CHAPTER ONE

INTRODUCTION

Background to the Study

Education remains the most powerful tool in liberating people from poverty and is widely recognized as the bedrock of both individual and national development. It is also seen as an essential tool for effective and sustainable growth and development in all societies of the world. Thus, all forms of education constitute the major force in transforming human potentials into effective and efficient resources. Education is, therefore, regarded as an indispensable tool for producing individuals who are mentally and morally upright so as to build a society that is socially, politically and economically developed. This might be the reason why Federal Government of Nigeria clearly stated that education shall continue to be highly rated in the national development plans because it is the most essential instrument of change as it will equip students with necessary skills to live effectively with the development of science and technology, (Federal Republic of Nigeria, 2014).

While stressing the importance of education, Achuonye and Ajoku (2003) opined that education is considered as the optimal instrument that is used for the integration of individuals with the society for achieving high level of development in the area of political, social and economic development. It can, therefore, be said that education seeks to produce a fully developed individual and a society with all round development. In recognition of the stated educational objectives, Nigeria like many other countries of the world is expected to take education as priority with the intention of accomplishing both quantitative and qualitative education so as to achieve the desired development. This, therefore, means that the development

of every country of the world depends largely on the quality of her education. In the development of any nation especially in the area of science and technology, Mathematics occupies a substantial place. It is an important discipline which any nation intending to develop in the area of science and technology cannot afford to neglect. This observation is buttressed by Attah and Guwan (2016) who opined that Mathematics is a science subject that plays a pivotal role in the science and technological development of every nation. It is an important subject that cuts across all aspects of human life. This might be the reason why it is regarded as a universal language and a way of thinking needed, in small or large measure, to understand the world around and make meaningful contributions. Mathematics as a subject, therefore, stands high above other school subjects because of its universal utility in every area of human endeavour and it is seen as a prerequisite subject required for admission into various higher institutions of learning in Nigeria.

The place of Mathematics in other field of studies cannot be underrated as observed by Kolawole and Oginni (2011) that Mathematics is an instrument that facilitates the teaching and learning of other subjects. It was further stated that Mathematics plays a critical role in shaping students' later stage of occupational options especially in the contemporary Nigeria, where greater emphasis is being placed on industrial and technological development. This might be the reason why Okafor (2005) stressed the significance of Mathematics in the science and technological development of any nation and as such it should be seen not only as a school subject to be learnt but also as a service to other areas of human endeavour. This implies that Mathematics plays a significantly important role in industrial and technological development of a nation which cannot be underestimated, and a significant academic success in the subject is very

important considering its utilitarian value as well as contributions to the advancement of science and technology in the world at large.

Despite the importance of Mathematics, high rate of low academic performance in the subject is being recorded on yearly basis especially among senior secondary school students in external examinations (Ajayi, 2014). This statement is buttressed with the Statistics of May/June Students' Performance in Mathematics in West African Examination Council as shown in Table1.

Table 1: Percentage of Students in Nigeria that obtained Credit and above (A1-C6) pass and below (D7-F9) in the May/June WASSCE in Mathematics (2007-2018)

Year	Total No. of Students	No. of Students that obtained Credit & above (A1-C6)	% of Students with Credits & above (A1-C6)	No. of Students with (D7-F9)	% of Students with (D7-F9)
2007	1,275,330	198,441	15.56	1,076,889	84.44
2008	1,369,142	314,903	23.00	1,054,239	77.00
2009	1,373,009	425,633	31.00	947,376	69.00
2010	1,351,557	453,447	33.55	898,110	66.45
2011	1,540,250	581,630	38.93	952,620	61.07
2012	1,675,224	819,390	49.00	852,834	51.00
2013	1,543,683	555,726	36.00	987,957	64.00
2014	1,692,435	529,732	31.30	1,162,703	68.70
2015	1,593,442	544,638	34.18	1,048,804	65.82
2016	1,544,234	597,310	38.68	946,924	61.32
2017	1,559,162	923,486	59.22	635,676	40.78
2018	1,572,396	923,486	49.98	648,910	50.02

Source: West African Examination Council (WAEC) Lagos, Nigeria, 2018.

The statistics in the Table 1 indicates that in 2007, 198,441 out of 1,275,330 students representing only 15.56% passed at credit level and above in Mathematics while 1,076,889 students representing 84.44% obtained below credit pass (D7-F9) but their performance at credit level and above in the subject rose to 23% in 2008, 31% in 2009, 33.55% in 2010, 38.93% in 2011 and 49% in 2012 respectively. The low performance trend resurfaced in 2013 where students' performance at credit level and above dropped from 49% in 2012 to 36% in 2013 and 31.30% in 2014. The trend in the students' downward performance in Mathematics also indicated that in 2015, 544,638 out of 1,593,442 students representing 34.18% pass at credit level and above while 1,048,804 students representing 65.82% obtained D7 and F9. However, credit pass and above in the subject rose to 38.68% in year 2016, 59.22% in 2017. Students' performance in the subject also declined in 2018 where 923,486 representing 49.98% from the total number of 1,572,396 students obtained credits and above. The statistics, therefore, revealed that there was fluctuation in the performance of the students in the subject.

It is quite discouraging that, despite the efforts of the Federal Government of Nigeria at forestalling the trends of students' low academic performance in Mathematics, the subject has not recorded a significant academic progress for the past 12years period indentified. Concerning the repeated record of low academic performance in Mathematics, scholars and researchers have focused their attentions on different factors responsible for low academic performance. For instance, McGuire (2000) identified variables such as teacher factors which consist of mastery of the subject matter, instructional techniques, classroom management, communication skills, and personality and also student factor as well as environmental factors as the main causes of low academic performance in Mathematics. This means that, though teachers have been persistently held responsible for low academic performance, students too cannot be completely exonerated as

they have important roles to play in making sure effective teaching and learning take place. In line with this, Al-Srour (2005) affirmed that students' creative ability and enabling environment for learning play a significantly important role on academic performance of the students. This means that creativity in the teaching-learning process cannot be left unaddressed by educators and researchers.

The concept of creativity as an important variable in the discussion of academic performance cannot be over-emphasized. The term creativity has no singularly adopted definition because of its complex nature. For instance, Edwards (2001) defined creativity as openness to new ideas and the willingness to go beyond the stated rules of solving problem by taking an appropriate step to explore the unknown in order to provide solutions to a given problem through the application of different methods. Similarly, Olatoye and Oyundoyin (2002) defined creativity as a novel way of coming up with a new and relevant ideas which is characterized by four major components namely: (a) Fluency (variability of answers to a given problem), (b) Flexibility (changing course of action easily when need be), (c) Originality (consisting of something new and relevant), and (d) Elaboration (adapting and building on the existing ideas). It is also seen as a power of the mind to see what other people see but in a different perspective so as to make unusual but relevant connections to find answers to some of the basic questions of life. Creativity helps students to try different concepts, new methods, different perceptions, and different points of view in order to fill a gap left by others.

Craft (2003) stressed that creativity should be taken as an essential aspect of education especially in this competitive world where creativity is highly needed in problem solving and that focus should be on the creativity of everyday life known as 'little c' creativity'. This involves a great deal of resourcefulness which is considered very effective in giving individual

opportunities to explore his/her environment in order to implement an action to arrive at a new idea of solving problems. To Scholl (2005), creativity is an act of identifying, restating, comparing and contrasting, making intelligent guesses and interpreting a problem in order to proffer a unique and relevant solution to a given problem. It was further stated that there is a strong link between problem solving skill and creativity as people need to think creatively especially when a fixed solution to a problem does not exist and rules for solving the problems are not readily available.

While stressing the importance of creativity in education, Saadu (2015) opined that it should be placed at the centre of educational practices and that teacher should assume the responsibility of being a facilitator that builds students' potentials so as to encourage their creativity related behaviour. It was also observed that although creativity cannot be created but it can be killed right from the onset. This is because, in most cases, an answer to a given problem is known even before the question is posed to the student. Similarly, Tuckman (2001), in his study, affirmed that creativity is not encouraged in educational setting because of the teacher's inability to identify factors that are capable of blocking the creative process. This is because any student that deviates from the usual and traditional method of solving or providing solution to a given problem is often wrongly regarded as being disobedient.

As observed by Altodary (2002), the development of creative ability and emergence of talented ideas are discouraged among students especially at secondary school level owing to the continued reliance on conventional methods employed by the teachers in the classroom. This is based on the wrong assumption that the teacher is the only repository of knowledge while students are expected to take passive role by solely paying attention to the teacher in the classroom. However, the role of creativity appears not to have been given the worth it deserves

in the Nigerian school system. Creativity can, therefore, be said to deserve more attention than it is currently given in the Nigerian academic setting. There is therefore a need for a change of old and fixed methods of solving problems in order to accept and allow new idea into classroom situation so as to achieve the desired objectives of education. It is an established fact that if students are given opportunity to independently interact with their environment with little or no supervision, they are capable of bringing something new and relevant into teaching and learning situation. In support of this observation, Noori (2002) averred that creativity is positively related to students' academic performance.

This might be the reason why Adeboye (2016) opined that creativity should be given adequate consideration in education and identified two major ways by which people express creativity as: (i) adaptors who work and build on the previous ideas and opinions in order to arrive at new solutions to a problem and they are known for their ability to profit from the existing knowledge and experience, (ii) innovators, on the other hand, are characterized by their ability to bring into existence something new and relevant that is relatively independent of the existing ideas. This implies that individual differences in cognitive style cannot be discarded in the expression of creativity. Creativity, according to Vikas (2017), is said to be closely related to cognitive style.

Whatever importance is attached to creativity it appears to be that cognitive style also plays a similarly important role in academic performance particularly in Mathematics. Cognitive style, according to Pitcher (2002), is the relatively stable strategies, preferences and attitudes that determine an individual's modes of problem solving. It implies an individual preferred and consistent approach of acquiring and processing information in order to solve a given problem.

The distinct ways in which the same people usually respond to the same task differently is referred to as cognitive styles.

Similarly, Kalu (2004) defined cognitive style as individual differences in the mode of perceiving, learning and problem solving that differentiates one person from another when addressing a problem. It is the consistently stable approaches and preferences which define an individual's modes of perceiving, remembering and solving problems. In order to differentiate cognitive style from the related concept of learning style, learning style is seen as an umbrella term that comprises cognitive styles. In educational setting, according to Wyss (2002), cognitive styles and learning styles are generally used interchangeably but as a construct cognitive style is more stable, deep seated and pervasive.

Cognitive style is also seen as the link between intellectual abilities and personality and it is regarded as an essential factor that determines the form of learning and how people deal with the environmental elements. The fact that people perceive information differently means they cannot respond to the same environmental problem the same way. Teachers are, therefore, expected to identify students' cognitive styles so as to be able to cater for the individual differences. It can therefore be said that cognitive styles influence an individual's preference for dealing with environmental stimuli and the approach of doing it. To support this, Okwo and Otuba (2007) attested that an individual's cognitive style can facilitate or hinder the acquisition of knowledge especially in science. It was further observed that instructors need to be flexible in the way they teach in relation to students' cognitive style so as to assist learner to learn the way he or she understands.

As observed by Leila and Moslem (2013) individuals adopt different approaches in handling single task and to them these differences do not indicate the level of intelligence or

specific ability. For instance, some learners tend to quickly react when confronted with an environmental problem while other people take their time to analyse the problem before responses are made. These groups of people are classified as having impulsive-reflective dimension of cognitive styles (Keller & Ripoll, 2001). Reflective individuals are characterized by the fact that they make fewer mistakes, delay their responses, analyse the problems, consider other alternatives before the response is provided. This is the tendency to make delayed response, taking much of the time to find a right solution to a problem and taking into consideration all possible alternatives before a decision is made which is, in most cases, considered appropriate and this is the characteristic of an individual who is field independent student.

