g. Mathematics, English), and nonacademic self-concept was divided into social, emotional and physical self-concepts.

Marsh (1990b) later tested the academic self-concept portion of the Shavelson and Bolus (1982) model and concluded that the model was supported when it was limited to self-concepts in academic core subjects such as English and mathematics. Byrne (1984) noted that much of the interest in the relation between self-concept and achievement stemmed from the belief that academic self-concept has motivational properties such that changes in it will lead to changes in subsequent academic achievement. Marsh (1990a) conducted a longitudinal study about the relationship between academic self-concept and academic achievement and tested two models. The self-enhancement model was based on the assumption that prior academic self-concept affects subsequent academic achievement and was used implicitly to justify many educational programmes designed to enhance self-concept; and the skill development model was based on the assumption that academic self-concept merely reflected academic skills so that the best way to enhance academic self-concept is to improve academic skills (Marsh, 1990a). In reality, the relationship between academic self-concept and academic achievement is likely to be reciprocal, that is, prior academic achievement affects subsequent academic self-concept and prior academic self-concept also affects academic achievement.

There have been different constructs proposed of student self-beliefs in academic achievement. For example, the research on students' perceptions of their competence and self-concept is similar to the research on expectancies and values (Harter, 1982, 1985, 1990, 1998; Marsh & Shavelson, 1985). Research on perceptions of competence comes from a more developmental perspective on the development of self and personal identity in contrast to the focus on motivation in expectancy-value theories (Schunk, Pintrich and Meece, 2008). Marsh and Shavelson (1985), define self-concept broadly as "a person's perceptions of himself or herself." According to their model, self-concept has six characteristics. These are:

1) self concept is multi-faceted;
2) self-concept is arranged hierarchically;
3) global self-concept is stable, but becomes less stable as it becomes more situation specific;
4) self-concept becomes more multi-faceted and distinct as a person gets older;
5) self-concept is both descriptive and evaluative; and

6) self-concept can be differentiated from other constructs such as academic achievement.

According to Bong and Skaalvik (2003), strong self-efficacy and positive self-concept lead students to set challenging yet attainable academic goals for themselves, feel less anxious in achievement settings, enjoy their academic work more, persist longer on difficult tasks and overall, feel better about themselves as person and as students. In other words, high self-efficacy and self-concept are associated with good academic outcomes. Along this line of argument, successful students usually have high self-efficacy and self-concept and the related adaptive cognitive processes. They are likely to attend to instruction, participate in tasks, rehearse information to be remembered, expand effort, persist on challenging tasks and have proximal, specific and moderately difficult goals (and have mastery goal orientation). They also feel competent in skills and have high confidence in their ability to learn and perform on tasks.

Bong et al (2003), used various cognitive and self-regulatory learning strategies. They are more likely than other students to use deeper thinking processes and practice self-observation, self-judgment and self-reaction. At the same time, they will observe their goal process. They will more likely use self-modeling (cognitive and behavioural changes stemming from observing one's own performances). Successful students also have high motivation and enjoy the academic tasks. They are more concerned about acquiring skills and strategies rather than performing tasks. They make more adaptive attributions when they succeed or fail on a task. However, they may not always have a positive outcome expectation. They learn through their own as well as others' experiences and interpret others' feedback appropriately. They may get involved in social comparison but at the same time be willing to contribute to group work. They have high self-esteem and self-worth, are optimistic but practical, agreeable and active. They are the ones teachers like and everybody wants to be.

Some researchers consider self-perceptions of competence as integral components of an individual's self-concept (Pajares 1997; Shavelson and Bolus, 1982). Because of this, self-efficacy beliefs are often viewed as requisite judgments necessary to the creation of self-concept beliefs. Academic domain-specific self-concept has been shown to be related to academic achievement and to other motivation constructs across domains (Harter, 1998). However, few researchers have explored the relationships among self-efficacy, self-concept and academic performances and the results are inconsistent (Pajares, 1997).

A strong background in mathematics is critical for many career and job opportunities in today's increasingly technological society. However, many academically capable students

prematurely restrict their educational and career options by discontinuing their mathematical training early in high school. Several recent surveys (e.g. National Assessment of Educational Progress [NAEP], 1988; National Centre for Educational Statistics [NCES], 1984) indicate that only half of all high school graduates enroll in mathematics courses beyond the 10th grade. These reports also indicate that fewer women than men enroll in the more advanced courses in high school mathematics (NAEP, 1988; NCES, 1984), although the "gender gap" is beginning to narrow (Eccles, 1987). Further, students of both sexes, but particularly women, do not attain a high level of mathematical competency, even if they have completed four years of high school math (NAEP, 1988).

Self-concept is a characteristic way of thinking, feeling and behaving about oneself. It may embrace attitudes, one's own interest area, opinions that affect the way we deal with different situations. Harter (1998), stated that it is important for students to have a good understanding of themselves and their personality, if they are to make intelligent career plans. What they would like to be is a determining factor in self-concept. The self-concept factors to be considered include their mental abilities, special abilities and interest. Pajares (1997) considered factors of mental abilities to be verbal comprehension, word fluency ability, spatial ability, numerical ability, reasoning ability and memory. He matched careers with abilities in backing up his reasoning and urged students to become familiar with their personality and self-concept in order to guide their career choice. According to him, a developed career plan included evaluation of personality through self-concept, self assessment and communication with others.

According to Wigfield and Eccles (2000), self-concept is shown to be a domain with many pathways. In this domain, there are numerous career clusters as well as career clashers that coincide with abilities. Harter (1998) states that it is helpful to consider the attitudes people hold about themselves when choosing a career. This is because attitude about self-concept have been organised into consistent modes of thinking, feeling and reacting to evaluation of our environment.

Self-concept is also defined as the collection or impressions a student made about his/her appearance. These impressions form the cognition or the understanding in dealing with persons or things. Thus, what makes up the cognitive map or self-concept may not be fully known. Everyone shares some factors or constructs. These constructs are self-concept traits that become valuable when choosing a career. The environments, such as our formal education has played a major role in the formation of constructs. Organisations of personality or self-concept constructs are evidence in three situations. First, the individual sees the

factors that could potentially change personality. Second, only certain environmental factors impinge upon the individual. These environmental factors enter into the ideas that the individual has had about themselves. Third, of all the factors that enter into the cognizance, only a few are perceived, and even those may be distorted or altered to fit the requirements needed to fulfill the comfort limits of our reality.

Simon (2000) said further that the process choice is affected by experience and purpose. One's experience is limited by the ability to perceive only what the individual is prepared to perceive. Individual's purpose also limits his/her ability to perceive. Thus, experience and purpose have been translated to self and situation, or personality and environment. Self-concept determinants include the entire cluster of individual's biological and psychological attributes, as well as behavioural and physical features with genetic origins. The genetic determinants include sex, physical structures, intellectual and non-intellectual abilities and aptitude. The physical appearances such as height, weight, body proportions, and structure of the face exert influences on others' reactions toward us and in-turn on our self evaluation.

Marsh (1990a) stated that there are "coherent systems of thought and feelings manifested by corresponding pattern of behaviour". He went on to identify three ego states that individual's exhibit. The first, called the "parent" ego, is derived from parental figures, figures of authority. The second state, the "adult" ego, appraises the environment objectively on the bases of experience. And third, each individual carries within himself/herself, a little boy or girl who feels, acts, talks and responds just the way he or she did when he/she was of a certain age. This ego state is called the "child". Individuals always operate in one of the three ego states during any time of the day. Each of the ego states has its importance and people need all three in order to operate as a complete human being.

2.6 Summary of Review

The knowledge of mathematics is indispensable to humankind. It is fundamental to the understanding and mastery of the sciences and the complexity of modern technology. According to Aluko (1990), every individual needs some knowledge of mathematics in order to live a useful life and be an effective member of the society. This is due to the fact that the knowledge of mathematics is necessary in all spheres of life such as agriculture, business transactions, domestic activities, politics, religion and decision making.

Fakuade (1977) in Onwuakpa (1999), describes mathematics as the queen of all sciences and servant of all disciplines while Obe (1996) refers to it as a source of

enlightenment and understanding of the universe. According to him, the prosperity of any country depends on the volume and quality of mathematics offered in its school system. Mathematics is the language of science and without it, knowledge of science is superficial. Considering the importance of mathematics, Nigeria in her march towards technological development, has not only made mathematics a compulsory subject in the curriculum of the primary and secondary levels of her educational system (Federal Republic of Nigeria 2004) but also a prerequisite to the study of science courses in her colleges, polytechnics and universities (JAMB Brochure 1992-2007).

In a study, Obeameata (1992) examines the Senior School Certificate Examination (SSCE) results for three consecutive years; 1988, 1989 and 1990 in nine subjects including mathematics and finds that the percentage of students who passed at credit level in al the selected subjects was as low as 3% and 6% in some of the subjects. In another related study, Adeleke (2007) compared the level of performance of Nigerian students in mathematics with four other countries (Gambia, Ghana, Liberia and Sierra Leone) exploring Senior Secondary School Certificate Examination conducted by West Africa Examination Council (WAEC) from 1992 to 1999. He notes that Nigeria has the lowest percentage of students who had credit scores (A1 –AC) in an average of a nine year period. Nigeria scored 13.7% while others scored 37.6, 30.1, 17.8 and 17 percent respectively. This statement was supported by the analysis of results of all Nigerian students who sat for Senior Secondary School Certificate Examination in mathematics conducted by WAEC for a period of five consecutive years; 2002, 2003, 2004, 2005 and 2006.

The poor performance becomes even more alarming on examining the academic achievement of students across the country in mathematics. What then could be responsible for this poor performance despite its recognition in the society and the various efforts made by the Federal Government since the inception of the new policy on education? This is one of the questions to be answered by this study.

Research has also shown that students perform better academically when parents are involved in their child's schooling. Parents are instrumental to their children's academic success and parental involvement has a positive impact on students' achievement. The extent to which parents show concern about the child's progress and accomplishments; support and supervise home-works and school assignments and even merely communicate about school with their children have been shown to determine students' tendency to successfully complete school and to maintain good grades (Parcel and Daifur, 2001).

At a broader level, socio-economic status has been shown to be related to students' outcomes such that students from middle to upper class families tend to out perform those from less advantaged background. This comes through number of paths. First, children from high income families tend to be children of highly educated parents, who often place more value on school and become involved in their children's schooling than the poorly educated parents. Second, children living in poor communities may have fewer resources and materials available to them (books, equipment, toys, computers, etc) and so may receive a poorer quality education than children from better-off communities.

Attempt is made to review studies on the following headings: Students' attitudes and cognitive achievement, Socio-economic background and students' academic achievement, Age of mother at birth of the child and the child's academic achievement, Parents' support and the educational academic achievement of senior secondary school students in mathematics, Social theories related to students' academic motivation and self-concept.

CHAPTER THREE

METHODOLOGY

This chapter presents the research methodology under seven sections. These are the research design, population, sampling procedure and sample, instrumentation, data collection, methodological challenges and data analysis procedure.

3.1 Research Design

The study is a non-experimental type and a survey (an ex-post facto) research design was adopted. Unlike experimental research method where the researcher controls the variables except the independent variable to see what happens, the ex-post facto research is a systematic empirical inquiry in which the researcher does not have direct control of the independent variables because their manifestation have already occurred or because they are inherently not manipulatable. Thus, inferences about relations among variables are made without direct intervention, from concomitant variation of independent and dependent variables (Kerlinger and Lee, 2002).

The variables of the study are:

Exogenous variables:

V_1 = Age of the mother at birth of the child; V_2 = Parents' education

Endogenous variables:

V_3 = Parents' occupation; V_4 = Parents' support;

V_5 = Number of children in the family; V_6 = Academic motivation;

V_7 = Self-concept; V_8 = Attitude;

V_9 = Achievement in mathematics.

3.2 Population and Sampling Procedure

3.2.1 Population

The target population for this study comprised all the senior secondary school one students (SSS 1) in Ogun State, Nigeria. Ogun State was used because it is the gateway state to many states and neighbouring countries. In Ogun State, we can find plurality of ethnic groups been represented as in the case of other states in Nigeria. The choice of students in senior secondary school one (SSS 1) was based on three assumptions that:

(i) majority of the students would be able to read printed materials with little assistance from the research assistant or researcher.

(ii) the students would have completed their course contents in JSS 3 mathematics curriculum. This was considered important because the achievement test will reflect the JSS 3 mathematics curriculum as a unit; and

(iii) after three years of exposure of students to mathematics in secondary school, any measure of attitude will be rightly answered by the students, thus, making the attitude measurement valid and possibly reliable.

3.2.2 Sampling Frame

There are 20 local government areas (LGAs) in Ogun State which have been divided into three senatorial zones. The distribution of the LGAs and the senior secondary schools in the three senatorial zones are as follows:

(i) In Ogun Central, there are six LGAs with 82 senior secondary schools.

(ii) In Ogun East, there are nine LGAs with 118 senior secondary schools.

(iii) In Ogun West, there are five LGAs with 72 senior secondary schools.

In all, there are three senatorial zones, 20 LGAs and 272 senior secondary schools in Ogun State, Nigeria. The researcher collected the list of secondary schools in Ogun State from the Ministry of Education, Abeokuta and the distribution of SSS1 students in Ogun State is presented in Appendix 1.

3.2.3 Sampling Techniques

The sample of the study was selected using the multi-stage sampling procedure.

1. At the first stage, three LGAs were purposively selected from each senatorial zone as the researcher selected LGAs with large number of rural areas. The choice of local government areas with large number of rural areas were made based on the researcher's interest in some variables using rural areas as the case study in order to investigate the extent to which these variables determine students' attitude and achievement in mathematics.