On the other hand, individuals with impulsive cognitive style respond quickly and adopt the first solution that comes to their mind without considering other possible solutions. It is the tendency to resolve problems hastily, using trial and error, making chance decisions without considering the detail. Reflectivity or reflective cognitive style can, therefore, be said that being impulsive in cognitive style might hinder students' academic performance.

Field dependence and field independence are other dimensions of cognitive style which had attracted a significant attention in research especially in the area of academic performance. FD and FI dimension of cognitive styles are the tendencies to use internal or external frame of reference to acquire, process information and solve problem. FD and FI cognitive style, according to Hall (2000), was defined as the degree to which a learner uses external or internal frame of references or cues as a guide in solving problems. A FI individual is described as analytic, competent, individualistic, task oriented, intrinsically motivated and thorough while a FD individual is described as group oriented, sensitive to environmental cues and criticisms, externally motivated who prefer external information and group oriented task.

In his observation, Enooz (2003) affirmed that students with FI cognitive styles tend to thrive in scientific disciplines while students with FD cognitive styles tend to do better in humanitarian disciplines. Field independent students take a step by step analysis of the problem to be solved without being influenced by the cues in the environment where a given task is to be carried out. They are known for setting and testing more than one hypothesis at a time and irrelevant ones are discarded in order to arrive at right answers to a given problem. Field dependent students, on the other hand, take cues from the environment where a given task is to be carried out and they rely to a greater extent on the superior social skills to provide solution to a given problem. Other cognitive styles were also identified as analytic, relational, and inferential.

Analytical style is also called FI and is described as the tendency to use internal frame of reference after series of analysis in solving problem while relational style is described as a mode to associate object based on its features in order to establish a relational link between them. An individual with inferential cognitive style has imaginative tendency to associate objects based on their features which are not directly observable but are inferred from the available information. For example, an individual with inferential cognitive style sees a bicycle and a motorcycle as similar because both are means of transportation. The influence of these identified cognitive styles on students' performance to a greater extent depends on the type of the task under consideration and self-efficacy is usually found significantly important by social cognitive theorists in the discussion of cognitive styles as human achievement depends largely on the interactions between one's behaviours and personal factors (e.g., thoughts, beliefs).

Discussing academic performance with a particular reference to Mathematics, therefore, might not be fully understood without taking into cognizance the academic self-efficacy of the

students. Self-efficacy implies how an individual judges himself and his confidence to succeed in a given academic task. It is a psychological construct which defines an individual's self-belief to successfully accomplish a given academic task. Attempts had been made by scholars to describe academic self-efficacy. As observed by Bandura (2001) academic self-efficacy is an individual's personal belief in his/her capability to successfully complete a particular academic task. It is also seen as a factor that has positive influence which determines students' performance in a given academic task. It influences the amount of effort, perseverance and academic mindset of students to achieve a desired educational goal.

Zajacova, Lynch, and Espenshade (2005) averred that there is a positive relationship between specific academic self-efficacy and students' academic performance but generalized self-efficacy, on the other hand, was not significantly related. Within the educational setting, there is a genuine interest in understanding the cognitive and behavioural factors that can enhance or sustain student's academic performance, and how it affects overall developmental process of the student. Hence, educational psychologists pay special attention to self-efficacy as a fascinating factor in classroom.

Empirical studies had widely revealed that self-efficacy is significantly related to the students' academic performance than other cognitive variables and it is regarded as an essential competence and performance mediator (Brown, Tramayne, Hoxha, Telander & Lent, 2008). This is because self-efficacy enhances cognitive processes. Perceived self-efficacy goes a long way in determining students' performance as it affects fundamental area such as goals setting, ideals, interest, target expectations, and perceived difficulties and opportunities in the social settings. People's beliefs about themselves represent a fundamental factor in attaining the set goals as well as decision making in life. It was observed that the higher an individual's perceived self-efficacy

is, the higher will be the effort expended in an activity and their persistence to achieve the desired goal; this is very essential for students to succeed in a learning process (Bandura, 2006).

Similarly, Schunk and Pajares (2005) observed that academic self-efficacy plays a key role in students' self-regulated learning. It was further stated that students with high belief of self-efficacy increasingly tend to put in more effort, persistently examine their progress, and apply strategies to attain educational goal. In support of this affirmation, Klassam and Lynch (2007) opined that only students with high self-efficacy can do better and achieve more than the expectations while their counterparts with low academic self-efficacy find it difficult to excel in their academic endeavour and reach the expectation. In a related manner, Afari, Ward and Khine, (2012) affirmed that students whose self-efficacy is high had better academic performance in Mathematics than their counterparts whose academic self-efficacy is low while investigating relationships between academic self-efficacy and students' academic performance in Mathematics.

It, therefore, appears that creativity, cognitive styles and academic self-efficacy as variables of this study, despite their importance, have not been given adequate attention in Nigerian classroom setting. To the best of the researcher's knowledge, there is a dearth of studies that combined these listed and discussed variables together to examine their relationship with students' performance in Mathematics especially in South-west, Nigeria. It is on account of this that the present study attempted to investigate the relationship among creativity, cognitive styles, academic self-efficacy and Mathematics performance of students in South-west. Nigeria. This study, therefore, attempted to complement the existing body of knowledge on the factors of students' academic performance in the South-west, Nigeria.

Statement of the Problem

In Nigeria, the downward trend in students' performance in Mathematics among secondary school students as reported in the statistics by (WAEC, 2018) has been a serious concern to educators and researchers. Could this be as a result of the variables of this study lacking in the teaching and learning of Mathematics in classrooms? It, therefore, appears that there is little understanding of how to nurture and support creativity in current classroom environment as observed by Oduolowu (2001).

Equally worrisome to the researchers and educators, in addition to neglecting creativity in the classroom, is the way teachers teach students without taking into consideration the individual difference in cognitive styles which is capable of influencing their academic performance especially in Mathematics at secondary school level. In line with this observation, Njagi (2015) observed that lack of flexibility in the way instructors teach in relation to students' preferred cognitive style is a strong factor that affected students' performance in Mathematics. Bandura (2006) equally affirmed that self-efficacy plays an essential role in the students' motivation to achieve but in spite of this noticeable effect of academic self-efficacy as a psychological construct on academic performance, it appears that adequate attention has not been given to it and this might have negative influence on students' performance.

Studies related to the variables under consideration include a study by Noori (2002) who observed that creativity has positive relationship with students' academic performance while investigating relationship that exists between students' creativity and their performance in English Language in Shiraz city. This study considered English Language as a subject and was conducted outside Nigeria. Similarly, Wang (2011) examined relationship between students'

creativity and Physics performance and observed that creativity is positively related to students' academic performance in Physics. This study was carried out on American students and Physics as a school subject was considered.

Conversely, Olatoye, Akintunde and Ogunsanya (2010) affirmed that creativity was not a significant predictor of students' academic achievement while examining relationship between Business Administration students' creativity and academic achievement in Oyo State, Nigeria. In a study, Abdurauf (2015) who researched on field dependence- independence cognitive style and students' performance in science subjects in Zamfara State observed that cognitive style was a significant predictor of students' performance in science. However, this study was restricted to a State in North-west geopolitical zone. In a related manner, Onyekuru (2015) observed that students' academic performance and their preferred cognitive styles were positively related while examining cognitive styles of field dependence-independence and secondary school students' academic performance in Rivers State. This study covered a Local Government Area in River State.

In another study, Rastegar (2016) averred that there was a low positive relationship between cognitive styles of field dependence-independence and students' academic performance in English Language while investigating relationship that exists between Iranian students' academic performance in English language and their cognitive styles. This study considered English Language as a subject. Also, Ogunmakin and Akomolafe (2013) researched on the relationship that exists between secondary school students' academic performance and self-efficacy in Ondo State, Nigeria and found out that academic self-efficacy was positively related to students' academic performance. In agreement with this finding, Moustafa and Sudhir (2013) while conducting a study on relationship between academic self-efficacy and academic

performance of undergraduates at the University of Assiut, Egypt reported that academic self-efficacy was positively related to students' academic performance. This study was carried out among Undergraduates in Egypt and it was a foreign based study.

From the foregoing, it can be inferred that most of the related studies in this area focused on other subjects and students with higher level of education. Also, those studies were conducted outside this present locale and did not combine the variables of creativity, cognitive styles and academic self-efficacy to examine their relationship with students' academic performance. This is the gap the researcher filled to complement what exists in the literature by examining the relationship among creativity, cognitive styles, academic self-efficacy and senior secondary school students' performance in Mathematics in South-west, Nigeria.

Purpose of the Study

The main purpose of this study was to investigate the relationship among creativity, cognitive styles, academic self-efficacy and senior secondary school students' performance in Mathematics in South West, Nigeria. Specifically, the study examined the:

a. Profile of creativity, cognitive styles, academic self-efficacy and performance of senior secondary school students in Mathematics in South west, Nigeria.
b. relationship among creativity, cognitive styles, academic self-efficacy and academic performance of senior secondary school students in Mathematics in South-west, Nigeria.
c. relationship among field independent, field independent cognitive styles and academic performance of senior secondary school students in Mathematics in South-west, Nigeria.

Research Questions

The following research questions guided the focus of this study:

a. What is the profile of creativity, cognitive styles, academic self-efficacy and senior secondary school students' performance in Mathematics in South-west, Nigeria?
b. Is there any relationship among creativity, cognitive styles, academic self-efficacy and academic performance of senior secondary school students in Mathematics?
c. Is there any relationship among field independent, field dependent and students' academic performance in Mathematics in South-west, Nigeria?

Research Hypothesis

The following null hypotheses formulated from the research questions guided the study.

H_{01}: There is no significant relationship among creativity, cognitive Styles, academic self-efficacy and academic performance of senior secondary school students in Mathematics in South-west, Nigeria.

H_{02}: There is no significant relationship among field independent, field dependent cognitive styles and students' academic performance in Mathematics in South-west, Nigeria.

Scope of the Study

This study examined relationship among creativity, cognitive style, academic self-efficacy and senior secondary school students' performance in Mathematics in South-west Nigeria. This locale was chosen because most of the related studies were foreign based and the few ones in Nigeria concentrated more in other geo-political zones. Descriptive research of correlation type was used for this study. Senior Secondary School Students (SSSIII) was chosen because, the researcher believes, they would have covered the required syllabus. A total of 1,620

respondents participated in this study from the total population of 1,961,505. According to Research Advisor (2006), a sample size of 1,620 was found appropriate in a population size of 2.5 million with a marginal error of 5%.

To measure senior secondary school students' creativity, cognitive styles and academic self-efficacy, adapted versions of Creativity Assessment Test developed by Olatoye, Akintunde and Ogunsanya, (2010), Academic Self-Efficacy Scale developed by Owen and Froman (1988) and Field independence/dependence scale developed by Wyss (2002) were used respectively. WAEC May/June, 2017 Multiple Choice Performance Test in Mathematics was used to determine secondary school students' Mathematics performance. The instruments adapted were validated and the reliability indices coefficient determined. The data collected from the study were analysed using percentage and Multiple regressions all at 0.05 confidence level

Operational Definition of Terms

The following terms were operationally defined in the context they were used in the study:

Academic Performance: senior secondary school students III scores in the Mathematics Performance Test (MPT).

Academic Self efficacy: senior secondary school students III perceived self-belief and capability to successfully complete a given academic task which is measured by academic self-efficacy scale

Cognitive style: students' preferred way of acquiring, processing information and problem solving.

Creativity: students' original, unique and unusual ideas of solving Mathematical problems and is measured by using creativity assessment scale.

Field Dependent: students' tendency to rely on superior social skills or environmental cues in solving Mathematical problems

Field Independent: students' tendency to take a step by step analysis of a given problem in Mathematics without being influenced by the environmental cues in providing solutions

Significance of the Study

To enhance or sustain students' academic performance in Mathematics, it is essential to determine the relationship among creativity, cognitive style and academic self-efficacy and students' academic performance in Mathematics. The researcher believed that the finding of this study, if effort is made to publish it in a recognized professional academic journal, might be of benefit to teachers, students, curriculum planners, school counselors, researchers.