2. At the second stage, the proportionate sampling technique was used to select a total of 60 senior secondary schools from 147 senior secondary schools in the 9 LGAs selected from the three (3) senatorial zones in Ogun State, Nigeria and this

represented a total of 40 per cent of the entire schools in the nine LGAs selected. The percentage of the number of schools in each LGA as compared with the total number of selected schools in the nine LGAs was determined. This was done by dividing the number of schools in each of the selected LGA by the total number of schools in the nine LGAs and multiplying by 100. The distributions are in Table 3.1.

3. At the third stage, simple random sampling technique was employed to select a total of 40 SS1 comprising male and female students from each of the participating schools. Altogether, a total of nine LGAs, 60 schools and 2,400 students were involved in the study. The distribution is shown in Table 3.1 below.

Table 3.1: Distribution of used LGA and Senior Secondary Schools

Zone	S/N	Selected LGA	No of SSS in selected LGA	% of SSS in selected LGA	No of selected SSS in selected LGA	No of Students in selected school
OCS	1	Obafemi / Owode	13	13/147 x 100 = **9**	13/147 × 60 = **5**	40 × 5 = **200**
OCS	2	Abk. South	20	20/147 x 100 = **14**	20/147 × 60 = **8**	40 × 8 = **320**
OCS	3	Odeda	11	11/147 x 100 = **7**	11/147 × 60 = **5**	40 × 5 = **200**
OES	4	Ijebu – North	19	19/147 x 100 = **13**	19/147 × 60 = **8**	40 × 8 = **320**
OES	5	Ogun – Waterside	13	13/147 x 100 = **9**	13/147 × 60 = **5**	40 × 5 = **200**
OES	6	Sagamu	18	18/147 x 100 = **12**	18/147 × 60 = **7**	40 × 7 = **280**
OWS	7	Ado-Odo / Ota	22	22/147 x 100 = **15**	22/147 × 60 = **9**	40 × 9 = **360**
OWS	8	Ipokia	11	11/147 x 100 = **7**	11/147 × 60 = **5**	40 × 5 = **200**
OWS	9	Yewa – North	20	20/147 x 100 = **14**	20/147 × 60 = **8**	40 × 8 = **320**
TOTAL			**147**	**100**	**60**	**2400**

Table 3.1 gives summary of the number of schools and students used in each of the selected LGA.

3.3 Instrumentation

This study was designed to examine the pattern of relationship between students' home background variables, academic motivation, self-concept on attitude and achievement in mathematics. This implies that to examine the relationships, information must be gathered about the home of the students, attitude towards mathematics and achievement in the subject.

In order to collect data and provide answers to the research questions, the following research instruments were developed and employed by the researcher in gathering data:

1. Students' Questionnaire (SQ)
2. Attitude Towards Mathematics Questionnaire (ATMQ)
3. Self-Concept Scale (SCS)
4. Parents' Support Scale(PSS)
5. Academic Motivation Scale (AMS)
6. Students' Mathematics Achievement Test (SMAT)

1. STUDENTS' QUESTIONNAIRE (SQ)

Under the students' questionnaire (SQ) instrument, the researcher created four sections for measuring variables that related to the students. These are:

(a). Demographic Data (DD);
(b). Parents' Qualification (PQ)
(c). Parents' Occupation (PO);
(d). Home Supportiveness (HS)

(A) Demographic Data (DD)

The demographic data questionnaire was designed to collect information from the students on the following items:

(i) School name;
(ii) Type of school;
(iii) School location;
(iv) Gender;
(v) Age;
(vi) Class;
(vii) Mother's age at the birth of the child.

The item number seven, which addressed the issue of age of mother at birth of the child was calculated by subtracting the age of the child from the age of the mother to get the real age of the mother at the birth of the child. The mother's age was grouped into three categories-young teenage mother (age 11-19 years), mid-age group (ages 20-35) and older mothers (ages above 35 years). The instrument is documented in section A of Appendix III.

(B) Parents' Qualification (PQ)

The students were asked to provide only the highest qualification of their parents. The issue of parents' qualification was given a score ranging from zero (0) to 11, where 0 was awarded to no schooling and 11 to Ph.D. parent. Thus, a minimum score of zero and a maximum score of 22 was given to the parents. The instrument is documented in section B of Appendix III.

(C) Parents' Occupation (PO)

This section obtained information about the occupational levels of the parents of each student. The parents' occupations were given scores from one to seven, where one was awarded to parents that were farmers and seven was awarded to parents that were in professional and managerial occupations, thus giving a minimum score of two and a maximum score of fourteen. The instrument is documented in section C of Appendix III.

(D) Home Supportiveness (HS)

The home supportiveness section obtained information about how the home environment supported the learning of the students. The section comprised four items which are:

i. The learning facilities provided in the home for the students;
ii. The type of house the students and their families live in;
iii. What they have in their various homes that can support learning (e.g. library/reading room, book shelves, etc.)
iv. Means by which the students go to schools.

For the purpose of analysis, the type of house the students' live was scored from one to five. The issues of what the students have in their various homes that can support learning (e.g. library/reading room and book shelves) was given equal weights of one each while the means by which the students go to school was scored from one to three. The instrument is documented in section D of Appendix III.

2. ATTITUDE TOWARDS MATHEMATICS QUESTIONNAIRE (ATMQ)

The instrument was designed by the researcher to obtain information about students' general attitude towards mathematics. This instrument whose draft contained forty-five items was subjected to expert judgement using four evaluators who had mathematics background and two mathematics classroom teachers. They were to identify (i) bad items on the account of ambiguity;

(ii) the items that needed to be rewarded, and
(iii) to specify the items that were good.

Based on their comments, the draft was accordingly modified and the number of the items came down to thirty-one. The instrument is a Likert scale items with four options ranging from "strongly agree" to "strongly disagree". Out of the 31 Likert scale items, 15 indicated

positive attitude while 16 indicated negative attitude towards mathematics. Since attitude emphasises favourability or unfavourability, the response format was numeric. In the numeric scale, the items were judged on a single dimension and arranged on a scale with equal intervals. The scale label was about the students' perceived degree of importance for each item and the response of the students signified the extent to which they agreed or disagreed to an item. The more favourably respondents judged the items, the higher the numerical value. Scores for each of the items ranged from one to four. Positive attitude items were scored using ascending scores while negative attitude items were scored in reversed order. The total score for both positive and negative items constituted the index of attitude. The students' attitude questionnaire towards mathematics is presented in Appendix IV.

3. SELF-CONCEPT SCALE (SCS)

This section of the instrument was used to elicit information from the students about their confidence in learning mathematics. It consisted of 14 Likert scale items with five options. The response options for each item were "Not at all" (coded as 1), "Just a little" (coded as 2), "A little" (coded as 3), "Much" (coded as 4), and "Very much" (coded as 5). Sample item of this measure was "To what extent do you think that you can understand mathematics?" Responses to the statements were recorded as the level of students' self-confidence in learning mathematics. All the items of this measure are documented in Appendix V.

4. PARENTS' SUPPORT SCALE (PSS)

Measure of parents' supportiveness was developed by the researcher in order to obtain information from the students about the extent to which their parents support them in school. The section comprised 15 items which required "Yes" or "No" response. For the purpose of analysis, the "Yes" was rated 1 and the "No" was rated zero (0). A sample item of this measure was "Do your parents provide you with meals before going to school?" All the items of this measure are presented in Appendix VI.

5. ACADEMIC MOTIVATION SCALE (AMS)

This instrument comprised 19 items. It was intended to obtain information from the students on how they value mathematics. The response options for the items were "Strongly agree" (coded as 4), "Agree" (coded as 3), "Disagree" (coded as 2), and "Strongly disagree" (coded as 1). A sample item of this measure was "I think learning mathematics will help me

in my daily life". A higher score on an original item means a higher value attached to mathematics on this construct. All the items of this measure are documented in Appendix VII.

6. STUDENTS' MATHEMATICS ACHIEVEMENT TEST (SMAT)

To measure the achievement of students in the subject, a Mathematics Achievement Test (MAT) was developed by the researcher using a table of specifications (Appendix II) to generate 50 items for students' mathematics tasks. The test is a multiple-choice objective test with four options A, B, C and D. The items were based on the common topics found in the schemes of work of the schools used for the study. The common topics were 15 in number as can be seen in the test blueprint. The content areas of these topics were identified and the educational objectives were specified at the following levels: Knowledge, Comprehension and Application.

A table blueprint was accordingly prepared and shown in Appendix II. Items were constructed to reflect the specifications in the test blueprint. Care was taken to ensure that there were no ambiguous items, and no inter-locking items which in effect removed the "bandwagon effect". Before bringing the test items to the point of administration, they were subjected to expert opinion of five secondary school teachers with mathematics background and two evaluators. Their comments led to the modification of the test items either by rewarding certain items or by removing them on the account of ambiguity. Forty out of the original fifty items were retained and, each item has one correct option (the key) and three distracters. The correct option attracts 1 mark and the total mark obtainable is 40. Kuder Richardson formula 20 was used to estimate the internal consistency of the instrument. The SMAT was presented in Appendix VIII.

Basis of Distribution of Items over Cognitive Levels

Bloom classified educational objectives into three domains – cognitive, affective and psychomotor. The cognitive domain includes those objectives, which deal with processes like knowing, perceiving, recognizing, reasoning, conceiving, judging and thinking. Thus, table of specifications provide the operational blueprint that guides the test builder and ensure that he or she builds a test that will do what it is set to do. The table of specifications is a 2 - way table that relates the units of lesson or content area to the levels of cognitive domain objectives at which these contents has been learnt.

On the table of specifications, many questions were asked under the lower-ordered cognitive skills (i.e. knowledge, comprehension and application) than the upper-cognitive areas (i.e. analysis, synthesis and evaluation). This is because the six categories are listed in order from least to most complex. Again, both "Knowledge" (category I) and "Comprehension" (category II) are basic to "Application" (category III). Thus, in categories I, II and III, questions could be most useful in teaching-learning situation and this can lead the learner to apply, analyse, synthesise, or evaluate the principles gained.

Further, when considering the level for which these questions were drawn as stipulated in the population, the test items from lower-order cognitive skills and abilities are more appropriate for measuring specific knowledge and reasoning. Also, since new situations are met outside the classroom, more of the application questions are needed to equip the child for further application. Again, it could be seen that there was no question on the upper categories of the table (i.e. analysis, synthesis and evaluation). It was the view of the researcher that if there were questions on the upper categories, it could lead to loss of motivation on the part of the learner in responding to the questions. In other words, the distribution of items was designed to minimize the level of frustration on the part of the testees.

3.3.1 Validity of the Instruments

Validity is one of the most important characteristics of a good measuring instrument. Validity according to Kerlinger and Lee (2000) refers to the soundness or appropriateness of a test or item in measuring what it is designed to measure. They expressed the importance of this criterion by stating that it is essential to make a thorough review of evidence regarding the validity of any instrument.

For the purpose of this study, both the face and content validity of the instruments were ensured. Face validity refers to how well inconsistency, ambiguity and confusion are removed from an instrument. To ensure face validity of the instruments, the initial drafts of the instruments were scrutinised by a group of specialists and colleagues in educational evaluation who were required to check for all non-technical flaws in the instruments. While, the content validity of the instrument was enhanced by suggestions from the researcher's supervisor, four experts in questionnaire construction at the Institute of Education, University of Ibadan, Nigeria as well as inputs at the post graduate seminar of the Institute of Education, University of Ibadan, Nigeria. Such inputs enhanced a thorough validation in order to ensure

that the instruments actually measured what they were intended to measure in relation to the research questions.

Based on the suggestions and comments of these experts and colleagues, the necessary corrections were made. This necessitated the restructuring of some of the items, addition of new items and the removal of ambiguities and irrelevancies associated with the items. The final version of the instruments was trial tested on a sample of 50 students who were not part of the real study sample, in Ijebu-Ode LGA of Ogun State, Nigeria. The data collected showed that the students did not have problems responding to the items in the questionnaire.

3.3.2 Reliability of the Instruments

Reliability according to Kerlinger and Lee (2000) is concerned with the accuracy of the instruments in relation to stability and precision over repeated use. In computing the reliability of this research instruments, Cronbach's alpha (α) was utilised in estimating the reliability coefficient. The reliability of the students' responses to the instruments was established as shown in Appendix VI. The scores for each item were encoded in SPSS software. The Cronbach alpha reliability of the instruments was established as: ATMQ = 0.73; SCS = 0.71; PSS = 0.66; AMS = 0.85. The Kuder Richardson formula 20 was used to estimate the MAT internal consistency. The reliability of the test was estimated as 0.84. This method was hinged on the assertion of Adegoke, (2009); Duncan, (1966); Kerlinger and Lee, (2000) that the Cronbach's alpha (α) will help the researcher to determine the coefficient of internal consistency especially when items on a measure are not scored dichotomously and this was the case with this study. The construct, content and criterion related validities were found to be adequate.

3.4 Data Collection Procedure

The necessary data for this study were obtained from students of the selected schools in the selected LGAs. Before going to the field, the researcher trained eight field research assistants on how to administer the instruments in order to collect the required data. The training lasted for two days. The researcher and the assistants visited the selected schools to be used, and a letter of introduction was given to the principal requesting his/her permission to administer the questionnaire to the students (Appendix IX). After granting the permission, each of the principals signed a copy of the letter and returned same to the administrator. The

administrator then distributed the instruments to the randomly selected SS1 students in the selected schools in the participating LGAs and collected them on completion.

The researcher and each of the research assistants handled one LGA each to administer the research instruments and ensured that respondents obtained clarification on issues needing explanation. After collection of data, the research assistants returned the questionnaires to the researcher who merged the responses to the students' questionnaire and achievement tests. Questionnaire responses without corresponding responses to achievement tests were discarded. The idea was to have complete sets of the students' related instruments.