The finding of this study is expected to be of benefit to the teachers who might gain insight into the importance of creativity, cognitive style and academic self-efficacy on academic performance of the students so as to allow creativity in the classroom through the use of discovery method, problem- based method and other suitable methods that encourage creative talents of the students. It might also help the students to gain better understanding of the importance of creativity, cognitive styles and academic self-efficacy on academic performance. This can be achieved by making attempt to give feedbacks to the students involved in the study through seminars presentation.

Similarly, the result of this study might assist curriculum planners to gain better understanding of the importance of creativity, cognitive styles and academic self-efficacy on academic performance as this might assist them to design a flexible curriculum that would allow creative talents of the students to be utilized in problem solving. This might, to a reasonable extent, discourage conventional way of solving problems in Mathematics where students need to strictly follow the laid down rules and the fixed methods of solving problems. It might also assist curriculum planners in making curriculum flexible so as to give room for individual difference in cognitive styles especially in this modern world where learner is expected to learn the way he or she understands.

It was equally believed that the findings of this study might be of benefit to school counsellors and other personnel to gain insight into the importance of creativity, cognitive style and academic self-efficacy on students' academic performance so as to provide the needed counselling services that will assist the students to have self-understanding of their individual differences in creative ability, cognitive style and self-efficacy in order to take the right steps to achieve all round development. Counsellors, as part of school support personnel, are saddled with the responsibility of giving professional assistance to students to identify their concerns and to guide them to live up to the challenges of life in order reach their potentials. In a similar vein, other researchers might find the result of this study useful as an important reference to carry out further studies in other Nigerian geo-political zones so as to increase the generalizability.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related literature was done under the listed sub-headings:

a. Concept, Characteristics and Theories of Creativity;
b. Concept and Models of Cognitive Styles;
c. Theory of Cognitive Development;
d. Concept of Self-efficacy, Academic Self-efficacy and Theory of Self-efficacy;
e. Creativity and Teaching/Learning of Mathematics;
f. Cognitive Styles and Teaching/Learning of Mathematics;
g. Academic Self-efficacy and Teaching/Learning of Mathematics;
h. Empirical Studies on Academic Performance in Mathematics;
i. Empirical Studies on Creativity, Cognitive styles, Academic Self-efficacy and Academic Performance;
j. Appraisal of the Literature Reviewed; and
k. Conceptual Framework

Concept, Characteristics and Theory of Creativity

Creativity as a concept has no singularly adopted definition because of its complex nature and several scholars have researched into the concept. Hence, literature is replete with several definitions. For instance, Okpara (2000) defined creativity as the art of providing solutions to problems through the power of imagination and reasoning. Bartel (2001) affirmed that creativity reflects the creator's inner needs, perceptions and motivations to deal with some environmental problems which results in novel solution that shows creator’s personality. It is an activity of the mind to see things in a different way in order to find answer to some of the basic questions of life. In another observation, creativity is defined by Van-Hook (2002) as an interpersonal and intrapersonal process by which unusual, relevant, original and high-quality products are developed. This involves ability of an individual to productively interact with his immediate

environment in order to provide solutions to a given problem. Similarly, Williams (2004) opined that creativity is an art of exploring other possible means of providing answers to the identified problems and it is said to be closely related to divergent thinking. Creativity, according to him, is seen as a concept which is independent of intelligence. This implies that creativity cannot be equated to mean intelligence.

Craft (2005), in his research, opined that creativity means openness to new ideas to break or add to existing system and the motivation to explore the unknown in the environment. Also, Barry and Kanematsu (2006), defined creativity as a process of producing original ideas which include combining the existing work and ideas in a different perspective for the purpose of creating new and relevant solution to a problem. Three important components of creativity are also identified as the creative person, the creative product, and the creative process but the most emphasized ones especially in the classroom is creative person and creative process.

Creativity has also been conceptualized by Akinboye (2004), as a means of moving away from old method of doing things in order to attain success. It was stated further that creativity helps learners to go beyond the fixed methods of solving a given problem and thereby gives room for new and relevant ideas. As observed by Magno (2009), creativity is an end product of an implemented imagination and fantasy directed towards arriving at a solution to a given problem. It is an intra personal process (imagination, dream and motivation) and inter-personal process (interaction with the environment) of coming up with something new and relevant. This is buttressed by Sanchez-Ruiz (2011)'s claim that creativity is a multidimensional phenomenon with many contributing factors that consist of personality characteristics both seen and unseen applied to proffer answers to the basic questions based on motivational drives arising from the interactive effect of the environment. He equally stressed the significance of creativity in

education because it aids students to employ new ways of providing answer to a given problem. However, creativity in the classroom is said be different from completely new ideas to new ways of considering and solving problems, (Alenizi 2008). It involves scientific ways of recombining and modifying existing ideas to solve a given problem in the teaching-learning process.

Despite the different choice of words and perspectives of the scholars, it is observed that all these definitions are in agreement with one another. Fundamentally, they all connote the quality of being novel, resourceful and flexible when providing solutions to a given problem especially in the classroom.

Characteristics of Creativity

One of the distinctive attributes of creativity is divergent thinking, which according to Olasehinde (1994), should be encouraged in the classroom because it allows students to try different methods of solving problems. Creative individuals are said to be inquisitive, focused and determined when confronted with certain problems. Similarly, Johnson (2004) observed that creative individuals prefer and pursue complicated issues. Thus, they are interested in complex activities so as to discover new things that are useful and relevant to the world. In a related manner, Clarkson (2005) emphasized that creative individuals display persistence, willingness and determination in order to complete a given task and they always have motivation to face failure. They are also independent thinkers who always look for unusual ways of addressing a problem. Some of the traits of creativity were also highlighted as:

a. Tolerance for ambiguity
b. Willingness to take risks with behavioural flexibility
c. Ability to work independently.

Also, creative learners are said to be both intrinsically and extrinsically motivated, original and flexible in solving a complex problem (Hillman, 2006). Thus, they consider all other alternatives before taking final decision because they want to see the possibility of getting better ways of solving a given problem. Skinner (1941) one of the earlier researchers of behavioural psychology said that creativity can be strengthened or weakened depends on whether reward or punishment follows an a creative act.. According to him, reward strengthens creative act and failure to give reward weakens it. It can, therefore, be rightly said that creativity can be encouraged or discouraged depending on how it is being handled especially in the classroom. Hence, it is necessary that teachers and educators identify some of the characteristics of creativity and encourage them in the classroom. Very important in the discussion of creativity are the theories of creativity which were considered relevant in this study. These are:

Theories of Creativity

a. The Psycho-analytic Theory of Creativity
b. Behaviouristic Theory of Creativity
c. The Humanistic Theory of Creativity

The Psycho-Analytic Theory of Creativity: Sigmund Freud (1908) proposed that creativity wells up from unconscious drives. There are conflicting opinions about how this occurs, but the various psychoanalytic schools of thought generally suggest that creativity is a by-product of primary processes. Freud (1959) took a pathological view of man and affirmed that only unhappy people experienced daydreams and fantasies; these are fundamental part of the creative process. It was further observed that unsatisfied wishes are the driving forces behind fantasies; every separate fantasy contains the fulfillment of a wish, and improves an unsatisfactory reality. Creativity was therefore seen as the sublimation of sexual drives. However, The creative

person's curiosity about sexual matters starts at three years of age and has three outlets later in life: first is repression, which is quite energetic; the second outcome occurs when sexual investigation is not totally repressed but is coped with by thought processes or by compulsive defenses and in the third outcome which is the rarest and perfect type, sexual curiosity is sublimated into that inquisitive attitude which leads to creativity.

In support of observation, Taylor, a theorist, (1988) equally observed that creativity is an element of the mental functioning which is very active in the id where the individual uses it to seek pleasure and avoid pain because id mainly operates on the pleasure principle. It was also observed that the use of this primary process in creativity is a regression in the service of the ego. He believed that the process occurs in the preconscious, an area not momentarily in consciousness but easily accessible. Taylor (1988) further explained that all forms of creativity are products of both the environment and personality through which the ego allows preconscious and unconscious material to emerge. As observed by Carl Jung (1923) creativity is divided into two categories which are psychological art, and visionary art. According to him, psychological art is mainly produced by primary processes. Therefore, these psychoanalytic theorists explained that reward is not the act itself for creativity, but rather a relief from pain, worry, or sexual tension. This, therefore, means that relief from pain and worry motivate an individual to engage in a creative activity which leads to creativity.

The implication of this theory is that the teacher should look for and encourage unique approaches to problem and ideas of individuals in the classroom. Knowledge of what has happened before reveals the causes of the present happening and therefore teacher should encourage a person to concentrate on new ideas instead of existing ones (Egen & Kauchak, 2001). In addition to this, teacher should provide a friendly atmosphere for creativity and

discourage idea of self-defeating behaviour among students in producing relevant ideas in a unique way.

Behaviouristic Theory of Creativity: According to behavioural psychologist Skinner (1941), sublimated libidinal drives do not explain all the dimensions of creativity. However, sexuality in some form appears in many explanations of creative behaviours even if only in metaphor. Skinner, a radical behaviourist, did not assign creativity to these unconscious drives. According to him, there was a relationship between creativity and reproductive drives. It was further explained that what happens after creative act is exhibited determine whether such act would be repeated or not. This claim is buttressed the postulation of Watson (1913) who affirmed that only what is observable is appropriate for scientific study.

Therefore, behaviourists confined their study to the behaviours associated with these processes. Skinner (1941) averred that an individual' personality is conditioned by the social environment. It was observed that an individual's creative ability can be encouraged by rewarding creative product. To him, if this is persistently done the behaviour will then be stored in the unconscious memory throughout one's life connected with various environmental stimuli. In the work of Skinner, it was observed that people's creative ability improved as an individual overcome tension reduces because the individual had found a successful solution to the problem. The individual may experience additional conditioning if other people praise the creative product. It is believed that man, to a reasonable extent, can be conditioned in a particular manner to engage in creative activities. This implies that creativity plays an important role in determining how an individual responds to the environmental stimuli and his usual choices.

Similarly, Edward Thorndike (1985) emphasized the Law of Effect which says that reward strengthens responses and failure to reward reduces them. Thorndike, and Skinner, continued to study how reward or absence of reward influenced behaviour over time. This conditioning is termed operant conditioning. Therefore, operant conditioning and unconscious memories are the primary elements in a behavioural explanation of creativity. According to them, creativity results from reshuffling psychic material which is unconscious to the individual and thereby only seems spontaneous (Frager & Fadiman, 1984). The implication of this theory is that teacher should provide conductive environment that will allow explanatory activities and give children creative tasks that will enable them discover their potentials. Also, creative behaviour needs to be strengthened by giving reward in the classroom.

Humanistic Theory of Creativity: Maslow, a pioneer researcher, (1968), affirmed that primary, secondary as well as integrated creativity that combines the attributes of the first two are the three major categories of creativity. To him, the primary creativity which was identified as the first one that depends on the primary processes but Maslow incorporated cognitive and co native processes plus the drives of the id. Also, creativity that was described as secondary arises from the application of higher reflection processes; it builds on primary creativity with the addition of analysis, synthesis and detailed explanation. It was stated that success depends to a greater extent on motivation as well as perspiration which comprehensively described secondary creativity. Secondary creativity, according to Koestler (1964), surfaces during the verification stage of finding solution to a problem. Creativity at this stage cannot be completely described as fully refined. The integrated creativity which was described as final category combined the attributes of the first and second category of creativity. The creativity at this stage was referred to as scientific discoveries.

Creativity is, therefore, seen as characteristics of self-actualized and healthy individuals. This is why humanistic psychologists consider creativity a product of a healthy self, a symbol of man's growth potential. Creativity is not the pessimistic avoidance of anxiety through fantasy but a direct confrontation involving a deliberate change in the interaction between an individual and his environment. Some characteristics of a self-actualizing personality are confidence, courage, self-determination, independence, fluency, integration, and self-acceptance. According to his observation, Maslow affirmed that creativity is a product of an individual who is healthy, fully developed and self-actualized. This shows the esteem with which humanistic psychologists view human nature.

There exist many individual theories but the human capacity is central to all of them. Creativity is essential to growth as the individual learns and adapts to his environment and to inner sense of values. Maslow sees human being as being conscious, self-directed, self-actualizing and healthy as this is the main dividing line between humanistic psychologists, psychoanalytic and behaviouristic psychologists. This is because psychoanalytic and behaviouristic psychologists see unconscious drives and conditioned responses respectively as the cause of human creativity. They also see creativity as a means of compensating or making up for areas otherwise lacking in the personality (May, 1975; Frager & Fadiman, 1984). Humanistic psychology theorists, therefore, bring wholeness to the human being and the creativity process.

The classroom implication of this theory is that teachers should not overlook those young children who show little promise in their performance in the academic area. In addition, teaching should involve the development of integrated personality. The basic psychological needs of the student should be satisfied first before higher order need should be pursued. Considering the

relevance of this theory in Nigerian school system, the psychological needs of the students at all levels have not been given adequate attention it deserves. Another important concept that needs clarification in this study is the concept of cognition.

Concept of Cognitive Styles and Models of Cognitive Styles

There are several attempts by scholars to define the term cognitive styles but there seems to be no agreement on a particular definition. One of the earlier researchers of cognitive style, Ellis (1995) defined cognitive style as the manner in which people perceive, organize, and remember information when confronted with a particular challenge. Each person is said to have a more or less consistent mode of cognitive functioning. In an attempt to differentiate cognitive style from related concept of learning styles, cognitive style is frequently included under the umbrella term learning style but as a construct it is much more pervasive, stable and consistent than learning style. Cognitive style, according to Kholodnaya (2002), is defined as a psychological mechanism that regulates and controls an individual's cognitive functioning.

Similarly, Miller (2003) described cognitive style as the characteristics, self-persistent modes of functioning, individual employed in their perceptual and intellectual activities. The fact that some students perform one single academic task differently in a similar condition demonstrates that they are different as regards to the manners in which information is acquired and processed and reaction to environmental stimuli. Similarly, Sternberg and Williams (2002) opined that cognitive style is the basis of discrimination between individuals during their interaction with the elements of the situation, and also is an important approach to understanding a personal way of thinking. Advocates of this construct had tried to differentiate cognitive style

from cognitive ability to show that there are individual differences in the performance that cannot simply be reduced to difference in intelligence.

According to Srinivas (2011), cognitive style has to be considered as a holistic process of cognition that begins with the perception, and mediated by information processing, and the resultant retrieval; it varies from person to person and it is affected by various personality factors such as previous information, heredity and environment. The way people learn and deal with problems largely depends upon the link between personality and cognition. This link is called cognitive styles and it is described as the way by which information is acquired and processed by the brain. It is, therefore, noticed that all these definitions are similar. Basically, difference in individual mode of acquiring and processing information is central to all the definitions.

Cognitive styles of field dependent and field independent is one of the cognitive styles which had attracted the attention of researchers. FD and FI were developed by Witkin to represent the contrasting differences between field dependent (global) and field independent (analytic) cognitive styles. In a submission, Summerville (1999) defined FI and FD dimensions of cognitive styles as a global versus an articulated style that shows the extent to which an individual's processing of information is affected by the contextual field. In agreement to this, Felder (2000) defined FI cognitive style learner as analytic, confident, competent, self-structuring and detailed oriented and inward while FD cognitive style learner is described as global, group oriented, sensitive to external information and externally motivated.

Similarly, Zhang (2004) defined FD and FI as a reflection of the degree to which an individual uses external or internal frame of references or cues as a guide in solving problems. A Field Independent (FI) Cognitive style learner, according to Okwo and Otuba (2007), is described as analytic, competent, individualistic, task oriented, intrinsically motivated and

thorough while a Field-dependent cognitive style learner is described as group oriented, sensitive to environmental cues and criticisms, externally motivated who prefer external information and group project.

In the same vein, Ruttun (2009) summarized the characteristic of FI learners as: analytical, individualistic, competitive, independent, intrinsically motivated, insensitive to some external cues, less affected by structures of the field while FD learner may be described by the following attributes: global, accepts structures, influenced by pronounced features, structured format and externally directed. However, field structure is central to all definitions of FD and FI dimension of cognitive styles and is considered relevant in this study because of the analytical nature of Mathematics. Previous studies on cognitive styles were based on the following models:

a. Witkin's Field Independence-Dependence
b. Kagan's Theoretical classification of Impulsivity/ Reflectivity
c. Pask's Holistic-Serialistic

Witkin's Field Independence-Dependence: There are various theoretical classifications of cognitive style, but this model has probably gained the most attention in the literature, (Witkin 1976). This model is adopted because of its relevance to the study under consideration as Mathematics involves analytical processes. In this classification, it was argued that FI individuals rely more on internal frames of reference (that is, they are less dominated by the more obvious or salient cues that a problem presents and are thus able to perceive analytically), while FD individuals rely more on external frames of reference (that is, they rely to a larger extent on their superior social skills to solve a problem), implying that FD individuals have a greater ability to perceive globally.

FI individuals tend to adopt an analytical approach to problem solving, sample more cues inherent in the field and are able to extract the relevant cues necessary for the completion of a task. Conversely, FD individuals take a passive approach, are less discriminating and tend to take into consideration the most salient cues in their surrounding regardless of their relevance. Original testing was done using the Body Adjustment Test and the Rod and Frame Test (Witkin, Moore, Goodenough, & Cox 1977). In these tests, subjects were asked to determine their alignment or misalignment with true vertical given internal and external stimuli that may differ. It was found that one group of subjects determined their alignment as vertical based solely on the visual cues in the room. These subjects were field dependent that is they were unable to determine their vertical alignment because of a discordant visual field while other subjects displayed field independence and were able to perceive their alignment as separate from the visual surroundings.

Also, the Embedded-Figures Test was used to determine a subject's field dependence or independence based on the time they take to find a simple figure in a more complex visual field. Subjects who were FD spent more time finding the figure while FI subjects found the figure quickly. Most people fell on a continuum between being completely field dependent or field independent. It shows that some people can take from both sides of the classification of cognitive style as propounded by Witkin (1976).

It was found that field dependent students prefer to work in groups, and require extrinsic motivation and more structured reinforcement from teachers. Conversely, field independent students prefer individualistic work and tend to be intrinsically motivated.

Kagan's Impulsivity-Reflectivity: This is also called conceptual tempo. Impulsivity-reflectivity dimension of cognitive style was first introduced by Kagan in 1965. This theory is one of the

easiest theories to measure. The Matching Familiar Figures Test was administered to children and the time it took them to make decision was then measured. One group of the children made decision hastily after briefly looking at the figures. This group of children was classified as having impulsive cognitive style while the other group delayed their responses, considered the detail and carefully deliberated the choices before arriving at a decision and thus they are classified as having reflective cognitive style.

The children were repeatedly tested to find that the conceptual tempo is consistent and stable between the group either impulsive or reflective. There are some doubts as to whether this is only applicable to high uncertainty (Sternberg & Grigorenko, 1997). To them, impulsivity is not the same has having an impulsive personality. This has to do with individual difference in decision making.

Holistic-Realistic Theory: The holistic-socialistic cognitive style was researched by Pask in the early 1970's. A group of children were tested by asking them to categorize a selection of imaginary animals into groups. It was found that some children tend to try to understand the overall principles and will develop and raise more than one hypothesis at one time; these subjects were referred to as holists. On the contrary, serialists raised one hypothesis at a time and did not proceed until that was tested. Serialsists have tendencies not to think about possible alternatives to the problem (Pask, 1976). On the contrary to Witkin's theory of field dependence, there is little or no statistical positive relationship between holistic – serialistic subjects and scores on standardized intelligence tests (Ridding & Cheema, 1991).

Unlike FI and FD dimensions of cognitive style where one trait (field independence) is generally always associated with higher achievement, holistic and serialistic personalities are just as likely to achieve or fail regardless of style. Holists, who tend to easily conceptualize the global

view of a problem and acquire additional knowledge beyond that related to the problem can deviate from the original purpose and make incorrect comparison. Likewise, serialists, who tend to be very analytical and logical in their understanding of the specific goals of the problem, can develop improvidence where they are unable to identify the overall concept of a problem. However, some learners seem to be able to switch between the two styles and they are called versatile learners. It, therefore, appears that this cognitive style generally only affect decision making.

Theory of Cognitive Development

Cognitive psychologists are concerned with the study of how individuals think, remember and learn. These psychologists spend most of their time studying human thought processes and the capacity for understanding, interpreting and retaining information. They, therefore, apply psychological science to understand how individuals perceive events and make decisions. Piaget (1970), a renowned cognitive psychologist developed a systematic study of cognitive development in children. According to his observation, children' ways of thinking is considerably different from the way adults think. This did not imply that children think at a slower rate, they just express their thoughts differently when compared to adults. Piaget's work showed that children are born with a very basic genetically inherited mental structure that evolves and is the foundation for all subsequent problem-solving ability.

Cognitive development was also seen as a progressive reorganization of mental processes resulting from maturation and experience. Therefore, Piaget viewed Intelligence as adaptation of an organism to the environment which is controlled by the mental organizations that the individual uses to represent the world and designate. Piaget (1970) equally viewed intellectual growth as a process of adjusting to the world. This happens through; Assimilation (the process of

using or transforming the environment so that it can be placed in preexisting cognitive structures), Accommodation (the process of modifying cognitive structures in order to accept something from the environment). Both processes are used simultaneously and alternately throughout life and the balance between the two (applying previous knowledge (assimilation) and changing behaviour to account for new knowledge (accommodation) is achieved through a process he called equilibrium. However, Piaget identified five stages of Cognitive development in the life of human being. At each stage, the child will acquire more complex motor skills and cognitive abilities. These stages of cognitive development are:

Sensory-motor Stage, Birth-2Years: During this stage, senses, reflexes, and motor abilities develop rapidly. Intelligence is first displayed when reflex movements become more refined, such as when an infant will reach for a preferred toy. Understanding of the world involves only perceptions and objects with which the infant has directly experienced. Action discovered first by accident and is repeated which would be applied to new situations to obtain the same results. One of the features of this stage is object permanence and it is developed towards the end of sensory-motor stage. At this level, the child understands the existence of the objects even though they cannot be seen or heard

Preoperational Stage, 2-4years: The child in the preoperational stage is yet unable to think logically. Through the language acquisition, the child is able to represent the world through mental images and symbols, but in this stage, these symbols depend on his own perception and his intuition. Egocentrism is known to be the feature of this stage. Although the child is beginning to take greater interest in objects and people around him, he sees them only from his own perspective. This stage is regarded as period of curiosity, inquisitiveness. Preschoolers are

always questioning and investigating new things. Since they know the world only from their limited experience, they make up explanations when they don't have one. It is during the preoperational stage that children's thought differ the most from adult thoughts.

Intuitive Stage, 4-7years: At this stage, operations gradually develop but thinking remains basic. The child can easily be misled by the new and more complex feature i.e. shape and size. Their mental operation is yet to be fully developed because of their limited experience. They are yet to develop mental operation of grouping and arranging objects in a qualitative series.

Concrete Operational 7-12years: The stage of concrete operations begins when the child is capable of performing mental operations. Piaget defines a mental operation as an internal process, an action performed in the mind. Mental operations permit the child to think about physical actions that he or she previously performed. The preoperational child could count from one to ten, but the actual understanding that one stands for one object only appears in the stage of concrete operations. The child at this stage is capable of reversing the action of his thought. A child knows that something that he can add, he can also subtract. He or she can trace her route to school and then follow it back home, or picture where she has left a toy without a haphazard exploration of the entire house. In addition, children begin to use inductive logic. This involves going from a simple to complex. They however have difficulty using deductive logic. A child at this stage is able to do simple mathematical operations. Operations are labeled concrete because they apply only to those objects that are physically present.