Two thousand and four hundred copies of the questionnaire and mathematics achievement test were distributed to the selected students in the 60 schools in the 9 LGAs and a total of 2,317 (96.5%) questionnaire and mathematics achievement test were returned, among which 366 (15.3%) badly filled ones were discarded. A total of 1951 (81.2%) questionnaire and mathematics achievement test, fully responded to, were utilised and data collection lasted for 28 working days.

3.5 Methodological Challenges

The major limitation of this study was the formation of the variables used. The researcher tried to match variables with constructs from educational theories. One other challenge that was faced by the researcher during the study was associated with the insincerity of the students about their home background and ability. This problem was solved with the assistance of the Head of Department (Mathematics) who helped the researcher to address the students and sought the consent of those who wanted to participate in the exercise that were later selected at random.

3.6 Data Analysis Procedure

The scores for the items were encoded in SPSS software version 12 (2003) in order to analyse the data. The statistical procedures used to describe the variables include frequency counts and percentages. Variables linkages were performed on the data using recommendations for standard path-analytic procedures identified by the experts (Adegoke, 2009; Duncan, 1966; Kerlinger and Lee, 2000; Kerlinger and Pedhazur, 1984) and all the research questions were tested at 0.05 level of significance.

To achieve this, experts required that:

i. A hypothesised causal model is built involving students' attitude towards mathematics and achievement in mathematics based on temporal order, theoretical consideration and documented evidence.

ii. Identify the paths of the model through structural equations;

iii. Trim the paths of the model based on statistical significance and meaningfulness; and

iv. Validate the new model by reproducing the zero order correlation matrix of the variables from a set of normal equations using the path coefficient in the new model.

Blalock (1964) cited in Ariyo (2005) asserts that causal modelling is a technique for selecting those variables that are potential determinants (or causes) of the effects, and then attempting to isolate the separate contributions of the effects made by each predictor variable or cause. One of the methods of causal model analysis is the path-analysis developed by Wright (1921, 1934). Blalock (1964) also advanced factors guiding the formulation of the path model. They are:

i. Temporal order;

ii. Research findings; and

iii. Theoretical consideration.

3.6.1 Building the Hypothesised Recursive Path Model

Building of the recursive path model was based on the assumptions that causal interrelationship must be examined among a set of variables that have been logically ordered on the basis of time. Other assumptions are:

i. The model must accurately reflect the actual causal sequence;

ii. There is a one-way causal flow in the model. This implies that, reciprocal causation between variables is ruled out;

iii. The criterion variables are measured on an interval scale;

iv. The relations among variables in the model are linear, additive and causal in nature. Consequently, curvilinear, multiplicative or interaction relations are excluded;

v. The residuals are not correlated with variables preceding them in the model, nor are they correlated among themselves; and

vi. The structural equation for each endogenous variable includes all variables that are direct causes of that particular endogenous variable.

3.6.2 Identifying and Trimming the Paths in the Model

In order to identify the paths of the hypothesised causal model, the researcher explored all the necessary hypothesised linkages through structural equations listed below:

Structural equation of the hypothesised model are:

$$X_3 = P_{31}X_1 + P_{32}X_2 + e_3 \quad \text{----------3.1}$$

$$X_4 = P_{41}X_1 + P_{42}X_2 + P_{43}X_3 + e_4 \quad \text{----------3.2}$$

$$X_5 = P_{51}X_1 + P_{52}X_2 + P_{53}X_3 + P_{54}X_4 + e_5 \quad \text{----------3.3}$$

$$X_6 = P_{61}X_1 + P_{62}X_2 + P_{63}X_3 + P_{64}X_4 + P_{65}X_5 + e_6 \quad \text{----------3.4}$$

$$X_7 = P_{71}X_1 + P_{72}X_2 + P_{73}X_3 + P_{74}X_4 + P_{75}X_5 + P_{76}X_6 + e_7 \quad \text{----------3.5}$$

$$X_8 = P_{81}X_1 + P_{82}X_2 + P_{83}X_3 + P_{84}X_4 + P_{85}X_5 + P_{86}X_6 + P_{87}X_7 + e_8 \quad \text{----------3.6}$$

$$X_9 = P_{91}X_1 + P_{92}X_2 + P_{93}X_3 + P_{94}X_4 + P_{95}X_5 + P_{96}X_6 + P_{97}X_7 + P_{98}X_8 + e_9 \quad \text{--------3.7}$$

From the above equation; seven regression analyses were run in order to compute the values of the path coefficient for the hypothesised causal model. As recommended by experts in causal modelling (Adegoke, 2009; Kerlinger, 1978; Kerlinger and Lee, 2000; Pedhazur, 1973 and 1982; Pedhazur and Kerlinger, 1985), only meaningful paths with significant coefficient at 0.05 levels and above were retained. The insignificant paths were erased while the absolute value of path coefficient was taken to be at 0.05 as recommended by these experts. This enabled the researcher to produce the final model. These criteria were used in trimming the model in order to obtain a more parsimonious model that would be consistent with the theory that generated it without much loss of information.

3.6.3 Verifying the Efficacy of the New Model

The new model was validated by reproducing the original correlation matrix of the variables using the path coefficient in the new model through a set of normal equations developed from the new model. If the difference between the original and the reproduced correlation is minimal, it implies that the model is good and that the original data are consistent with the new model.

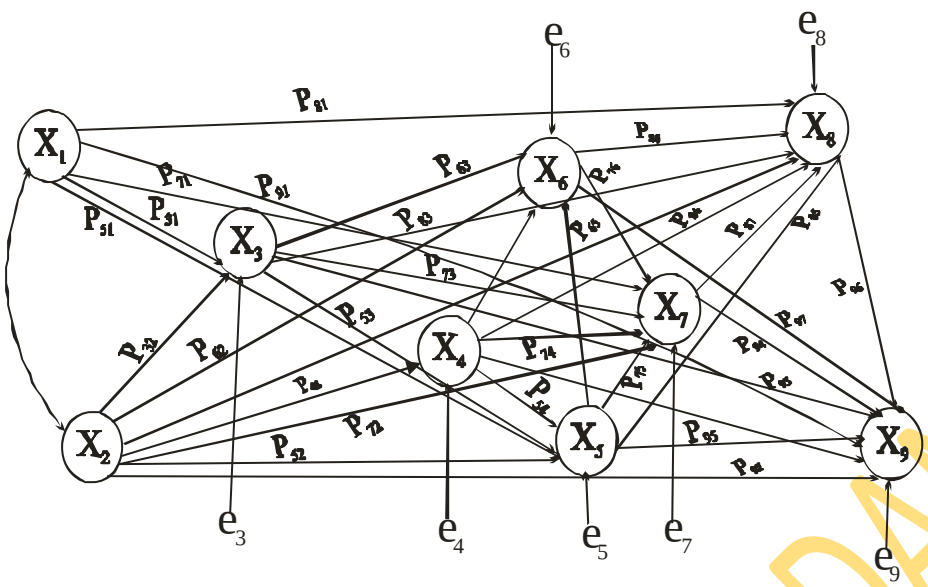


Figure 3.1: Hypothesised non-recursive path model of nine variables

Key:

X_1 = Age of the mother at birth of the child; X_2 = Parents' education;

X_3 = Parents' occupation; X_4 = Parents' support;

X_5 = Number of children in the family; X_6 = Academic motivation;

X_7 = Self concept; X_8 = Attitude;

X_9 = Achievement in mathematics

Considering the variables X_i (i = 2, 3, 5 and 9), there is evidence that parents' education will affect parents' occupation, parents' income, number of children in the family and students' academic achievement in mathematics. According to Grissmer (2003), parents' level of education was considered to be the most important factor affecting students' achievement. A family's socio economic-status includes among other variables the parents' education and occupation. Thus, a family with high socio-economic status often has more success in preparing their young children for school because they typically have access to a wide range of resources to promote and support their children's development. They are able to provide their young children with high quality child care, books and toys to encourage them in various learning activities at home. This in turn, affects the students' academic achievement in mathematics. For families in poverty, basic necessities are lacking, parents may place top priority on housing, clothing and health care. Educational toys, games and books may appear to be luxuries. This point was supported by Bookcock (2000) and Lloyd (2002) on the relationship between school performance and parental socio-economic

condition where they concluded that students with high achievement values tend to come from families that are more educated and with higher status of occupation. In another study by Howley (1989) and House (2002) students learn better if they are from above average or average income family, with well-educated parents who participate in the school's educational process and encourage children to learn.

Therefore, based on the available literature, parents' education (X_2) would causally influence parents' occupation (X_3) and number of children in the family (X_5). It is, therefore, logical to say that parents' education (X_2) influences parents' occupation, number of children in the family and students' achievement in mathematics. The hypothesised linkages between variables Xi (i = 2, 3, 5 and 9) are shown in Figure 3.2 below.

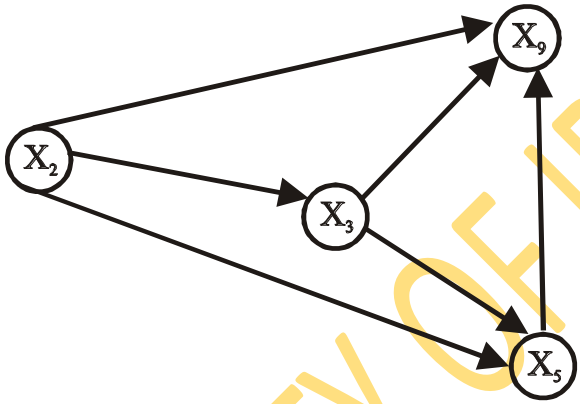


Fig. 3.2: Causal path among variables X_i (i = 2, 3, 5 and 9)

Key:

X_2 = Parents' education; X_3 = Parents' occupation;

X_5 = Number of children in the family; X_9 = Achievement in mathematics

Considering the variables X_i (i = 1, 2, 5, 8 and 9) and on the basis of literature (Moore, 1993; Satin, Leveno and Sherman, 1994; Olausson, Chattingius and Goldenberg, 1997; Brooks-Gunn and Chase-Lansdale, 2001; Fraser, 2004), it could be hypothesised that mother's age at birth of the child (X_1) will affect the child's social and emotional development. This, in turn, will affect the child's academic achievement (X_9). For instance, it seems logical that young mothers are socially and emotionally immature; and coping with the demand of an infant is more challenging for a teenager than for an older woman. It is also logical that the age at which a woman gives birth to her first child (X_1) will definitely affect the number of children in the family (X_5). In addition to this, if a teenage mother has additional children when she is older, she may continue the pattern of parenting she established with her first child. She may provide the child and her other siblings with less cognitive stimulation and resources that can promote cognitive development such as a high

quality childcare arrangement and a stimulating home environment which in turn can boost academic achievement. As for the pattern of linkage between parents' education (X_2), number of children in the family (X_5), students' attitude towards Mathematics (X_8) and achievement (X_9), studies have shown that parents' education (X_2) influences the academic performance of their children (X_9). This is because parents would be in a good position to be the second teacher to their children and even guide them on the best way to perform well in their education. The hypothesised linkages between variables Xi (i = 1, 2, 5, 8 & 9) are shown in Figure 3.3 below:

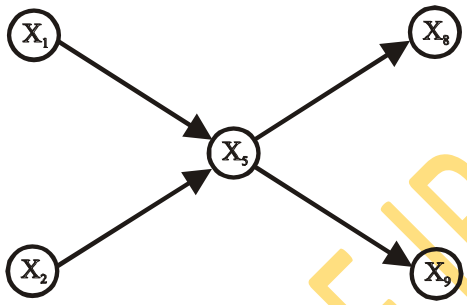


Fig. 3.3: Causal path among variables X_i (i = 1, 2, 5, 8 and 9)

Key:

X_1 = Age of mother at birth of the child; X_2 = Parents' education;

X_5 = Number of children in the family; X_8 = Attitude;

X_9 = Achievement in mathematics

Considering the variables X_i (i = 2, 4, 8 and 9), evidence has shown that parents' education (X_2) contributed to the choice of mathematics and science related courses offered by their children. Onocha (1985), shows that children of educated parents would naturally perform better than children from the illiterate families in science related courses. This is because the child from an educated family has a lot of support and guidance as well as enough textual and academic materials that can assist him/her in his/her educational career. He or she is even likely to be sent to good schools where seasoned teachers will handle his/her subjects. Yee and Eccles (1988) report that parents' education (X_2) affects their support (X_4) which in turn affects their children's success or failure in mathematics. It is then logical to say that parental support in homes make it more possible for children to complete more homework, improve on their language skills, have better attendance at school, develop positive attitude towards mathematics, and above all, have good grades in mathematics (Cotton and Wikelund, 2001; Goldring and Shapira, 1993; Griffith, 1996; Henderson, 1987 and Simon, 2000). Bouchey and Hartley (2005) then conclude that the achievement gap in

mathematics is caused by the general influence of parents. They further contend that many parents promote the study of the humanities to their female children and the study of mathematics and sciences to their male children. This was supported by Kahle and Meece (1994) that parents seem to encourage boys more in mathematics and science areas than they do girls. It is therefore logical to say that parents' support (X_4) affects the attitude developed by students towards Mathematics (X_8) and their academic achievement (X_9). The hypothesized linkages between variables X_i (i = 2, 4, 8 and 9) are shown in Figure 3.4 below:

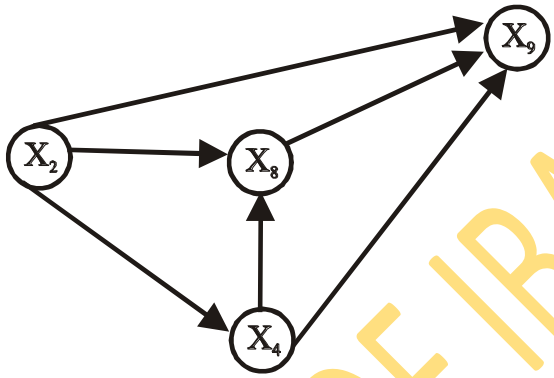


Fig. 3.4: Causal path among variables X_i (i = 2, 4, 8 and 9)

Key:

X_2 = Parents' education; X_4 = Parents' support;

X_8 = Attitude; X_9 = Achievement in mathematics

Considering the variables X_i (i = 1, 5, 8 and 9), available literature from McAnarney & Hendee (1989); Nord, Moore and Morrison (1992); Satin, Leveno and Sherman (1994); Olausson, Chattingius and Goldenberg (1997) and Frazer (2002) indicate that children of older mothers are more likely to have academic problems in schools, possibly as a direct result of the older age of the mother due to structural damage and biological disadvantage. Also Williams and Decoufle (1999) focused on mental retardation and attributed the increased incidence of co-developmental retardation among children of older mothers to Down's syndrome. A number of studies (Card, 1981; Wadsworth, Osborn and Taylor, 1984; Geronumus, Korenman and Hillemeier, 2005; Barrat, 1991) attribute lower cognitive scores among children of teenagers to decreased vocalisation and poor parenting practices. Keeves (2000) observed that number of children in the family, age spacing of the children and birth order are correlates of students' cognitive ability. He further opined that sibling size exert significant effect on students' attitude which in turn affect their academic achievement.