Formal Operational Stage 12years to Adulthood: The child in the concrete operational stage deals with the present, basically concentrate on the present. However, the child who can use formal operational thought can think about the future, the abstract, and the hypothetical issues. Piaget's final stage coincides with the beginning of adolescence, and marks the start of abstract

thought and deductive reasoning. Thought is more flexible, rational, and systematic. The individual can now conceive all the possible ways they can solve a problem, and can approach a problem from several points of view. The adolescent can think about thoughts and operate on operations, not just concrete objects. He or she can think about such abstract concepts as space and time. The adolescent develops an inner value system and a sense of moral judgment. The child at this stage can think abstractly and operate on the deductive reasoning.

According to Piaget, assimilation and accommodation require an active learner, not a passive one, because problem-solving skills cannot be taught, they must be discovered. Hence, in practical, students should be given opportunity to freely interact with the learning materials and should be properly guided in their action in order to reach their potentials. The educational implication of Piaget's theory is the adaptation of instruction to the learner's development level. It is important that the content of instruction needs to be in congruence with the developmental level of the learner. The instructors' main role is the facilitation of learning by providing various required experiences for the students. It was further stated that use of discovery and problem-based methods gives opportunities for students to explore and experiment, while encouraging new understandings. Opportunities that allow learners of different cognitive levels to work together often help encourage less mature students to advance to a higher understanding of the material. However, there exist individual differences in the mode of organizing and processing information which psychologists termed cognitive styles.

Concept of Self-efficacy, Academic Self-efficacy and Theory of Self-efficacy

Several researchers had attempted to define the concept of self-efficacy. As defined by Zimmerman (2000), self-efficacy is a positive emotional experience that enables an individual to confidently handle and complete a given task. As observed by Murphy and Alexander (2001),

self-efficacy is a motivational and psychological construct which make individual to have self-belief about his/her ability to successfully complete a given task. It refers to an individual's conviction and judgment about being able to successfully perform a particular activity. Similarly, Pajares (2002) opined that self-efficacy is an influential factor that determines an individual's choices of task and the capability to achieve the set goals.

In a related manner, Bandura (2006) defined self-efficacy as a set of self-convictions connected to distinct realms of functioning rather than a global or general trait. Self-efficacy, according to him, is domain specific and is more precise and limited as compared to self-confidence which is a universal personality quality that refers to how boldly people take actions in most situations. However, according to Pajares (2002), academic self-efficacy is generally considered in academic settings rather than generalized self-efficacy. This is because academic self-efficacy is a task specific and refers to learner's personal belief about his ability to attain a set educational goal. It determines the efforts, amount of time learners put in to achieve the intended objectives in education.

In an attempt to differentiate self-efficacy from related concepts, Linenbrink and Pintrich (2003) observed that self-efficacy is different from self-esteem or self-concept in that it is a task-specific evaluation while both self-esteem and self-concept are more general affective of self evaluations. In a related manner, Adeyemo (2007) defined academic self-efficacy as one's belief about his capability to successfully carry out a specific academic task. It was observed further that a high academic self-efficacy influences learners' academic mindset and academic accomplishment.

In line with this, Academic self-efficacy is described as an individual's self confidence to successfully complete a given academic task (Schunk & Pajares, 2005). It is also observed that

there exists agreement in all the definitions. Most importantly, the concept of positive self-confidence is central to all definitions and belief to successfully complete academic task. It is, equally, necessary to enlighten teachers and instructors about the significance of self-efficacy as a salient factor in education. Very crucial in this discussion is cognitive social theory of self-efficacy propounded by Bandura (1977) and is considered appropriate and relevant in this study.

Bandura's Cognitive Social Theory of Self-efficacy: This theory was propounded by Bandura (1997). According to him self-efficacy is a concept that explains people's self-belief and confidence to successfully carry out a given task. It an individual's self-conviction about his capability to complete a task (Pintrich, Smith, Garcia, & McKeachie, 1993). Bandura identified self-efficacy as a multidimensional construct which can differ in strength (i.e. positive or negative), generality (i.e. relating to many situations or only few), and level of difficulty (i.e. feeling efficacious for all tasks or only easy tasks). In line with this, Eccles and Wigfield (2002) averred that individuals' self-efficacy expectations are major determinants of goal setting, activity choices, willingness to expend efforts, and persistence. Learners' sense of efficacy affects their selection of activities, and how much effort they give. It was affirmed that self-efficacy is an important factor that influences individual's confidence to handle a given task.

The self-confident individuals, according to Eccles and Wigfield, approach threatening situations with confidence instead of giving up and even if they face failure they maintain the task and sustain effort. On the other hand, people whose self-efficacy is low in a given domain take challenging tasks as personal threats; they concentrate more on their inabilities or deficiencies than how to achieve this task in a successful manner. As a result, they tend to give up the task easily instead of making sustained effort because they easily lose their faith in their capabilities. Four major source of self-efficacy identified by Bandura (1994) include:

Mastery Experience: These occur when one attempts to carry out a task and he/she is successful. It demonstrates level of our mastery. If a student has succeeded in carrying out a task in the past, it will boost the self-efficacy of such student. Mastery experiences are the most effective way to boost self-efficacy because people are more likely to have belief in their capability that they can do something new if they are given a similar task to what they have mastered and successfully carried out in the past. Therefore, this means that learners should be encouraged not to dwell on their negative experience.

Vicarious Experience: Another factor influencing self-efficacy according to Bandura is vicarious experience; that is, the observation of successes and failures of other people (models) who are similar to one's self. Seeing a role model successfully complete a task, one would like to attempt the same task and thereby increases self-efficacy. The more one identify with the person being watched, the greater the influence on the belief that one's self can also achieve the same behaviour being observed. Vicarious learning is at the core of teacher-student instruction. The teacher demonstrates the skill, the student then copies.

Verbal Persuasion: The third factor affecting self-efficacy is verbal or social persuasion. When one is persuaded verbally that he/she is capable of achieving or mastering a task, they have tendencies to put in effort to complete the task. Having people around to offer verbal encouragement goes a long way in supporting a person's belief in himself or herself that a particular task can be successfully carried out. This implies that teacher plays an important role in sustaining students' interest to complete a given task by offering words of encouragement cannot be discarded in a classroom setting.

Somatic and Emotional State: This occurs when a person successfully completes a task provides a guide as to the likelihood of future success or failure. It was further stated that stress, anxiety, worry and fear have negative influence on self-efficacy and it is capable of leading to exhibition of self-defeating behaviour or inability to carry out a given task (Pajares, 2002). Stressful situations create emotional arousal, which in turn affects a person's perceived self-efficacy in coping with the situation (Bandura & Adam, 1977). The classroom implication of this theory is that the teacher should identify sources and factors that influence self-efficacy so as to encourage them to build their self-beliefs.

Creativity and Teaching/Learning of Mathematics

It appears that meaningful learning experience can only be achieved if students are not restricted to old and fixed methods of providing solution to a given problem and they are accorded opportunity to express creativity by playing active role in the learning. One of the frequently identified problems in the teaching as well as learning of Mathematics, according to Lithner (2008), is that students are expected to understand Mathematics and to become efficient problem solvers but students yet depend, to a greater degree, on fixed methods of solving problems. Real learning was said to be difficult to achieve, if students are compelled to strictly follow the stated rules and fixed methods of solving problem (Adebayo, 2016). Creativity, therefore, appears to be a fundamental aspect of teaching as well as learning of Mathematics. It was further observed that Mathematicians, for instance, create new theories and make intelligent guesses in handling advanced Mathematics and as a result creativity in Mathematics underlies many breakthroughs and advances in other disciplines, including the natural and social sciences.

The importance of creativity in the classroom especially in teaching and learning of Mathematics, as observed by Sriraman, (2005) can be understood in the students' capability to bring into being relevant and original work that relatively goes beyond the existing and old knowledge and the ability to open avenues of new questions in the subject for other students to follow. This attests to the need for teachers to nurture creativity in young children who are in the early stages of learning Mathematics, and therefore their Mathematical creativity must be clearly defined. Similarly, Adams and Chen, (2012) opined that creativity for school learners is the process that results in insightful solutions to a given problem and the formulation of new questions that allow an old method to be discarded from a new perspective requiring imagination and innovations.

As observed by Saracho (2012), creativity flourishes when teachers support student's ability to generate original ideas and noted that creative teaching promotes critical thinking. It was equally opined that creativity does not require students to invent new mathematical theorems or prove advanced hypotheses. Instead, it points to students' problem solving skill following a set of procedures in order to frame their own questions, see new possibilities in Mathematical situations, and produce unusual but relevant answers to address a given problem. Creativity is therefore considered essential for effective learning of Mathematics, no matter the age of the student. For instance, Kilpatrick, Swafford, and Swindell, (2001) advocated that students possess ability to solve problems creatively and resourcefully in Mathematics and it was recommended that teachers should support creativity and flexible thinking as students learn about Mathematical concepts and problem solving.

However, teachers, especially those working with young children, in most cases, neglect and not ready to adopt self discovery method of teaching students and design problem based

activities that promote problem-solving ability of the students in the classroom, (Shriki, 2009). This teachers' negative attitude towards teaching creativity in the classroom might be as a result of their lack of competence and content knowledge to effectively and resourcefully teach Mathematics, (Ball, Thames, & Phelps, 2008). This implies that to teach creatively in the classroom especially Mathematics, educators need to understand students' thinking ability and their creative power in order to intentionally nurture and promote it. This kind of teaching requires the understanding of both the subject content matter and the students' learning process. Teachers need to employ their own Mathematical knowledge and draw on their own confidence to help their students acquire a strong foundation of content knowledge and skills (Baer & Garrett, 2010). Creativity, according to Azimi (2012), can be taught in the classroom especially among secondary schools students. To accomplish this goal, the following points are essential:

a. Students should be allowed to operate in specific situation;

b. Student should be giving consideration to see new possibilities and relevant ideas and questions;

c. Opportunities should be made available for learners to explore and respect individual differences for creative behaviour;

Based on the rapid changes in science and technology; students need to be more novel and creative. Therefore the schools need to enhance creative thinking among students. This can be achieved through the following;

a. Respecting students;

b. Paying attention to creative environments in schools;

c. Respecting the value of creative thinking of students;

d. Considering adequate rest period in finding answer to a given problems in Mathematics.

e. Encouraging creative students for constructive criticism;

Despite the importance attached to creative teaching as well as learning of Mathematics, not all teachers have these abilities to identify and encourage creativity among students in the classroom. It might be that there is low teachers' awareness of creativity related behaviour among the students. In line with this, for instance, Beghetto (2007) conducted a study on teachers' perception on creative teaching amongst students at the secondary education and found that teachers already believed that students' unique and novel responses in classroom discussions were potential distractions; to him, this opinion was especially prevalent amongst prospective teachers in Mathematics education.

In addition, most teachers find it difficult to make Mathematics curricula used in schools flexible and as a result discourage creative teaching, (Drake, 2009). These kind of curricula are neither conducive to helping children obtain a conceptual rather than procedural understanding of key concepts in Mathematics. However, Sriraman and Lesh, (2007) affirmed that Mathematics is more than a set of rules or procedures, as many consider it to be; rather, it implies a means of thinking about how structures relate to one another. As identified in their study, some of the ways of encouraging creative teaching as well as learning of Mathematics are stated as follows:

a. Conducive Environment: enabling environment and other learning tools available in the classroom influences teaching and learning activities. Teachers are expected to make available resources from the environment that students can utilize to nurture creativity.

b. Conceptual Understanding: This is different from completely procedural understanding of Mathematics (Rittle-Johnson, Siegler, & Alibali, 2001) requires the students' ability to retrieve, bring into use, and build on what one is learning and has already been taught. This ability or predisposition leads to deeper understanding as well as better long term retention of Mathematical vocabulary and ideas. It provides an important basis that holds together the pieces of knowledge the student has acquired. Teachers would be able to recognize students' thinking processes and making necessary connections among concepts.

c. Sustained Motivation: teachers are expected to understand that creativity is manifested in the motivation or drive students display in working on a problem even when students are experiencing a difficult time. Some students are persistent in struggling with challenging problems, showing willingness to continue and wanting to sustain efforts to find out solutions to a given problems even after other students have withdrawn.

d. Accepting Risk and Error: teachers' recognition of risk and error as a necessary part of Mathematical creativity is very imperative. Therefore, teachers should ensure that what really matter for students was the process of trying and not necessarily on final solution so as to encourage creativity by praising creative work.

e. Ensure Students' Responsibility: students are expected to take active role and face real learning themselves while teacher should adopt more of a secondary role to let students take more responsibility in learning Mathematics. This is possible if students are given control so that they could take more active role in learning Mathematics creatively instead of dominating the entire time of instruction so that students can make connections to real life In a related manner, Baer and Garrett (2010) identified some of the strategies that must be taken cognizance

of to enhance creativity in the classroom especially in teaching as well as learning of Mathematics and these strategies are as follows:

a. Providing a Rich Environment: teachers are to provide a nurturing environment for creativity through establishing a safe, supportive, and stimulating environment for effective Mathematics teaching as well as learning. This can be achieved by helping to create an emotionally safe, social environment for students to take risks and be ready to make mistakes; actually introducing the making of mistakes as a routine part of the daily learning of Mathematics; encouraging free exploration and trying out of all kinds of approaches to problem solving; providing physical tools, materials, time and space to stimulate student thinking; and working with parents to extend creativity in learning of Mathematics into home environments.

b. Making Curriculum Flexible: This refers to a set of teaching practices whereby the teacher makes Mathematics curriculum flexible in order to encourage creative learning. The teacher may redesign lessons provided in the curriculum, add components to the lessons or create new learning experiences to expand the student's possibilities for acquiring more and deeper knowledge and understanding of Mathematics.

c. Exposing Students to Variations of Experience: students' works through verbal, visual, and other modalities. In this subject, teachers' focus is expected to be on making curriculum flexible with the sole aim of opening students' minds and helping them achieve deeper understanding and better learning outcomes.

d. Reinforcement: this is one the strategies used to support creativity. This is seen as a way of encouraging students to learn Mathematics creatively. This can be achieved through the following means: 1) praising or showing approval and appreciation to students when they display

creativity in learning of Mathematics; 2) enhancing or sustaining students' motivation when they struggle with Mathematics and encourage them to keep focusing; and 3) encouraging students to try different possibilities and use an open mind in their work. It can therefore be said that creativity takes a substantial position in the teaching as well as learning of Mathematics and therefore should be considered as an important aspect education.

Cognitive styles and Teaching /Learning of Mathematics

Teaching as a career appears to have faced with many challenges. Teachers, therefore, should be competent, efficient and resourceful to be able to assist learners to attain the desirable knowledge irrespective of their individual differences. Hence, there is considerable evidence that individuals have varied capacities, preferences, and modes of acquiring and managing new information (Kozhenvnikov, Evans, & Kosslyn, 2014). However, one of the fundamental areas of individual variation is cognitive style and it is referred to as a persistent mode of behaviour that determines how an individual acquires and processes information. In the implementation of classroom activities, it has been established that there is a relationship between cognitive styles of teachers and learners which bring about varied responses to the environmental stimuli.

In their own observation, Grimley and Banner (2008) affirmed that the role of cognitive styles as a variable in the students' academic performance can be seen in the classroom activities particularly in a problem based activity that requires a step by step analysis of a given task. In a study, Hall and Felder (2000) opined that field independent students are reflective, task-oriented and concerned with mastery concept and therefore excel in Mathematics and problem solving activities while their counterparts who are field dependent have difficulty in breaking down information into isolated facts to find solution to a given problems and find it difficult to solve

Mathematical problems. This is supported by Alamolhodaei (2001) who equally observed that field independent students showed higher performance than field dependent students in word problems in Mathematics. A similar conclusion on the importance of cognitive styles was drawn by Atkinson (2010) and Ibrahim and Aljughaiman (2012) who equally observed that there was significant differences in performance of various groupings of cognitive styles on academic tasks. This implies that students' cognitive styles play an important role in learning of Mathematics.

Teaching should therefore be tailored in a way to give consideration to learners' cognitive styles at all levels of education both at primary and secondary education. In recognition of the individual differences in cognitive style, Awofala, Balogun and Olagunju (2012) opined that teacher needs to be flexible in teaching Mathematics by taking into consideration learners' cognitive styles while examining the effect of three modes of personalization on students' Mathematics performance. The study examined the effect of cognitive style on students' performance in word problems. The results indicated that cognitive style had significant effect on students' performance in Mathematical word problems. Thus, students with analytic cognitive style significantly performed better than the students with non-analytic cognitive style. This implies that cognitive style and verbal ability of students were good predictors of students' performance in Mathematics. Also the results revealed that field independent students performed better than the non analytic (Field dependent) in Mathematics. Hence analytic cognitive style students performed better than their non analytic cognitive style counterparts in Mathematics.

While stressing the importance of cognitive styles in the classroom especially in a problem based activity, Danili and Reid (2006) affirmed that students' cognitive style should be given adequate attention in the classroom by the teacher. It was also observed that field

dependent students find it difficult to separate a given task from the environment and they depend to a larger extent on the superior social skill while field independent students have tendency to keep a task separately from the environment where the task is to be carried out. Field dependent learners are externally motivated and prefer learning in group and frequently keep in contact with teachers for extrinsic motivation. This means that they rely on teachers' guidance and motivation as a means of praising creative product. While learning conditions that allow students who have the cognitive style of field dependence, in order to learn optimally among others: (1) learning in group or learning in a social environment, (2) given more instructions clearly and explicitly, (3) provided certain strategy before performing an instruction, (4) served more feedback. FD students who tend to be more oriented to people and social relationships than the FI for example, they tend to be better at remembering social information such as conversations and relationships, work well in a group, and to choose subjects such as history and literature. FI students are more likely to do well with numbers, science, and problem solving tasks (Slavin, 2006). Through the understanding of learners' cognitive styles, teachers can take into consideration the cognitive style of the individual students in different learning strategies.

To support this observation, Douglas (2003) posited that the level at which the learner acquires a given information, and the degree to which the information is processed is dependent on (i) the personal disposition of the learner, (ii) personal disposition of the teacher and (iii) the learning environment. This study was conceived on the premise that in any learning environment, the cognitive styles of the teacher interact with those of the learner resulting differential learning experiences for each individual learner. This therefore underlies the need to tailor teaching to cater for learners' cognitive styles and it is generally recommended across all levels of education.

Self-efficacy and Teaching /Learning of Mathematics

Proficiency in Mathematics is crucial for functioning in everyday life, as well as for success in our ever-changing technological society (Brown, 2014). The importance of Mathematics extends beyond the academic circle. This is because basic arithmetic skills are required for everyday situations. Students may experience negative interactions with the mathematical content because they are taught only the basic skills rather than the concepts that underlie these skills (Beilock & Willingham, 2014). These negative interactions may lower the confidence in their Mathematical ability, leading to students avoiding learning of Mathematics. In addition to this, teachers' low Mathematical self-efficacies have been found to negatively influence students‟ attitudes, beliefs, and perceptions in Mathematics (Beilock, Guderson, Ramirez, & Levine, 2010).

In an attempt to improve students' interest in the learning of Mathematics, researchers have continued to search for variables such as teacher-learner related factors that could be manipulated to improve students' academic performance in the subject because of student's low performance in the subject. Hence, teachers' and students' self-efficacy begin to gain attention of researchers as positive factor of improving performance in Mathematics.

Self-efficacy is a term used to describe an individual's beliefs or judgments of their personal capacity to engage in certain activities. Self-efficacy is a domain-specific assessment of competence to perform a given specific task. It is seen as a judgment of one's ability to successfully execute specific behaviours in a specific situation. An individual's level of self-confidence determines how the individual will handle situations and how persistent they are when they are confronted with certain challenges, (Zimmerman, 2000). Self-efficacy determines

the goals an individual set for themselves, the amount of effort they put in to accomplish the set goals, how persistent they are willing to work to be successful, and how they respond to failure. It is an established fact that teachers with low Mathematics self-efficacy cover only what they feel comfortable teaching and leave difficult topics in Mathematics, (Smith, 2010). These beliefs are not necessarily based on a person's actual competence to accomplish a task; rather, the beliefs are based on an individual's perceptions of their ability to accomplish a task. These self-efficacy beliefs impact a number of behaviours that include academic achievement and job performance. It was observed that teacher self-efficacy could be general teaching efficacy where teacher has zeal for teaching or personal teaching efficacy that has to with teacher's capability and competence to actually teach (Coleman, 2001).

While emphasizing the importance of students' self-efficacy, Dorman (2001) opined that self-efficacy determines learning outcomes and that it can have significant implications for improving students' academic performance. Similarly, Fraser and Khine (2013) observed that learners' academic Performance in Mathematics and their self-efficacy beliefs were closely related. This submission agrees with Afari, Ward and Khine (2012) who equally averred that teacher self-efficacy was a strong predictor of students' performance in Mathematics. This was a relationship study that examined the influence of teacher self-efficacy on students' academic performance in Mathematics.

Other researchers who supported this finding include Velayutham and Aldridge (2012) who, in the same vein, observed that motivational beliefs and academic self-efficacy significantly predicted students' performance in science subjects. This study involved 1360 science students in Australia. According to Coleman (2001), a teacher's general teaching self-efficacy conveys a personal belief that the power of teaching influences students' learning.

Teachers who have high teaching efficacy take responsibility for student learning. However, teachers who have a low sense of general teaching efficacy feel powerless in helping challenging or struggling students. Teachers' personal efficacy reflects their beliefs regarding their individual abilities to teach, manage the classroom, and effectively motivate the learners to learn, (Muijs & Reynolds, 2002). This implies that teacher with high self-efficacy plays important role in enhancing students' performance as well as how persistent in the efforts they put in to complete a given academic task not only in Mathematics but also in other areas of human endeavour.

Efficacious teachers display self-confidence, enthusiasm, and a high level of expectation of success that motivate students' learning, and they encourage sustained interest of students to try more even though they give incorrect responses (Muijs & Reynolds, 2002). In a similar vein, Kahle (2008) emphasized that self-efficacy is a strong determinant of a person's choices regarding any personal skill, ability, job success and achievement, and individual course of actions in the classroom because these are determined by an individual's beliefs in his or her own abilities. It was also noted that self-efficacy constitutes a large part of the educational setting in that it influences academic motivation, effort, interest, and self-belief of both the students and the teachers. The extent to which a student believes that he/she is competent enough to successfully complete a specific task is particularly important given that self-efficacy has been argued to have powerful effects on achievement behaviour. From a theoretical perspective, research has evidently revealed that learning Mathematics requires a system that embraces collaboration, discussion, and tools for solving complex problems (Goos, Galbraith, Renshaw, & Geiger, 2003).

As observed by Schunk and Pajares, (2009), in the learning environment, self-efficacy and all or some of its factors such as past experience, vicarious experiences, verbal persuasion,

and physical and emotional state) may facilitate the achievement, retention, and desire for knowledge among students especially in Mathematics. It was further stated that performance experience is considered the most influential factor of self-efficacy and it determines teaching and learning of Mathematics, given that learning Mathematics depends to a greater degree on tapping into prior knowledge. Students with positive past experiences in Mathematics were found to have better performance in Mathematics as a subject.