It is, therefore, logical to expect mothers with more children to spend less time with each one and the achievement of their children may suffer as a result. The hypothesised linkages between variables X_i (i = 1, 5, 8 and 9) are shown in Figure 3.5.

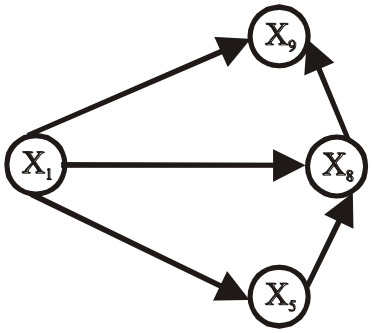


Fig. 3.5: Causal paths among variables X_i (i = 1, 5, 8 and 9)

Key:

X_1 = Age of mother at birth of the child; X_5 = Number of children in the family;

X_8 = Attitude; X_9 = Achievement in mathematics

Considering the variables X_i (i = 4, 8 and 9), Wilson (1983) meta-analysed the relationship between attitudes towards mathematics (X_8) and achievement in mathematics (X_9) and found positive relationship in the variables; though, the overall relationship was small but positive (about 0.15). Shrigley (1990) finds a modest positive correlation between attitude (X_8) and achievement (X_9). Parents' support (X_4) also remains a main contributor to their children's attitudes and career aspirations Steinberg (1993). Steinberg and Silverberg (1986) noted that adolescents' educational aspirations are more related to their parent's educational goals and focus; thus, Simpson, Koballa, Oliver and Crawley (1994) concluded that attitudes of parents are "crucial factors" in career choice.

It was noted by Smith and Hausafus (1997) that parents can support mathematics and mathematics teachers' efforts in the subject. This is by helping their children see the importance of taking advanced mathematics courses, emphasising the importance of mathematics in today's careers, limiting television set watching, and visiting science/mathematics related exhibitions and fairs with their children. Family support is a factor in mathematics' academic achievement and in children's expectation of themselves.

In a meta-analysis of factors that influence mathematics achievement, Staver and Walberg (1986) argued that parental factors such as interest in the child's school work, facilitation of homework and control of television watching, along with other external-to-school factors, contributed more to students' achievement than did school controllable factors. Maple and Stage (1991) also noted that parental variables (such as parental

education, support and interest in their child's school work) contributed to the choice of mathematics and science related majors. The hypothesised linkages between X_i (i = 4, 8 and 9) are shown in Figure 3.6 below:

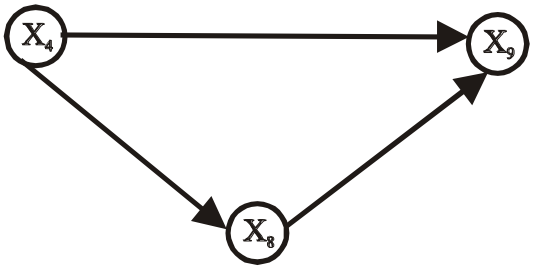


Fig. 3.6: Causal paths among variables X_i (i = 4, 8 and 9)

Key:

X_4 = Parents support X_8 = Attitude X_9 = Achievement in mathematics

Considering the variables X_i (i = 1 and 2), the age of mother at birth of the child (X_1), and parents' education (X_2) are the exogenous (independent) variables. They are variables that can influence others but cannot be influenced by other variables in the model. Their variability is determined by causes outside the causal model. The curved r_{12} path shows that it is not clear in the model which variable causes each other. Theoretically, the linkage between 1 and 2 is a double pointed arrow showing possible bivariate correlations between exogenous variables. The hypothesised linkage between variables X_i (i = 1 and 2) is shown in Figure 3.7 below:

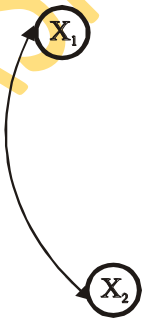


Fig. 3.7: Causal path among variables X_i (i = 1 and 2)

Key:

X_1= Age of mother at birth of the child X_2= Parents' education

Considering X_i (i = 1, 2, 3, 4, 5, 6, 7 and 8), there is evidence that age of mother at birth (X_1), parents' education (X_2), parents' occupation (X_3), parents' support (X_4), number of children in the family (X_5), academic motivation (X_6), self concept (X_7) have been found to have influence on students' attitude (X_8) towards mathematics. Aghenta (1982); Soyibo (1985); Steinberg (1993); Kahle and Meece (1994) and Gardner (1997) report similar studies.

The hypothesised linkages between X_i (i = 1, 2, 3, 4, 5, 6, 7 and 8) are shown in Figure 3.8 below:

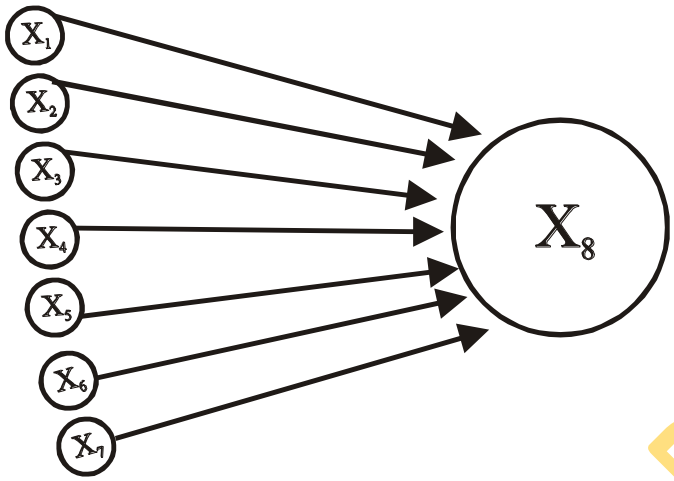


Fig. 3.8: Causal paths among variables X_i (i = 1, 2, 3, 4, 5, 6, 7 and 8)

Key:

X_1 = Age of mother at birth of the child; X_2 = Parents' education;

X_3 = Parents' occupation; X_4 = Parents' support;

X_5 = Number of children in the family; X_6 = Academic motivation;

X_7 = Self concept; X_8 = Attitude

Considering X_i (i = 1, 2, 3, 4, 5, 6, 7, 8 and 9), evidence has shown that age of mother at birth (X_1), parents' education (X_2), parents' occupation (X_3), parents' support (X_4), number of children in the family (X_5), academic motivation (X_6), self-concept (X_7), attitude (X_8) towards mathematics have been found to have influence on the students' achievement (X_9) in mathematics (Lockheed, Fuller and Nyirongo, 1989; Maple and Stage, 1991; Moore, 1993; Wilson, 1997; Philips, 1999; Brodie, 2001; Finger & Schlesser, 2002; Williams, 2004; Song & Hattie, 2004). The hypothesised linkages between variables X_i (i = 1, 2, 3, 4, 5, 6, 7, 8 and 9) are shown in Figure 3.9:

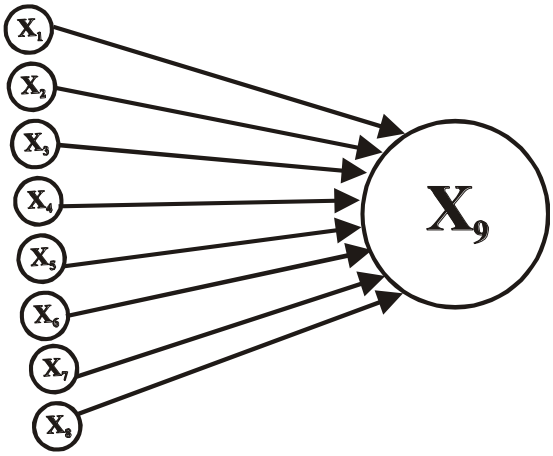


Fig. 3.9: Causal paths among variables X_i (i = 1, 2, 3, 4, 5, 6, 7, 8 and 9)

Key:

X_1 = Age of mother at birth of the child X_2 = Parents' education

X_3 = Parents' occupation X_4 = Parents' support

X_5 = Number of children in the family X_6 = Academic motivation

X_7 = Self-concept X_8 = Attitude

X_9 = Achievement in mathematics

Considering the variables X_i (i = 2, 3, 5, 6, 8 and 9), in the home, children of educated parents are usually motivated to learn and they have greater achievement potentials than children of uneducated parents. Education to some extent provides relevant occupation which equally influences attitudes and achievement. In a home where the parents are highly educated and are gainfully employed in relevant occupations, there is natural tendency for children to possess suitable academic motivation. Such motivation in addition to parental motivation; press for success, encouragement and the provision of special tutorial services are expected to have positive direct and indirect effects on achievement and attitudes towards mathematics (William and Chelser, 2005; Comber and Keeves, 2000; Habel, 1986; Lankard, 1995; Karnel, 2001; Trusty, 1999; Kasprow, 2001).

On the other hand, children of uneducated parents, in homes where academic materials are lacking, tend to be less motivated, unless they are provided special remedial and enrichment programmes (Wang and Wildman, 1995; Kahle and Meece, 1994; Maple and Stage, 1991; Steinberg, 1993; Steinberg and Silverberg, 1986; Bamidele, 1987; Morish, 1995). As such, a high level of education, high status occupation and academic motivation are hypothesised to have positive effects on the attitudes towards mathematics and achievement in mathematics. Number of children in the family affects attention and academic motivation which a child receives and the adequacy of academic self-concept for the children in the home. Therefore, it was hypothesised that a small family size (e.g. 1 to 3 children) would have a positive effect on the learning outcomes. The hypothesised linkages between variables X_i (i = 2, 3, 5, 6, 8 and 9) are shown in Figure 3.10.

Again, in Figure 3.10, variables (X_2) parents' education and (X_3) parents' occupation were treated as exogenous variables, that is; they were not influenced by other variables in the diagram. Accordingly, any variability in them would be attributed to influences outside the path diagram. Variables (X_5) number of children in the family, (X_6) academic motivation,

and (X_8) attitude were endogenous variables, that is; they were influenced by other antecedent variables and their variability could be explained by the variable influence of exogenous and endogenous variables.

Variable (X_9) academic achievement in mathematics is taken as an endogenous and dependent variable which was influenced directly and indirectly by all variables that preceded it in the diagram. Since no survey research claims to explain 100 per cent variance, a third kind of variable the (e) which represented the endogenous variables was included in the path diagram. The P's, that is, path coefficients represented the impact of one variable on the other. The hypothesised linkages between variables Xi (i = 2, 3, 5, 6, 8 and 9) are shown in Fig. 3.10 below:

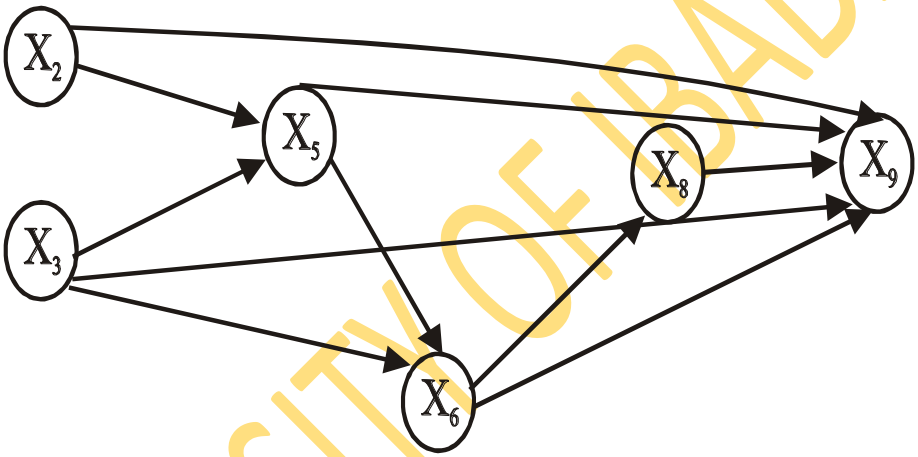


Fig. 3.10: Causal path among X_i (i = 2, 3, 5, 6, 8 and 9)

Key:

V_2 = Parents' education; V_3 = Parents' occupation;

V_5 = Number of children in the family; V_6 = Academic motivation;

V_8 = Attitude; V_9 = Achievement in mathematics

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.0 Introduction

Students' academic achievement is a function of factors that are associated with some home background variables, academic motivation, self-concept and attitude. In this chapter, all these are considered as shown in the data presented below. The percentages as reported in this section are based on the total retrieved responses to each item of the questionnaire. Also, this chapter presents the results and discussions derived from analysis of data obtained from the students who participated in the administration of the instruments. The results and discussions followed the order of the research questions in chapter one.