The teacher's belief in his or her ability to set educational goal and work to successfully achieve a specific teaching task in a particular classroom setting which is termed teacher efficacy and is capable of influencing student performance. Similarly, Knoblauch and Woolfolk (2008) referred to teacher efficacy as the teachers' self-belief in his/her capability to have a positive effect on student learning. It was further stated that self-efficacy consists of two kinds of efficacy expectation and outcome expectancy. A teacher's self-efficacy expectation goes a long way in influencing his/her thoughts and feelings, selection of instructional activities, the amount of effort expended in teaching and the degree of persistence while facing a challenge The outcome expectancy, on the other hand, refers to the likely consequences of teaching performance at the expected level of competence.

Similarly, Chang and Wu, (2009) observed that teachers' efficacy beliefs had great influence on the efforts, amount of time used in teaching Mathematics in the classroom which affect students' performance in Mathematics. This study investigated influence of teachers' efficacy on teaching of elementary Mathematics in Taiwan. This implies that self-efficacy had a great influence on one's task choices, effort, persistence, and achievement. In a related manner, it was affirmed that students who have self-efficacy in learning have tendencies to make more effort, persist longer and remain focused while facing obstacles, and eventually attain higher

levels of achievement. It was equally observed that teachers' efficacy has a strong relationship with the student learning and achievement (Cantrell, Young, & Moore, 2003).

In support of this submission, Woolfolk and Davis (2006) affirmed that teachers with a higher sense of efficacy for teaching may lead to effective teaching that can motivate students' positive learning and improve academic performance especially in Mathematics. Also, low efficacious teachers are typically less motivated with their own teaching, as well as often expressing discouragement and negative feelings about their instructional tasks with students. In relation to the aspect of personal responsibility for student learning, high-efficacious teachers assumed responsibility to see that children learn, and when their students experience failure, they appraise their own performance for ways they might have been more helpful while high efficacious teachers are willing to apply new instructional methods to better meet their students' learning needs (Woolfolk & David, 2006).

However, Goddard (2001) opined that the relationship between teacher efficacy and student performance seems to be indirect, with teacher efficacy influencing several teacher behaviours that, in turn, determine student achievement. In fact, previous studies have revealed that teacher efficacy has a powerful impact on student learning and achievement. With a particular reference to students, students who have high self-efficacy are likely to set higher goals, put in intensified efforts in schools, and remained focus while facing difficulties and setbacks, which in turns lead to higher academic achievement (Schunk & Meece, 2006). To them, students' self-efficacy had a direct effect on their academic performance. It was revealed that self-efficacy had significant relationship with students' academic achievement in diverse content domains. Similarly, several studies had found that students' Mathematics self-efficacy (SMSE) could significantly predict their mathematical performance especially at secondary

school level, (Nasiriyan, Azar, Noruzy, & Dalvand, 2011). Similarly, Chang (2012) conducted a study to examine Mathematics self-efficacy of students on their performance Mathematics in school. It was concluded that Mathematics Self-efficacy strongly predicted students' performance in Mathematics.

Vicarious experience according to Wise and Trunnell, (2001) is another most influential factor self-efficacy which was equally seen as a strong factor that influences performance in Mathematics. This is because students use their prior knowledge to judge their capabilities in relation to others. Verbal persuasion is said to be the third most significant factor of self-efficacy belief as well as physical and emotional state which is regarded as the least factor of self-efficacy belief (Chowdhury, Endres, & Lanis, 2002). Researchers, including Bandura, have suggested that self-efficacy affects human motivation, mindset, behaviour, and achievement (Bandura, 2000). In addition, it was also revealed that higher levels of self-efficacy are predictive of higher academic performance (Bong & Skaalvik, 2003). Likewise, students with high self-efficacy academically demonstrate greater success in Mathematics (Pajares & Schunk, 2009). In support of this submission, Sharma and Nasa (2014) identified four key areas where academic self-efficacy influences students' performance as:

i. Perception: this has to do with the students' self-belief about their abilities to complete a given academic task. This determines students' perceptions about what future holds for them in terms of their potential future academic results. Positive self-belief makes Students to have self-confidence that they can complete and achieve a set academic goal while those who have negative perception about their abilities have tendencies to dwell on negative experience and find it difficult to complete a set academic goal. This category of students finds it difficult to move on from negative experience and they rate themselves low to succeed in a given academic task.

ii. Students' Motivation: a high self-efficacious student tends to maintain positive academic mindset and self-determination and make extra efforts to successfully complete a given academic task and remains self confident even in the face of difficulties and assists them to move on from negative experience. On the other hand, students with low perceived self-efficacy find it difficult to sustain interest in learning activities which is capable of affecting their general performance.

iii. Affective domain: students' with high level of self-belief tend to have positive feeling that their capability to complete a set academic goal and have a sustained interest in learning activities while a student with negative feeling about their capability might find it difficult to be organized which is capable of affecting their effectiveness in their academic performance.

iv. At the selection level: students' choice of decision making to a greater extent depends on their self-efficacy. This is because students actively participate in the activity in which they have self-efficacy belief that they can successfully handle and withdraw from the activity they believe will be difficult to complete. The following are identified as ways of encouraging self-efficacy:

i. Clear Statement of Goal: students can be motivated by explaining the expected goals needed to be attained and the feedback on their progress towards achieving the set goals. This will enable students to have prior knowledge of the set goal and the amounts of effort they need to put in place to achieve the stated goal.

ii. Approach training: training students on the use of certain approaches to improve their performance by the teacher can be a helpful tool in developing students' self-efficacy. This might keep students alive to the fundamental elements of the task, design their encoding and retention abilities, help them to be more systematic in their work and more in control of their learning.

iii. Teacher serving as a Role Model: cognitive modeling can be an important instrument that can be employed by the teachers to build students' self-belief in handling a given academic task.

iv. Giving Feedback: teachers are expected to provide constant feedback to students on their progress towards a given academic goal as this will give them opportunity to assess their progress in learning. This will help them to put in extra effort to cater for deficiencies if the need be.

Fundamentally, it can therefore be inferred from the body of literature that students' self-efficacy plays important role in the teaching and learning of Mathematics and that teacher is key into the development of students' academic self-efficacy.

Empirical Studies on Academic Performance in Mathematics

There is a general consensus as parents and government conceive that investment in education is not yielding the expected and desired output due to the students' performance especially in Mathematics. In support of this submission, Ramírez (2006) affirmed that students' performance both at primary and secondary school levels is very disappointing which calls for the need to intensify effort to enhance students' academic performance. Similarly, Geary (2011) attested that students' performance in Mathematics has not been encouraging and also observed that lack of interest on the part of students in the subject had been the main cause of their persistent low performance. It was further observed that performance in Mathematics as well as other subjects can be improved by adopting suitable methods of instructions in the classrooms. As observed by Chiesa and Robertson (2010), Mathematics teachers are constantly held responsible for low performance of the students in the subject but students too cannot be exonerated as they equally plays an important role in the classroom activities.

Tali and Dar (2014) equally affirmed that downward trend in students' academic performance in Mathematics is persistently reported which is frustrating for all concerned stakeholders in education. This is because most of the students at all levels of education find Mathematics a complicated and uninteresting subject and develop feelings of hesitation and inferiority complex. They have total fear when they face Mathematics which directly serves as obstacles in the way of their learning progress in Mathematics. To them, motivation, enabling environment and high level of interest can enhance students' performance especially in Mathematics. This is buttressed by Idigo (2010) who opined that students' low Mathematics performance especially at secondary school level in Nigeria might be as a result of students' lack of motivation and their negative attitude towards learning of Mathematics.

In support of this observation, Goolsby (2013) observed that several factors have been highlighted as reasons for students' lack of interest in learning Mathematics. These include teacher-pupils ratio, classroom climate, Mathematics anxiety, government factor, instructional strategy, among others. In line with this, Dembe, Moorad, and Afemikhe (2008) equally averred that students' performance in Mathematics is not encouraging and that inadequate teaching facilities and experienced teachers to handle the available school resources affect students' academic performance in the subject. It was also observed that instructional resources as well as its appropriate utilization facilitate the teaching and learning of Mathematics and other subjects.

Also, one of the earlier researchers, Ifamuyiwa (2005) equally observed that uncooperative attitude of the students and inadequate classrooms and congested classroom environment are key factors that bring about students' low performance especially in Mathematics. This implies that congested classroom is capable of negatively influencing preparatory training such as students' interest to further learning of Mathematics. In a similar

vein, Vasanthi (2010) investigated learning environment and its influence on secondary school students' performance in Mathematics and found out that poor learning environment has negative influence on students' performance. This means that environment where learning is to take place plays a crucial role in students' performance.

While stressing the importance of learning environment, researchers such as Zabihi, Newsha and Mansouri (2012) had equally reported that there is a link between students' performance in Mathematics and learning environment where teaching and learning will be implemented. In another study, Tella (2007) investigated the relationship between students' academic performance in Mathematics and their motivation in Oyo state, Nigeria. It was found that highly motivated students did better in Mathematics than their counterparts who were less motivated. In agreement with this finding, Hejazi, Restegar, Krmdost and Ghorban-Jahromi (2009) concluded, in their study, that motivational beliefs and students' Mathematics achievement were positively related while investigating relationship between motivational beliefs and Mathematics achievement of secondary school students.

In line with this observation, while investigating relationship among creativity, achievement motivation and students' achievement in science subjects among secondary school students in Kwara State, Saadu (2015) concluded that creativity, achievement motivation and students' achievement in Mathematics were positively related. In another study, Geronime (2012) observed that students' self-concept is an important variable that predicts students' academic performance in Mathematics while examining middle school students' Mathematics self-concept on their Mathematics performance in America adopting a longitudinal study. It was concluded that the importance of Mathematics cannot be neglected.

In a similar vein, Okafor (2005) averred that everyone needs the knowledge of Mathematics, not just students identified as the most intelligent ones. This implies that the knowledge of Mathematics is very essential to cope with the life challenges. Hence, Mathematics is crucial to functioning in everyday life, as well as for success in ever-demanding technological society (Finnie & Meng, 2006). The importance of Mathematics is not limited to the academic circle rather its application is required for everyday situations. The objectives of teaching Mathematics in secondary schools as observed by Odili (2006) make it very essential as a foundation subject for success in other areas of academic endeavour and manpower development. The learning of Mathematics both within classrooms setting and outside, therefore, represents a fundamental step of preparing for livelihood and equally seen as a strong factor that determines students' later occupational choice. This might be the reason why Iji (2007) opined that any nation that intends for national growth and development in science, industries, and technology must make Mathematics a priority.

Similarly, Azuka (2012) affirmed that Mathematics plays a pivotal role in helping man to successfully engage in the economic activity which brings about the development of an individual and the world at large. It also helps people to make useful and precise decision. Mathematics is a science of number which is very essential in all facet of life to make meaningful contributions in the society. This is because all fields of studies depend largely on it for problem solving and prediction of outcomes. Therefore, the knowledge of Mathematics is very vital to any individual and the nation at large in the area of business activities, scientific discoveries, technological advancement, problem-solving and evaluation of decision in different situations in life. Akinoso (2011), in agreement with the previous researchers, attested that Mathematics is critical and vital for achieving scientific and technological development.

While emphasizing the importance of Mathematics, Sunday, Akanmu and Fajemidagba (2014) opined that it is regarded as an indispensable instrument for routine activities of man which cuts across other area of human endeavour. Considering the importance of Mathematics in the development of a nation, the Federal Government of Nigeria makes it one of the compulsory subjects both at primary and secondary education as contained in the National Policy on Education (FRN, 2013) which till today remains the centre point for all educational objectives in Nigeria.

It can therefore be rightly said that several factors interact together to determine Mathematics Performance of students as well as other subjects which means teachers and educators need to take cognizance of all these and several other factors as a means of enhancing students' academic performance in Mathematics as its impact can be felt in developing critical thinking of individual and technological development of the nation at large.