4.1 Results of Findings

Research Question One

What is the most meaningful causal model involving the listed home background variables (age of the mother at birth of the child, parents' education, occupation and support, number of children in the family), academic motivation, self-concept on students' attitude and achievement in mathematics?

Results

The hypothesised model already shown in Figure 3.1 was reproduced as Figure 4.1. The path coefficients and zero order correlation coefficients were written on each pathway with the correlation coefficients in parenthesis. Testing the significance of the path coefficients in the hypothesised model resulted in data which showed that only 15 out of 31 hypothesised paths met the criteria of significance at 0.05 levels, meaningfulness and have a link with the two criteria variables. The hypothesised model was therefore trimmed and re-specified to produce a more parsimonious model with 15 surviving paths in (Figure 4.2).

Validation of the New Path Model

To verify the efficacy of the new path model in Fig. 4.2, the original correlation data were reproduced using the computed path coefficients in the more parsimonious model. This is in line with recommendations for standard path-analytic procedures by the experts. Table 4.1 show the standardised path coefficients of the new path model while Table 4.2 show the original and reproduced correlation matrix; and the discrepancies between them are shown on Table 4.3. The Tables show that the discrepancies between the original and the reproduced

correlations are very minimal (<0.05), an indication that the pattern of correlation in the observed data are consistent with the more parsimonious model. The new model is therefore considered tenable in explaining the causal interaction between the predictor variables (variables 1-7) and the criteria variables (variables 8 and 9). Figure 4.2, thus, shows the most meaningful causal model involving the home background variables (age of mother at birth of the child, parents' education, occupation and support, number of children in the family), academic motivation, self-concept on students attitude to mathematics and achievement in mathematics. This is the main submission of this investigation.

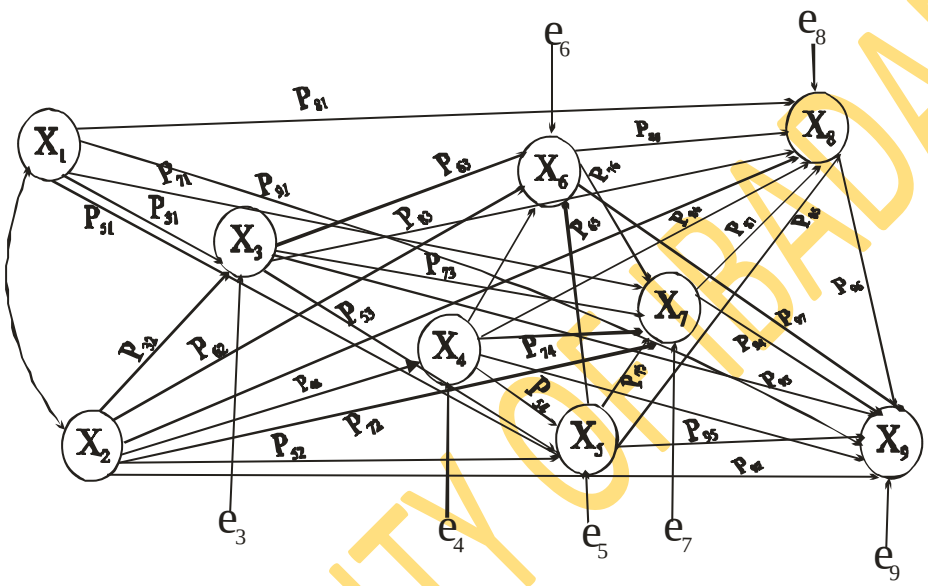


Fig. 4.1: Hypothesised non-recursive path model of nine variables

Key:

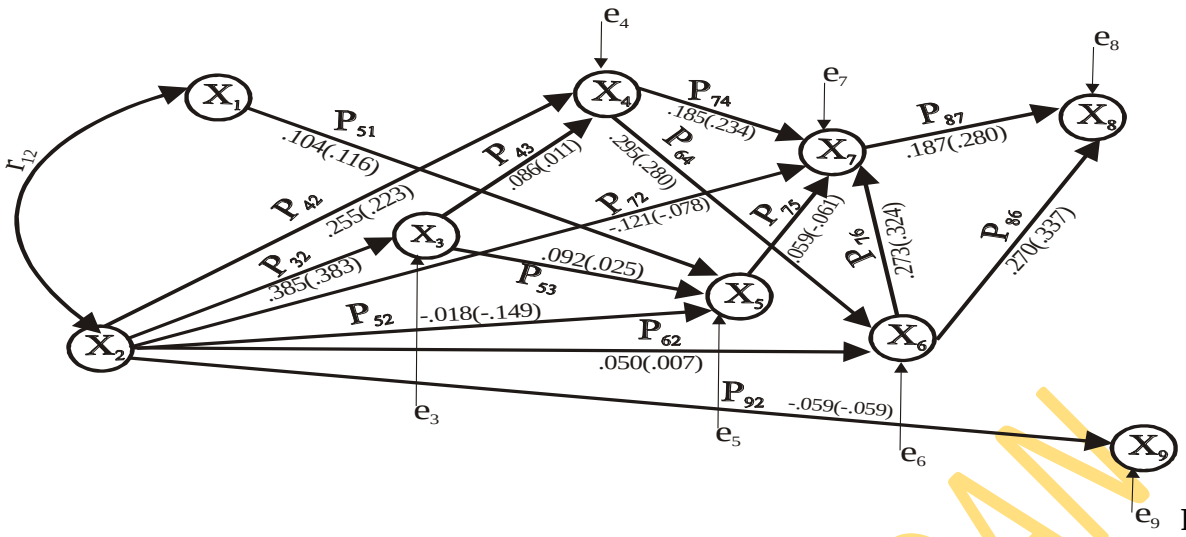
X_1 = Age of the mother at birth of the child X_2 = Parents' education

X_3 = Parents' occupation X_4 = Parents' support

X_5 = Number of children in the family X_6 = Academic motivation

X_7 = Self concept X_8 = Attitude

X_9 = Achievement in mathematics



ig. 4.2: The new path model showing path coefficient and zero order correlation coefficient in parenthesis.

Key:

X_1 = Age of the mother at birth of the child; X_2 = Parents' education;

X_3 = Parents' occupation; X_4 = Parents' support;

X_5 = Number of children in the family; X_6 = Academic motivation;

X_7 = Self concept; X_8 = Attitude; X_9 = Achievement in mathematics

Research Question Two

What are the directions, as well as estimates of the strengths of the causal path (path coefficients) of the variables in the model?

Results

The directions of the causal paths of the variables in the model are shown in the pathways which are: (i) significant (ii) meaningful; and (iii) have a link with the criteria variables (variables 8 and 9). An analysis of Table 4.4 reveals that these paths are 47 in number with associated beta weights (path coefficients) which give the estimates of the causal paths of the variables in the model. However, the actual estimates of some indirect paths were obtained by multiplying the beta weights of component single paths and the r_{12} value where applicable.

Testing the Significance of the Hypothesized Path Diagram:

Table 4.1 presents the standardised path coefficients of the new path models. It also shows the alpha level at which the path coefficients are significant or otherwise. Table 4.2

shows the original and reproduced correlation matrix for the nine variables, while Table 4.3 shows the discrepancies between the original and reproduced correlation coefficients.

Table 4.1: Estimated path coefficients for the new path diagram showing predictor variables on attitude and achievement in mathematics.

Path	Standardised Path Coefficients	P-value
P_{32}	0.385	0.05
P_{42}	0.255	0.05
P_{43}	0.086	0.05
P_{51}	0.104	0.05
P_{52}	-0.178	0.05
P_{53}	0.092	0.05
P_{62}	0.050	0.05
P_{64}	0.295	0.05
P_{72}	-0.121	0.05
P_{74}	0.185	0.05
P_{75}	0.059	0.05
P_{76}	0.273	0.05
P_{86}	0.270	0.05
P_{87}	0.187	0.05
P_{92}	-0.059	0.05

The Table provides the evidence that all path coefficients are statistically significant at the 0.05 alpha level.

Table 4.2: The original and reproduced correlation matrix for the nine variables

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	**1.000**	-0.060	0.010	-0.035	0.116	-0.028	-0.001	0.020	0.017
X_2	-0.060	**1.000**	0.383	0.223	-0.149	0.007	-0.078	-0.029	-0.059
X_3	0.010	0.385	**1.000**	0.011	0.025	-0.028	-0.062	0.012	-0.001
X_4	-0.014	0.288	0.186	**1.000**	-0.017	0.280	0.234	0.139	-0.035
X_5	0.113	-0.149	0.025	-0.042	**1.000**	0.009	-0.061	0.011	-0.018
X_6	-0.013	0.116	0.022	0.306	-0.040	**1.000**	0.324	0.337	0.009
X_7	-0.001	-0.087	-0.051	0.227	-0.058	0.324	**1.000**	0.280	0.021
X_8	-0.008	-0.013	-0.19	0.119	-0.009	0.331	0.274	**1.000**	-0.003
X_9	0.004	-0.059	-0.023	-0.013	0.009	-0.004	0.005	0.002	**1.000**

Note: Entries above the diagonal are original correlation coefficients
Entries below the diagonal are reproduced correlation coefficients.

Table 4.3: Discrepancies between the original and reproduced correlation coefficients

Correlation	Original	Reproduced	Difference
r_{12}	-0.060	-0.060	0.000
r_{13}	0.010	0.010	0.000
r_{14}	-0.035	-0.014	0.021
r_{15}	0.116	0.113	-0.003
r_{16}	-0.028	-0.013	0.015
r_{17}	-0.001	-0.001	0.000
r_{18}	0.020	-0.008	-0.028
r_{19}	0.017	0.004	-0.013
r_{23}	0.383	0.385	0.002
r_{24}	0.223	0.288	0.065*
r_{25}	-0.149	-0.149	0.000
r_{26}	0.007	0.116	0.109*
r_{27}	-0.078	-0.087	-0.009
r_{28}	-0.029	-0.013	0.016
r_{29}	-0.059	-0.059	0.000
r_{34}	0.011	0.184	0.173*
r_{35}	0.025	0.025	0.000
r_{36}	-0.028	0.022	0.050
r_{37}	-0.062	-0.051	0.011
r_{38}	0.012	-0.019	-0.031
r_{39}	-0.001	-0.023	-0.022
r_{45}	-0.017	-0.042	-0.025
r_{46}	0.280	0.306	0.026
r_{47}	0.234	0.227	-0.007
r_{48}	0.139	0.119	-0.020
r_{49}	-0.035	-0.013	0.022
r_{56}	0.009	-0.040	-0.049
r_{57}	-0.061	-0.58	0.003
r_{58}	0.011	-0.009	-0.020
r_{59}	-0.018	0.009	-0.009
r_{67}	0.324	0.324	0.000
r_{68}	0.337	0.331	-0.006
r_{69}	0.009	-0.004	-0.013
r_{78}	0.280	0.274	-0.006
r_{79}	0.021	0.005	0.016
r_{89}	-0.003	0.002	0.005

*** means not significant at 0.05 alpha level**

Total difference = 0.238

Mean difference = 0.007

As can be seen from the Table 4.3, the discrepancies between the original and reproduced correlations are very small. This indicates that the patterns of correlations in the data are consistent with the more parsimonious path diagram. Hence, the new path diagram

is tenable in explaining the interrelationship between home background variables (age of the mother at birth of the child, parents' education, occupation and support, and number of children in the family), academic motivation, self-concept, students' attitude towards mathematics and achievement in mathematics.

Research Question Three

What are the direct and indirect effects of the variables on students' attitude and achievement in mathematics?

Results

Table 4.4 shows 22 significant and meaningful pathways through which the predictors caused variation in students' attitude to and achievement in mathematics. Out of the 22 pathways, three were direct while 19 were indirect.

The results show that the two predictor variables that had direct effect on the first criterion variable (attitude) are the academic motivation and self-concept. The academic motivation had the highest direct contribution with beta value ($\beta = 0.270$) while self-concept had direct contribution with beta value ($\beta = 0.187$). The only predictor variable that had direct effect on the second criterion variable (achievement in mathematics) is parents' education. The predictor variable (parents' education) had direct contribution with beta value ($\beta = 0.059$) on achievement in mathematics as shown in Table 4.5. Again, there were six predictors that had indirect effect on the first criterion variable (attitude). Parents' support had the highest indirect effect ($\beta = 0.105$); followed by academic motivation ($\beta = 0.005$); number of children in the family ($\beta = 0.011$); parents' education ($\beta = 0.007$); parents' occupation ($\beta = 0.005$) and lastly, age of the mother at birth of the child ($\beta = 0.001$). There was no indirect predictor on the second criterion variable (achievement).

Research Question Four

What proportions of the total effects are:

(a) Direct; and

(b) Indirect?

Results

The total effects (direct and indirect) of all the seven predictor variables (age of the mother at birth of the child, parents' education, occupation and support, number of children

in the family), academic motivation and self-concept on criteria variables (attitude and academic achievement in mathematics) are shown in Tables 4.4 and 4.5. Out of the seven predictor variables hypothesised, only one (i.e, parents' education), significantly exerted direct influence on achievement with beta value (β = 0.059). However, all the seven predictor variables significantly exerted direct and indirect influence on students' attitude thus; academic motivation with beta value (β = 0.321); self-concept with beta value (β = 0.187); parents' support with beta value (β = 0.105); number of children in the family with beta value (β = 0.011); parents' education with beta value (β = 0.007); parents' occupation (β = 0.005); and age of the mother at birth of the child (β = 0.001).

Table 4.4: Effects of Seven Predictor Variables on the Two Criteria Variables

Outcome	Determinant	Direct path	Indirect path	Total effect
X_3 R^2 = 14.7%	X_2	P_{32}	---	P_{32}
X_4 R^2 = 5.6%	X_2 X_3	P_{42} P_{43}	$P_{32}P_{43}$ ---	$P_{42} + P_{32}P_{43}$ P_{43}
X_5 R^2 = 4.1%	X_1 X_2 X_3	P_{51} P_{52} P_{53}	--- $P_{32}P_{53}$ ---	P_{51} $P_{52} + P_{32}P_{53}$ P_{53}
X_6 R^2 = 8.2%	X_2 X_4	P_{62} P_{64}	$P_{42}P_{64}+P_{32}P_{43}P_{64}$ ---	$P_{62} + P_{42}P_{64}+P_{32}P_{43}P_{64}$ P_{64}
X_7 R^2 = 14.5%	X_1 X_2 X_3 X_4 X_5 X_6	--- P_{72} --- P_{74} P_{75} P_{76}	$P_{51}P_{75}$ $P_{42}P_{74}+P_{33}P_{43}+P_{42}P_{64}P_{76}+P_{32}P_{43}P_{64}P_{76}+P_{53}P_{75}+P_{62}P_{76}$ $P_{43}P_{64}P_{76}+P_{43}P_{74}+P_{53}P_{75}$ $P_{64}P_{76}$ --- ---	$P_{51}P_{75}$ $P_{72}+P_{42}P_{74}+P_{33}P_{43}+P_{42}P_{64}P_{76}+P_{32}P_{43}P_{64}P_{76}+P_{53}P_{75}+P_{62}P_{76}$ $P_{43}P_{64}P_{76}+P_{43}P_{74}+P_{53}P_{75}$ $P_{74} + P_{64}P_{76}$ P_{75} P_{76}
X_8 R^2 = 14.6%	X_1 X_2 X_3 X_4 X_5 X_6 X_7	--- --- --- --- --- P_{86} P_{87}	$P_{51}P_{75}P_{87}$ $P_{42}P_{64}P_{76}P_{87}+P_{42}P_{74}P_{87}+P_{32}P_{43}P_{64}P_{76}P_{87}+P_{32}P_{43}+P_{74}P_{87}$ $+P_{32}P_{53}P_{75}P_{87}+P_{52}P_{75}P_{87}+P_{62}P_{76}P_{87}+P_{62}P_{86}+P_{72}P_{87}$ $P_{43}P_{64}P_{76}P_{87}+P_{43}P_{74}P_{87}+P_{53}P_{75}P_{87}$ $P_{64}P_{76}P_{87}+P_{74}P_{87}+P_{64}P_{87}$ $P_{75}P_{87}$ $P_{76}P_{87}$ ---	$P_{51}P_{75}P_{87}$ $P_{42}P_{64}P_{76}P_{87}+P_{42}P_{74}P_{87}+P_{32}P_{43}P_{64}P_{76}P_{87}+P_{32}P_{43}+P_{74}P_{87}$ $+P_{32}P_{53}P_{75}P_{87}+P_{52}P_{75}P_{87}+P_{62}P_{76}P_{87}+P_{62}P_{86}+P_{72}P_{87}$ $P_{43}P_{64}P_{76}P_{87}+P_{43}P_{74}P_{87}+P_{53}P_{75}P_{87}$ $P_{64}P_{76}P_{87}+P_{74}P_{87}+P_{64}P_{87}$ $P_{75}P_{87}$ $P_{86} + P_{76}P_{87}$ P_{87}
X_9 R^2 = 0.4%	X_2	P_{92}	---	P_{92}

Table 4.5: Summary of Causal Effects of Predictor Variables on Attitude and Achievement in Mathematics.

Dependent variable	Determinant or Influencing variable	Direct path	Indirect path	Total effect
X_3	X_2	0.385	---	0.385
$R^2 = 14.7\%$				
X_4	X_2	0.255	0.033	0.288
$R^2 = 5.6\%$	X_3	0.086	---	0.086
Total		0.341	0.033	0.374
X_5	X_1	0.104	---	0.104
$R^2 = 4.1\%$	X_2	-0.178	0.035	-0.143
	X_3	0.092	---	0.092
Total		0.018	0.035	0.053
X_6	X_2	0.050	0.085	0.135
$R^2 = 8.2\%$	X_4	0.295	--	0.295
Total		0.345	0.085	0.430
X_7	X_1	---	0.006	0.006
$R^2 = 14.5\%$	X_2	-0.121	0.082	-0.039
	X_3	---	0.028	0.028
	X_4	0.185	0.081	0.266
	X_5	0.059	---	0.059
	X_6	0.273	---	0.273
Total		0.396	0.197	0.593
X_8	X_1	---	0.001	0.001
$R^2 = 14.6\%$	X_2	---	0.007	0.007
	X_3	---	0.005	0.005
	X_4	---	0.105	0.105
	X_5	---	0.011	-0.011
	X_6	0.270	0.051	0.321
	X_7	0.187	---	0.187
Total		0.457	0.180	0.637
X_9	X_2	-0.059	---	-0.059
$R^2 = 0.4\%$				
Total		-0.059	---	-0.059

Tables 4.4 and 4.5 present the total effects of each influencing variable on the dependent variables. The tables also provide the proportion of direct effects of the influencing variables on the dependent variables and the total indirect effects attributed to other variables in the path diagram. There were two criteria variables (attitude and achievement). For attitude, the total effect is 0.637 of which direct effect is 0.457 (71.7%) while the indirect effect is 0.180 (28.3%). For achievement, the total effect is 0.059 of which direct effect accounts for all 0.059 (100.0%).

4.2 Discussion of Findings

The results of the present study showed that most of the path coefficients of the hypothesised model were not meaningful and this brought about re-specification of the model. In the re-specified model, 15 significant pathways were recorded. These pathways were derived from seven structural equations for producing the most meaningful causal model (Fig. 4.2) involving home background variables (age of mother at birth of the child, parents' education, occupation and support, number of children in the family), academic motivation, self-concept, attitude and academic achievement in mathematics.

The structural equations for the re-specified models are as follows:

$X_3 = X_2 P_{32} + e_3$ ---------- 4.1

$X_4 = X_2 P_{43} + X_2 P_{42} + e_4$ ---------- 4.2

$X_5 = X_3 P_{53} + X_2 P_{52} + X_1 P_{51} + e_5$ ---------- 4.3

$X_6 = X_4 P_{64} + X_2 P_{62} + e_6$ ---------- 4.4

$X_7 = X_6 P_{76} + X_5 P_{75} + X_4 P_{74} + X_2 P_{72} + e_7$ ---------- 4.5

$X_8 = X_7 P_{87} + X_6 P_{86} + e_8$ ---------- 4.6

$X_9 = X_2 P_{92} + e_9$ ---------- 4.7

The results of the study, in relation to Table 4.3 shows that the computation of the reproduced correlations for the revised model is consistent with the empirical correlations as only 3 out of the 35 reproduced correlations exceeded a difference of 0.05. This was about 9% of the reproduced correlations and only 15 path coefficients were significant at the 0.05 levels as shown in Table 4.1. The direct, indirect and total causal effects of the revised model are presented in Tables 4.4 and 4.5 respectively.

Indirect and Total Effects

The direct effects as given in Tables 4.4 and 4.5 are the path coefficients or the beta weights in the re-specified model (Fig. 4.2). The indirect effects are estimated statistically as the products of direct effects, that is, the standardised regression coefficients of the paths that comprise them (Adegoke, 2009). For example, the standardised indirect effect of parents' education on parents' support is estimated as the product of the standardised coefficients for the paths: from parents' education to parents' occupation multiplied by from parents' occupation to parents' support.

In other words, P_{32} X P_{43} ➔ 0.385 X 0.086 = **0.033**.

Similarly, the indirect effect of parents' education on academic motivation is given by the paths: from parents' education to parents' support multiplied by from parents' support to academic motivation + from parents' education to parents' occupation multiplied by from parents' occupation to parents' support multiplied by from parents' support to academic motivation.

This implies that: P_{42} X P_{64} + P_{32} X P_{43} x P_{64} ===> 0.255 X 0.295 + 0.385 X 0.086 X 0.295

= 0.075 + 0.010 = **0.085**

Also, the indirect effect of academic motivation on attitude of students towards mathematics is given by the paths: from academic motivation to self-concept multiplied by from self-concept to attitude.

This implies that: P_{76} X P_{87} = 0.273 X 0.187 = **0.051**

The implication of the result is that for the P_{32} P_{43} which is 0.033, the parents' support is expected to increase by 0.033 standard deviations for every increase in parents' education effect of one full standard deviation via its prior effect on parents' occupation.

Likewise, for the $P_{76}P_{86}$, which has the value 0.051 implies that, attitude of students towards mathematics is expected to increase by 0.051 standard deviations for every increase in academic motivation effect of one full standard deviation via its prior effect on self-concept.

Again, from Tables 4.4 and 4.5 the outcomes of primary interest were attitude and achievement in mathematics of which their determinants as indicated by total effects were as follows: for academic achievement in mathematics, the total effect (0.059) was determined by parents' education (X_2) and this model explains approximately 0.4% of the variance in academic achievement in mathematics. For attitude, the primary determinants were age of the mother at birth of the child (X_1), parents' education (X_2); parents' occupation (X_3), parents' support (X_4), number of children in the family (X_5), academic motivation (X_6) and self concept (X_7). This model explains approximately 14.6% of variance in attitude. The primary determinants of self-concept were age of the mother at birth of the child (X_1), parents' education (X_2), parents' occupation (X_3), parents' support (X_4), number of children in the family (X_5), and academic motivation (X_6). This model explains 14.5% of variance in self-concept. The primary determinants of academic motivation (X_6) were parents' education (X_2) and parents support (X_4) with total effect of 0.135 and 0.295 respectively. The model explains approximately 8.2% of variance in academic motivation. The primary determinants of number of children in the family (X_5) were age of mother at the birth of the child (X_1), parents' education (X_2) and parents' occupation (X_3). This model explains 4.1% of variance in number of children in the family. The primary determinants of parents' support (X_4) were parents' education (X_2) and parents' occupation (X_3). This model

explains approximately 5.6% of variance in parents' support. Finally, the primary determinant of parents' occupation (X_3) was parents' education (X_2) with total effect of 0.385 and the model explains approximately 14.7% of variance in parents' occupation.

The result of the study (in relation to research question 1) indicates that the discrepancies in the original and the reproduced correlation were found to be minimal for 32 out of 35 have coefficients (< 0.05). This shows consistency in the pattern of correlation in the observed data which is now tenable in explaining the causal interaction between the home background variables, academic motivation, self-concept, attitude and academic achievement. The result of this study also indicates that 15 significant pathways were recorded from the re-specified model. These pathways were derived from the 7 structural equations for producing the most meaningful causal model.

The result in Table 4.5 reveals that parents' education has significant influence on the academic achievement of students in mathematics. This is because parents' education is the only predictor variable that exerted direct influence on students' academic achievement in mathematics as the direct effect was 0.059. This observation provides the evidence that students of educated parents might performed better than students of uneducated parents in mathematics achievement. The findings lend support to the results of Onocha (1985), Carlson (1997), Musgrave (2000) and Grissmer (2003) which reported that parents' level of education was the most important factor affecting students' academic achievement. Also, the results in Table 4.5 show that academic motivation had a strong total effect of 0.321 of which 0.270 was the direct effect of the variation on students' attitude towards mathematics while a total indirect effect of 0.051 was transmitted via self-concept.

The result also lends support to previous studies which have reported that student's academic motivation has a significant effect on students' performance in mathematics. Parents' support as can be seen from Table 4.5 exerted a total effect of 0.266 of which 0.185 was direct effect while a total indirect effect of 0.081 was transmitted via academic motivation and self-concept. The result is an indication that students from homes where the parents support the academic studies of their children might achieve better test scores, higher grades, have better attendance at school, complete more homework, demonstrate more positive attitude towards their academic, graduate at higher rates and more likely to enroll in higher education to pursue their career opportunities than children from homes lacking parental support. In the light of this finding, the need arises for parents to provide support which could contribute to the mathematics achievement of their children. This result also agrees with the findings of Steinberg and Silverberg (1986), Thomas (1986) and Steinberg (1993) that parents remain a main contributor to their children's socialisation, attitudes and career aspirations.

The finding that self-concept has a significant influence on students' attitude towards mathematics supports those of Byrne (1984), Clemes and Bean (1996) and Marsh (2000) which reported that there is a relationship between academic self-concept and attitude; and finally concluded that in reality the relationship is likely to be reciprocal. The implication of this observation is that there is a linear association between self-concept and students' attitude towards mathematics. Thus, at each school, training and development in the areas of the student's personal and social competence such as self-concept, self-esteem, social abilities, personal development, school mediation, living together and conflict resolution should be addressed through the teachers' developmental plans.

The results also reveal that parents' occupation has indirect effects on students' attitude towards mathematics. The result provide evidence that students whose parents belong to the high ranking occupational status might have a better attitude towards mathematics than their counterparts whose parents belong to the low ranking occupational status. This is because parents with high ranking occupational status might have enough income which can be used to provide the needed materials and support for their children in order to arouse their interest in mathematics than their counterparts in low ranking occupation whose major obligation is to provide shelter and food for the family. However, most of the effects of the parents' occupation variations were transmitted via parents' support, number of children in the family, academic motivation and self-concept.

With respect to the effects of age of mother at birth of the child and the child's attitude towards mathematics and academic achievement in mathematics; Figure 4.2 shows that there is only indirect effect of mother's age on students' attitude towards mathematics through the number of children in the family and it had the least total effect among the home background variables which exerted significant effects on students' attitude towards mathematics. Additionally, the result shows that the effect of mother's age at birth of the child and the child's attitude towards mathematics is very low and this indicates that in the face of other home background variables, its effects are very minimal. The implication of this however is that the age at which a mother gives birth to her child may contribute to low maternal education, unmarried status and/or poverty factor with known, large, negative effects on educational disabilities. Although maternal age does not directly influence the attitude of students in mathematics, it may have an indirect effect through the intermediate socio-demographic factors such as maternal education.

The number of children in the family has a significant effect on students' attitude towards mathematics. However, 0.011 was exerted indirectly by the number of children in the family on attitude through self-concept. The findings thus lend support to the results of Keeve (2000) which shows that sibling size exerts significant effects on students' attitude

which in turn may affect the academic achievement. It is thus explicable that the number of children has a direct effect on self-concept and indirect effect on students' attitude towards mathematics.

In general, the findings demonstrate that students from homes of small sibling size might perform better than students from homes of large sibling size. Notably, more of the effects of the variable, "number of children in the family" were transmitted via direct paths, namely; age of mother at birth of the child, parents' education and parents' occupation. Therefore, it is suggested that parents should maintain a small family size of one to four children, based on the claims that the attention and motivation which a child receives in the home and the educational opportunities like extra tutorial services provided by the parents decrease as the sibling size increases.

In summary, there is evidence that the more parsimonious path diagram is tenable in providing explanations for the interrelationships between home background variables, academic motivation, self-concept, students' attitude and academic achievement in mathematics. Thus, students who are from homes where parents support their academic studies and have a small family size, as well as those whose parents are educated and belong to the high ranking occupational status, might perform better in mathematics than their counterparts from homes lacking parents' support in academics, with a large family size, as well as those whose parents are uneducated and belong to the low ranking occupational status.

CHAPTER FIVE

SUMMARY OF FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

This chapter has five sections; section one summarises the findings; section two discusses the implications and recommendation of the results while in section three limitations of the study are discussed. In section four suggestions for further studies are made and in section five conclusions of the findings of this study are highlighted.

5.1 Summary of Findings

The major findings are summarised below:

(i). When the predictor variables; age of mother at birth of the child, parents' education, occupation and support, number of children in the family, academic motivation and self-concept are taken together, they effectively predicted the attitude of students towards mathematics.

(ii). A new model (the most meaningful causal model) involving the listed home background variables (age of mother at birth of the child, parents' education, occupation and support, and number of children in the family), academic motivation, self-concept, attitude and students' achievement in mathematics produced 47 significant and meaningful pathways with 15 direct and 32 indirect paths. The pattern of correlations in the observed data was found to be consistent with the new model.

(iii). Out of the seven predictor variables hypothesised to exert causal influence on achievement in mathematics, only one (i.e, parents education) significantly exerted such causal influence directly on achievement.

(iv). The variable, parents' education was the most potent predictor of students' achievement in mathematics while academic motivation, self-concept, parents' support, number of children in the family, parents' education, parents' occupation, and age of mother at birth of the child in a decreasing order of magnitude, made significant contributions to the prediction of students' attitude towards mathematics.

5.2 Implications and Recommendation

The findings summarised above have useful educational implications for the following groups of persons:

(i) Policy makers;

(ii) Parents; and

(iii) Teachers.

i. In order to ensure a successful teaching and learning of mathematics, the policy makers should provide adequate, experienced and qualified teachers in mathematics in schools;

ii. The findings have shed more light on some of the home background variables that affect academic achievement in mathematics. Thus, the study suggests the need for teachers to develop positive relations with students, to stress classroom activities which involve active teaching-learning process and students' participation. Also, they should engage students meaningfully in the subject to ensure better and satisfying results;

iii. The findings also provide ample evidence that the home exerts significant effect on attitudes in mathematics. It is therefore necessary to provide as much as possible relevant academic materials like supplementary books and magazines; encourage children to participate in mathematics related quiz and motivate students to learn, in order to achieve the development of intellectual and educational skills in them;

iv. Apart from this, there is the need for parents to maintain a small sibling size in their homes, given that this will provide adequate parental stimulation and academic motivation which are required by the students for maximum achievement in mathematics;

v. Owing to some home background factors which affect the learning of mathematics by the students, government should provide adequate funds to purchase necessary instructional materials and textbooks for effective teaching of mathematics; and

vi. Considering the importance of mathematics to the society, policy makers should make it compulsory for schools to have seven periods of 40 minutes each per week for the teaching of mathematics.

5.3 Limitations of this Study

The preceding chapters have provided the background to the study, the relevant literature, methodology, results and discussions as well as the summary of findings. The merits of findings in any study are limited by certain factors. In this study, the sources of limitations were identified as follows:

i. As an *ex-post-facto* type of study, the operating conditions did not allow for direct standardisation and manipulations of variables, since both the effects and the alleged causes have already occurred and must be studied in retrospect. The researchers had to resort to statistical control as the only means of establishing equivalence across the

various variables. This is an inherent limitation of typical ex-post-facto investigations, especially when causal linkages are being discussed.

ii. As already observed in the categories of educational indicators, there are many factors that could affect students' achievement in mathematics as a subject. Thus, selection of the variables was not easily done by the researcher. In this study few of these factors were selected as variables for consideration. Other variables that might be considered could not be measured effectively within the available resources to the researcher.

iii. Mathematics achievement of the students was measured by a paper and pencil test. Other aspects of the students' domains (affective and psychomotor) were not tested.

iv. Attitudes of the students were also measured by means of a questionnaire; it is usually desirable to supplement information obtained from a questionnaire with information from direct observation. However, it was not practicable to observe the 2400 students who participated in the study within the limited time of the research work. Moreover, the emphasis was to obtain a representative sample in such a wide survey.

v. The use of statistical significance and meaningfulness as criteria for trimming the paths and rejecting the contributions of some predictor variables to the variance in achievement might have been too strict to obey. In addition to this, the researcher considers the minimum value of 0.05 for meaningfulness as arbitrary.

vi. In causal modelling investigations, if the original and reproduced correlation matrices are "the same or nearly the same", the more passimonious (most meaningful) model is not rejected. However, lack of precision in the result of the findings poses a limitation.

5.4 Suggestions for further study

i. This study examined the effects of some home background variables (age of mother at birth of the child, parents' education, occupation and support, and number of children in the family), academic motivation, self-concept, attitude and achievement in senior secondary school mathematics in Ogun State. It is likely that some of the effects are reciprocal. A student's mathematics achievement, for example, may influence his or her motivation, or influence his or her attitude towards mathematics. It is also possible that some effects on mathematics achievement are direct while others are indirect. However, the influence of peer relationship was not examined. A study of the relationship between peer influence and learning outcomes in

mathematics should be of interest to policy makers, curriculum planners, parents, teachers and the students themselves.

ii In view of fact that this study revealed significant impact of certain variables on students' academic achievement in mathematics in Ogun State, the research should be replicated in other states of the country in order to affirm the influence that the variables in question have on students' academic achievement in secondary schools and for wider generalization of the research findings.

iii. In future studies, it is the opinion of the researcher that a study which examines other variables that can influence students' academic achievement in mathematics such as school variables, teachers' variables, availability of equipment and school motivation should be of interest to educators. Also, students' attitudes towards mathematics were measured by the means of self-reporting questionnaire; this can be improved upon by using other techniques like rating scales, observational technique and check list.

iv. An experimental study with a small sample of students in which detailed observation of their attitudes towards mathematics is undertaken will provide useful results.

v. Finally, researchers should replicate the study using similar sample and extending the sample size so as to test the validity of the conclusion reached.

vi. This study sought to investigate the extent to which some home background variables, academic motivation, self-concept determine attitude and achievement of secondary school students in mathematics in Ogun State, Nigeria. There is a limit to which the findings can be generalised. Therefore, there is need for further research which will cover a wider geographical/geo-political area of Ogun State including the urban.

5.5 Conclusion

From the findings of this study, the following conclusions were reached:

i. Given that the present study is limited to Senior Secondary Schools in Ogun State, similar studies could be carried out in other parts of the country to affirm or refute the conclusion reached. Thus, the present study should be a pointer in such direction.

ii. There is need to develop a love for mathematics through positive attitude towards it. This is because positive attitude may bring about appreciable improvement in mathematics achievement.

iii. Home background variables (i.e, age of mother at birth of the child, parents' education, occupation and support, number of children in the family) as well as academic motivation and self concept brought about greater improvement in students' attitude towards mathematics. It is therefore pertinent that parents be

encourage to put on earnest efforts in motivating students towards the learning of mathematics.

iv. With the present educational system, a credit pass in mathematics has been made compulsory for admission into tertiary institutions for all students, compared with the old system where ordinary pass in mathematics was acceptable for students offering art subjects. Arguably, when home environment and attitude of students are improved, there could be a significant improvement in the achievement of students in mathematics.

v. Since parents education influences students academic achievement in mathematics, the government and all stakeholders in education sector should endeavour to implement its policy on basic education for all and thus create an enlighten society in which every parent would be educated enough to have a positive influence on their children especially in their attitude towards mathematics which in turn would lead to better achievement in the subject.

vi. To ensure a successful teaching and learning of mathematics, there is a need to motivate students in order to arose and sustains their interest in mathematics. This would be considered a continuous process until there is evidence of improvement in interest and performance of the learners in the subject.

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APPENDIX I

The distribution of secondary schools in Ogun State based on senatorial zone

Zone	S/ N	LGA	No of SSS Schools	No of males in SSS1 (A)	No of females in SSS1 (B)	Total No of A & B
OCS	**1.**	Abk. North	16	1761	1522	3283
OCS	**2.**	* Abk. South	20	3483	3573	7056
OCS	**3.**	Ewekoro	8	514	451	965
OCS	**4.**	Ifo	14	2565	2066	4631
OCS	**5.**	* Obafemi / Owode	13	575	555	1130
OCS	**6.**	* Odeda	11	988	826	1814
			82	**9886**	**8993**	**18879**
OES	**7.**	Ijebu - East	11	603	607	1210
OES	**8.**	* Ijebu – North	19	1423	1396	2819
OES	**9.**	Ijebu-North East	9	360	309	669
OES	**10.**	Ijebu – Ode	14	2046	1228	3274
OES	**11.**	Ikenne	11	1285	1264	2549
OES	**12.**	Odogbolu	17	704	657	1361
OES	**13.**	* Ogun – Waterside	13	677	629	1306
OES	**14.**	Remo-North	6	203	209	412
OES	**15.**	* Sagamu	18	1830	1955	3785
			118	**9131**	**8254**	**17385**
OWS	**16.**	*Ado-Odo / Ota	22	2915	3067	5982
OWS	**17.**	Imeko/ Afon	6	502	359	861
OWS	**18.**	* Ipokia	11	1294	919	2213
OWS	**19.**	* Yewa-North	20	1514	1177	2691
OWS	**20.**	Yewa-South	13	1481	1200	2681
			72	**7706**	**6722**	**14428**
Total			**272**	**26723**	**25079**	**51802**

Source: Ministry of Education Abeokuta, Ogun-State

Key:
OCS = Ogun Central Senatorial Zone
OES = Ogun East Senatorial Zone
OWS = Ogun West Senatorial Zone
* The local government areas that were used for the study.

APPENDIX II

TABLE OF SPECIFICATION

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
Addition & Subtraction	1	1	1	-	-	-	3
Place Value	2	2	1	-	-	-	5
Factors, Prime Number	1	1	-	-	-	-	2
Percentages	2	1	-	-	-	-	3
Fractions	1	1	1	-	-	-	3
Multiplication & Division	2	1	1	-	-	-	4
Simplify	2	1	-	-	-	-	3
Decimal Number & Significant figure	1	1	1	-	-	-	3
L.C.M. & H.C.F.	2	1	1	-	-	-	4
Cost price & Selling Price	2	2	1	-	-	-	5
Ratio & Proportion	1	2	1	-	-	-	4
Statistics and Probability	2	1	1	-	-	-	4
Geometry and Algebra	1	1	-	-	-	-	2
Square and Square Root	1	1	-	-	-	-	2
Angles	1	1	1	-	-	-	3
TOTAL	**22**	**18**	**10**	**-**	**-**	**-**	**50**

APPENDIX III

STUDENT'S QUESTIONNAIRE (SQ)

SECTION A: Demography

1. School …….
2. School Location ……..
3. Sex Male ☐ Female ☐
4. Age ……
5. Class ……
6. Type of School: Boys only ☐
   Girls only ☐
   Boys and Girls ☐
7. Mother's Age …….

SECTION B: Parents' or guardians' qualification

Instruction:

Tick (✓) the appropriate column that best answer the question on parents' educational data. Only the highest qualification of your father, mother or guardian is required in the appropriate box.

Example: If father's level of education is 'B.Sc' and mother's level of education is 'No schooling', then, tick (✓) (i) under father and (a) under mother.

		Father / Male Guardian	**Mother / Female Guardian**
a.	No schooling.		
b.	Full primary school		
c.	Some secondary school		
d.	Full secondary schooling		
e.	Grade II		
f.	N.C.E.		
g.	O.N.D.		
h.	B.Sc / B.A / H.N.D.		
i.	B.Sc (Ed) B.Ed		
j.	M.Sc / M.A.		
k.	M.Ed		
l.	Ph.D		

SECTION C: Parents' or guardians' Occupation

Instruction: Tick (✓) the appropriate column that best answer the occupation of your parents.

Example: If father's occupation is consultancy and mother's occupation is farming, then tick 'c' under father and 'g' under mother.

	Guidelines to parents' occupation	**Father / Male Guardian**	**Mother / Female Guardian**
(a)	**Professional and Managerial** Doctor, Engineer, Lawyer, Accountant, Senior Civil Servant, Lecturer, Graduate teacher, Nursing sister, Manager of firm, Technologist, Officer in the armed forces, Police, Navy, Air-force, etc.		
(b)	**Intermediate Paid Employee** Non-graduate teacher, clerk, nurse, those below officers' rank in the armed forces, Police, Navy, Air-force, etc.		
(c)	**Businessmen:** Contractor, Company owner, business consultant.		
(d)	**Semi-Skilled and Unskilled Workers** Labourer, Cleaner, Driver, Cook, Gardner, Porter.		
(e)	**Traders** Small scale trading employing one to five people e.g. Clothes seller, Shop owner etc.		
(f)	**Craftmen/Artesans** Tailor, Carpenter, Goldsmith, Blacksmith, Mechanic and so on.		
(g)	**Farmers**		

SECTION D: Home supportiveness

10. Number of children my parents have (including children of other wives):

1 - 3 ☐

4 - 6 ☐

7 and above ☐

11. Type of house you live in

Single room apartment ☐

A room and parlor ☐

2 – 5 Bed room flat ☐

Duplex ☐

Any other (specify) ☐

12. Put **X** beside any of the following present in your room or flat.

(a)
- Television set
- Fan / air conditioner
- Refrigerator
- Deep freezer
- Video
- Computer

(b)
- Library / reading room
- Book shelves
- Newspaper

13. Means of going to School:

a. By trekking. ☐

b. By Public transport. ☐

c. By private car. ☐

APPENDIX IV

ATTITUDE TOWARDS MATHEMATICS QUESTIONNAIRE (ATMQ)

INSTRUCTION: The items here are for measure of students' attitude towards Mathematics.

Please respond to the following statements by using the scale below:

S.A. = Strongly Agree A = Agree D = Disagree S.D. = Strongly Disagree

NOS	ITEMS	SA	A	D	SD
1	I attend Mathematics class regularly and punctually.				
2	Mathematics topics are too difficult for me to understand.				
3	I do my assignment in Mathematics without force or reminder.				
4	I don't think that I can do advanced Mathematics.				
5	My desire is to go for Mathematics in higher institution.				
6	Mathematics has been my worst subject.				
7	I am always disturbed when I score below 60% in Mathematics.				
8	I avoid taking Mathematics lesson when possible.				
9	I like solving new problems in Mathematics.				
10	Mathematics is exciting and interesting				
11	Mathematics is boring.				
12	I never get tired of studying Mathematics.				
13	I feel worried before I enter the Mathematics class.				
14	Proficiency in Mathematics isn't that important for my career.				
15	Time passes so slowly during Mathematics classes.				
16	I like discussing Mathematics with my friends.				
17	Among all the subjects, Mathematics is the most frightening to me.				
18	I wish there were more Mathematics classes a week.				
19	Mathematics scares me.				
20	Mathematics is my best subject.				
21	Mathematics makes me feel uncomfortable.				
22	I wouldn't get bored if I studied Mathematics.				
23	I prefer reading other subjects to studying Mathematics.				
24	I study Mathematics more willingly than any other subjects.				
25	I find it difficult to understand what I read in Mathematics.				
26	I feel good when I am learning Mathematics.				
27	I read Mathematics like reading novels.				

28	I would like to spend most of my studying hours on Mathematics.				
29	I only practice Mathematics for examination.				
30	I enjoy Mathematics classes.				
31	I am always happy when Mathematics teacher fails to attend classes.				

APPENDIX V

SELF-CONCEPT SCALE (SCS)

INSTRUCTION: The items here are for measure of self concept. Please indicate how much you agree with these statements about Self concept.

	Statement	Very much	Much	A little	Just a little	Not at all
	To what extent do you:					
1	like Mathematics.					
2	think you can understand Mathematics.					
3	think that good Mathematics knowledge will make it easier for you to learn other subjects.					
4	believe that you are talented in Mathematics.					
5	agree that Mathematics is not one of your strengths.					
6	think that Mathematics is more difficult for you than for many of your classmates.					
7	think that Mathematics is an enjoyable lesson.					
8	agree that you are doing Mathematics because you have no choice.					
9	agree that if you have your way, you will avoid Mathematics.					
10	think that studying Mathematics is a waste of time.					
11	think that Mathematics is a friend you cannot part with.					
12	agree that doing well in Mathematics will give you the opportunity to enter your desired school.					
13	agree that you need to do well in Mathematics to get a desired job.					
14	think that you need to do well in Mathematics to in order to please my parents.					

APPENDIX VI

PARENTS' SUPPORT SCALE (PSS)

INSTRUCTION: The items here are for measure of parents' supportiveness. Please answer Yes or No by ticking (✓) the appropriate box

	Statements	Yes	No
1	Do your parents force you to hawk some commodities after school?		
2	Do your parents provide you the opportunity to attend evening classes after school hours?		
3	Do you have a mini library at home where you can read?		
4	Do your parents provide you with enough Mathematics text-books?		
5	Do your parents teach you any aspect of Mathematics at home?		
6	Do your parents select books for you to read at home?		
7	My parents always take me out for Mathematics quiz programmes		
8	Do your parents provide you with meal before going to school?		
9	My school is 10 to 30metres away from my home.		
10	My parents always ensure that I complete my homework		
11	Do your parents always check your school work on Mathematics?		
12	Do you have a computer to work with at home?		
13	Do your parents provide you with meal after school?		
14	Do you have land phone at home?		
15	Do you have internet facilities at home?		

APPENDIX VII

ACADEMIC MOTIVATION SCALE (AMS)

INSTRUCTION: Items here are for measure of academic motivation. Please indicate how much you agree with these statements about Mathematics

NOS	ITEMS	SA	A	D	SD
1	I like Mathematics because our teacher teaches us well.				
2	I like Mathematics because most of my friends like it.				
3	I like Mathematics because it will make me ready for science related courses.				
4	I like Mathematics because my parents provide me with a lot of materials on Mathematics.				
5	I like Mathematics because my school provides us a lot of materials Mathematics relevant to Mathematics instruction.				
6	I need Mathematics to learn other school subjects.				
7	I think learning Mathematics will help me in my daily life.				
8	I need to do well in Mathematics to get into university of my choice.				
9	I think I would like a job that involves using Mathematics.				
10	I need to do well in Mathematics to get the job I want.				
11	I like Mathematics because I enjoy learning Mathematics.				
12	I need to do well in Mathematics because my teacher wants all students to do well in it.				
13	I need to do well in Mathematics because it is my parents' wish.				
14	I like Mathematics because my parents encourage me to go for Mathematics debates.				
15	I need to do well in Mathematics because I would like to take more Mathematics in future.				
16	I need to do well in Mathematics in order to please my parents				
17	I need to do well in Mathematics in order to enter my desired school.				
18	I need Mathematics in order to study what I would like to do after I finish secondary school.				
19	I need Mathematics because good Mathematical knowledge makes it easier to learn other subjects.				

APPENDIX VIII

STUDENTS' MATHEMATICS ACHIEVEMENT TEST (SMAT)

INSTRUCTION: Time: **40 minutes**

Students are advice to choose from the options provided the most suitable answer to the following questions:

1. Find X in the ratio 1: 3 = 9: X

   (a) 27 (b) 36 (c) 37 (d) 18

2. Evaluate: 596.7 + 10,679.0 leave your answer to three significant figures.

   (a) 11300.0 (b) 11306.0 (c) 11275.7 (d) 11278.7

3. Which of the following is the least?

   (a) 0.01 (b) 0.002 (c) 0.0003 (d) 0.00009

4. John buys 20 bunches of bananas for N5.00. He sells them all for N6.50. What is his percentage profit? (a) 3 1/13% (b) 20% (c)30% (d) 77%

5. Approximate 30.74 to 3 significant figures.

   (a) 3.0 (b) 30.7 (c) 31.0 (d) 30.0

6. Find the square root of 576

   (a) 16 (b) 18 (c) 24 (d) 26

7. Simplify: 7½ - (3 + 2⅓)

   (a) 2 1/6 (b) 2⅓ (c) 6⅓ (d) 6 5/6

8. When Uzo was 15 years old, his sister Chinwe was 18. If Uzo was born in 1900, in what year was Chinwe born? (a) 1867 (b) 1897 (c)1903 (d) 1918

9. You have 35 oranges. You give Musa and Paul 5 oranges each. What fraction of the oranges have you given away?

   (a) 1/7 (b) 2/7 (c) 3/7 (d) 1½

10. I bought eggs at 84k a dozen and sold them at 9k each. What is my profit percent?

    (a) 28 4/9% (b) 28 4/7 % (c) 42 6/7 % (d) 55%

11. Irene, Grace and Patience received N396 to share in the ratio of 5, 4 and 3 respectively. How much did Irene receive?

    (a) ₦33 (b) N99 (c) N198 (d) N165

12. A man lost 20 percent by selling an article for N11.00. What was the cost price of the article? (a) ₦10.50 (b) N13.20 (c) N13.75 (d) N23.20

13. Divide 63.07 by 7

    (a) 9.1 (b) 9.01 (c) 8.1 (d) 8.01

14. How much less than 1 is the sum of ½ and ⅓

    (a) ⅓ (b) 1/5 (c) 1/6 (d) 3/5

15. From N35.05 take away N30.99

(a) N5.16 (b) N5.09 (c) N4.16 (d) N4.06

16. 0.0801 ÷ 0.9 is?

(a) 0.089 (b) 0.89 (c) 08.9 (d) 8.9

17. If 30% of the pupils in a school are boys. What percentage of the pupils are girls?

(a) 170% (b) 70% (c) 60% (d) 7%

18. The cost price of a toy car is N450 and the selling price is N504. What is the percentage gain? (a) 6% (b) 42% (c) 14% (d) 12%

19. Express ¾ as a decimal

(a) 0.85 (b) 0.80 (c) 0.75 (d) 0.67

20. Multiply 25 by 99

(a) 2475 (b) 450 (c) 2500 (d) 9925

21. What is the smallest number that can be divided exactly by 4, 6 or 9?

(a) 18 (b) 24 (c) 36 (d) 54

22. Simply: $\frac{10.2 \times 2.4}{4.8}$

(a) 0.51 (b) 5.16 (c) 5.01 (d) 5.1

23. Express 1/8 as a percentage

(a) 12 ½ % (b) 12 1/8 % (c) 162/3% (d) 25%

24. Which of the following fraction is the smallest?

(a) 1/3 (b) 1/5 (c) 1/6 (d) ¼

25. Express 75kobo as a decimal of N1.50

(a) 0.5 (b) 0.05 (c) 0.005 (d) 5.0

26. Multiply: 1 7/15 x 5 10/11

(a) 5 7/11 (b) 8 2/3 (c) 13/33 (d) 2/15

27. ½ - 5/8 + ¼

(a) 1/8 (b) ¼ (c) ½ (d) 2/15

28. Which of the following is equal to 60?

(a) $2^2 \times 3^2 \times 5$ (b) $3^2 \times 2 \times 5$ (c) 3 x 4 x 5 (d) $2^2 \times 3 \times 5$

29. Multiply: 0.0725 x 100

(a) 0.00725 (b) 0.072500 (c) 0.725 (d) 7.25

30. A woman bought a piece of cloth for N12.00 and then sold it for N15.00. What was her percentage profit?

(a) 11 1/9% (b) 20% (c) 25% (d) 125%

31. Divide 420.63 by 21

(a) 2.03 (b) 2.3 (c) 20.3 (d) 20.03

32. Which of the following is the L.C.M of 4, 6 and 10

(a) 2 (b) 30 (c) 60 (d) 120

33. Simply: 7 x 8.06 – 5 x 8.06

(a) 16.06 (b) 16.12 (c) 16.16 (d) 16.21

34. Express 37 ½ % as a fraction

(a) 37/100 (b) 37/200 (c) 3/8 (d) 3 / 16

35. A trader buys 200 oranges for 60k and sells then at 8 for 12k. What is his gain percent?

(a) 460% (b) 400% (c) 40% (d) 500%

36. Express 900 as a product of prime factors.

(a) 5^2 x 4 x 3^2 (b) 2^2 x 3^2 x 4^2 (c) 1 x 3 x 5 (d) 2^2 x 3^2 x 5^2

37. Simplify: 2/3 of 2¼

(a) 8/9 (b) 1½ (c) 1 1/8 (d) 1⅓

38. A trader sold a car to Mr. Brown for N1250 at a profit of 25%. How much profit did the trader make?

(a) N150.00 (b) N250.00 (c) N280.00 (d) N350.00

39. Simplify: 0.00168 ÷ 0.03

(a) 0.00504 (b) 0.0056 (c) 0.0504 (d) 0.056

40. Which of the fractions 1/9, ¼, 1/8, 1/7 and 1/5 is the smallest?

(a) 1/9 (b) 1/8 (c) 1/7 (d) 1/5

APPENDIX IX

UNIVERSITY OF IBADAN

INSTITUTE OF EDUCATION
INTERNATIONAL CENTRE FOR EDUCATIONAL EVALUATION

LETTER OF INTRODUCTION

The Principal,
_____
_____
_____

Dear Sir/Ma,

The bearer is from Mr. Ajayi, K.O., a lecturer at Tai Solarin University of Education, Ijagun, Ogun State, who is a PhD student of the above mentioned University, carrying out a case study on the project titled **"Path Analytic Study of Students' Home Background, Academic Motivation, Self-Concept on Attitude and Achievement in Senior Secondary School Mathematics in Ogun State, Nigeria"**.

Sir/Ma, your school is one of the sixty (60) schools approved for the study by my supervisor and I am soliciting for your maximum support. A total of nine (9) local government areas were selected from the three (3) senatorial zones in Ogun State comprising twenty (20) local government areas; and a total of forty (40) SSI students would be needed from each of the participating schools. Altogether, a total of two thousand and four hundred (2,400) students will be involved in the study.

The responses of your students will not in whatever manner be used against your school, as this is purely an academic endeavour.

I shall be grateful if my request is favourably considered.

Thank you in advance for your usual cooperation.

Yours faithfully,

Ajayi Kassim Olusanmi
Tai Solarin University of Education
College of Applied Educational and Vocational Technology
Department of Educational Management