Empirical Studies on Creativity, Cognitive Style, Academic Self-Efficacy and Academic Performance

The empirical studies on the relationship among creativity, cognitive style, academic self-efficacy and academic achievement of students were presented under the three sub-headings; namely;

a. Creativity and Academic Performance

b. Cognitive Styles and Academic Performance

c. Academic Self-efficacy and Academic Performance

Creativity and Academic Performance: In order to find causes and correlates of low academic achievement, several variables have been investigated and one of which is creativity. For

instance, Noori (2002) affirmed that creativity is positively related to students' academic performance. This study involved 306 senior school students as sample in Shiraz city and used Abedi creativity instrument to measure students' creativity and students' Cumulative Grade Point Average (CGPA) was used to measure their academic performance. This observation was supported by Habibollah, Rohani, Tengku, Jamaluddin and Vijay (2010) who equally concluded in their study that creativity was positively related to academic performance of the students. This is a foreign based study conducted among Malaysian University undergraduates and 153 undergraduates were chosen as sample for the study and students' CGPA was used to measure academic achievement while creativity was measured using the Khatena-Torrance Creative Perception Inventory (KTCPI).

Trivedi and Bhargava (2010) conducted a study in India on creativity and students' academic performance. A total number of 240 respondents of ages 15 to 17 were involved in the study. Passi Tests of Creativity (PTC) was employed to determine students' creativity. The study revealed that there was a significant relationship between creativity and students' academic performance. Also, Naderi, Abdullah and Aizan, (2010) concluded a study among senior school students involving 153 (105 males and 48 females) as sample. Students' achievement and their profile of creativity were measured using CGPA and a standardized instrument in Khatena-Torrance Creative Perception Inventory (KTCPI) respectively. Te study revealed a positive relationship.

Anwar, Aness, Khizar, Naseer and Muhammad (2012) affirmed that creativity was positively related to students' academic performance in a study conducted in Pakistan. The sample size of the study was 256 respondents. A standardized test on creativity and teacher made test were used to measure respondents' creativity and academic performance in science

respectively. In another study, Saadu (2012) carried out a study on the assessment of creativity level of upper basic students in Moro Local Government Area of Kwara State involving three hundred and two students. Creativity Assessment Scale and students' performance test were used in assessing students' profile of creativity. The study revealed that students' creativity was positively related to their performance and that students' creative ability was high. In another study, Elald and Batd (2015) examined creativity and students' academic performance using meta-analysis method. Twenty (20) studies were randomly selected as samples from 2012-2015. The finding revealed that there exist a positive relationship between creativity and students' academic performance. In a related manner, John (2016) carried out a study on the influence of creative style and gender on students' achievement in physics in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria. The sample consisting one hundred (100) Senior Secondary II physics students, made up of 50 males and 50 females in the Local Government. Kirton Adaptor-Innovator Inventory and the Physics Achievement Test were used as instruments for the study. The finding showed that creative style has a significant influence on students' achievement in physics.

Similarly, Saadu (2017) examined relationship among creativity, achievement motivation and secondary school students' performance in Mathematics. The study involved four hundred and two students in Kwara State. The result of the finding revealed that there was a significant relationship between creativity and students' academic performance. Also, Namia, Marsooli and Ashouri (2014) investigated students' academic performance and creativity and a total of 72 respondents were involved in the study using Torrens creativity test for collecting data from the respondents. It was found that creativity was positively related to students' academic performance. This is also foreign study conducted in Malaysia. Similarly, Al-Oweidi (2013)

conducted a study on creativity and students' academic performance in Jordan. The sampled respondents that participated in the study comprised 176 respondents within the range of 9-17 years. The creativity inventory was used to elicit information from the participants. The findings revealed that creativity was a significant predictor of students' performance. Also, in a study on creativity and secondary school students' academic performance in Taluk by Surapuramath (2014), it was observed that creativity was a significant predictor of secondary school students' performance. The study involved 100 students of different High schools as sample. Two standardized instruments were employed to elicit information for the study.

In contrast, Olatoye, Akintunde and Ogunsanya (2010) observed that there was a low relationship between students' academic performance and their creative ability. This study was conducted in South-west, Nigeria involving a sample size of 235 students offering Business Administration as a course of study in Oyo State Polytechnics and a standardized instrument in creativity test and CGPA were used to elicit information from the respondents. Also, Candrasekaran (2013), in his study, researched on high secondary school students' performance and creativity in Tamil Nadu, India. A total of 118 respondents were involved in the study. CGPA was used to measure respondents' level of academic achievement while their profile of creativity was measured using the Khatena-Torrance Creative Perception (KTCPI) Test. The finding revealed that all aspects of creativity examined were not significantly related to students' academic achievement.

Cognitive Styles and Academic Performance: Several researchers have researched into the variable of cognitive styles. For instance, one of the earlier researchers, Olashinde (1994) examined impulsivity/reflectivity with creativity in secondary schools in Ilorin metropolis. One hundred students with mean age of 15years were involved in the study using an adapted version

of Kagan's (1965) Matching Familiar Figure Tests and Creativity Test which comprised four subsets to determine the constructs respectively. It was observed that cognitive style and creativity were positively related.

However, in an attempt to examine correlates of academic performance, Ramlah and Nasir (2007) averred that field dependent-independent cognitive styles were positively related to students' performance in Mathematics in their study on students' academic performance and cognitive styles in Perak. A total of 395 respondents were involved in the study. Students' dimension of cognitive styles was determined employing a standardized instrument in GEFT and Mathematics performance was equally measured with the use of Teacher made test. It was also observed that FI students performed better in their academic achievement than FD students. A similar study conducted in Perak by Theen and Abdullah (2008) revealed that students' cognitive styles were positively related to their academic performance in General paper. The sample size of 152 respondents was involved in the study. Students' preferred cognitive styles were determined using GEFT. It was also revealed that FI students did better in their academic performance than students who were field dependent.

In a related manner, Jantan (2014) concluded that cognitive styles dimension of field dependence-Independence was positively related to primary school students' performance in Mathematics. This was a foreign based study conducted in Malaysia involving a sample size of 150 respondents. Similarly, Njagi (2015) examined influence of field dependence-independence on secondary school students' performance in Kenya. A sample size of 200 chemistry students was involved in the study and FI and FD questionnaire by Wyss (2002) and chemistry performance test were utilized in the study. It was concluded from the study that students' cognitive styles was positively related to their chemistry performance.

In another study, Tukur, Daniel and Abdulrauf (2015) affirmed that students' preferred cognitive style was a significant predictor of students' performance in Biology. This a Nigerian based study conducted in Zamfara State involving a sample size of 150 respondents. A Witkin's standardized instrument on field dependent/independent cognitive styles and a Teacher Made Test in Biology were utilized in the study. In a study, Ogan (2012) examined the relationship that exists between cognitive styles and undergraduates' achievement in Mathematics. This study is a Nigerian based study conducted in University of Nigeria Nsukka involving a sample size of 620 respondents. The Group Embedded Figure Test (GEFT) and Mathematics Achievement Test (MAT) were utilized in the study to determine the profiles of the constructs respectively. The study revealed that cognitive style was a significant predictor of students' performance in science.

In line with this finding, Ahmadzade and Shojae (2013) observed that cognitive style was a significant predictor of undergraduates' academic performance in Behbahan Islamic Azad University and a total of 1009 respondents were selected for the study. A standardized instrument in GEFT and undergraduates' GPA were utilized in the study. They also concluded from the finding that students with field independent cognitive style have better performance than their counterparts who were field dependent.

Similarly, Onyekuru (2015) while examining relationship that exists between cognitive styles and students' academic achievement in Rivers State, Nigeria involving total of 158 senior secondary school I, affirmed that cognitive styles dimension of field dependence- independence and students' performance were positively related. The researcher utilized GEFT to determine students' preferred cognitive styles and CGPA was used to determine students' performance. In a related manner, Idika (2017) affirmed that cognitive styles were positively related to the

students' performance in Chemistry. This is a Nigerian based study and was conducted in Oyo State, Nigeria and 208 senior secondary school students II were selected as sample for the study. Two standardized instruments in Chemistry performance test and cognitive style scale were utilized for eliciting information from the respondents for the study. It was also reported that the academic performance of field independent students was better than students who are field dependent. Also, Sozcu (2014) while investigating relationships between field dependent cognitive style and students' attitudes towards e-learning. Standardized instrument was used for determining students' cognitive style and their e-learning performance in Fatih University, in Turkey, found out that students' cognitive style of field dependence has positive relationship with their attitudes and preferences for students' roles in e-learning for distance education.

On the contrary, Azizi, Yusof and Wan (2002) observed that students' cognitive styles were not positively related to their academic achievement. This study was conducted in Selangor and the researchers involved 120 secondary school students as respondents in the study. Similarly, Rastegar (2016) reported that the two dimensions of cognitive styles (field independence vs. field dependence) considered in their study were not positively correlated with students' academic performance. This study was done among University undergraduates in Iran. A sample size of 72 undergraduates participated in the study while cognitive styles scale by Witkin and Eysenck were utilized to determine students' preferred cognitive styles. Students' performance was also measured using English Test. In another study, Altun and Cakan (2006) equally found out that there was no significant correlation between students' preferred cognitive styles and their academic performance in computer. A standardized instrument in GEFT was used to determine students' cognitive styles and their academic performance was measured with the use of teacher made test. A total of 130 respondents formed the sample for the study.

Self-efficacy and Academic Performance: several studies had also been carried out to examine the relationship that exists between academic self-efficacy and students' academic performance. for instance, Chemers, Hu and Garcia (2001) reported that students' academic self-efficacy was positively related to their academic achievement while examining relationship that exist between academic self-efficacy and students' academic achievement. The study was conducted among first year college and academic self-efficacy scale and students' GPA were used for the study. Also, Rahil el tal (2006) affirmed that academic self-efficacy was a significant predictor of students' performance in English Language. This study was conducted among secondary school students in Malaysia. The sample size for the study was 1,146 respondents. The instruments used to measure self-efficacy were Self-Efficacy Questionnaire developed by Bandura (1995) and Kim and Park (1997) while students' performance was determined with the use of English performance test.

In another study, Ayotola and Adedeji (2009) concluded that students with high Mathematics self-efficacy did better in Mathematics performance than their counterparts who had low Mathematics self-efficacy. This study involved a total of 352 secondary school students as sample in Oyo State, Nigeria. In a similar vein, Shahrzad, Kourosh, Mohammad, Haitham and Hossein (2011) averred that academic self-efficacy was positively related to students' academic achievement while carrying out relationship study on students' academic achievement and academic self-efficacy. This study was carried out among high school students in Iran. The study involved 250 respondents and data was elicited with the use of two standardized instruments in self-efficacy scale and students' Grade Point Average respectively. Also, Galyon, Blondin, Yaw, Nalls, and Williams (2012) observed that there was a significant positive correlation between students' academic self-efficacy and their academic performance in a study on students'

academic performance and academic self-efficacy. It was further observed that students who have high academic self-efficacy did better in their academic performance than students with low self-efficacy.

While examining relationship between academic self-efficacy and academic performance of undergraduates in Washington University, Khan (2013) equally concluded that academic self-efficacy was positively related to the students' performance. A total of 66 undergraduates, 17 males and 49 females were involved in the study. A standardized instrument on academic self-efficacy developed by Chemers, Hu, and Garcia (2001) was utilized in the study and students' Grade Point Average respectively.

Also, Moustafa and Sudhir (2013) affirmed that academic self-efficacy significantly predicted University undergraduates' academic performance. This was a relationship study conducted among undergraduates in Assiut, Egypt. A total number of 272 respondents were involved in the study and data was collected using Self-Efficacy Scale and students' Cumulative Grade Point Average. In line with this study, Honicke and Broadbent (2016) observed that academic self-efficacy was a significant predictor of students' academic performance while systematically reviewing studies on students' academic performance and academic self-efficacy. The sampled studies were studies investigating academic self-efficacy and students' performance in University populations published between 2003 and 2015. Fifty-nine eligible papers were selected and reviewed.

In the same vein, Ogunmakin and Akomolafe (2013) conducted a study involving secondary school students as respondents in Ondo state, Nigeria. The study investigated relationship between students' academic self-efficacy and their academic performance. A total number of 364 respondents participated in the study and data were collected from the

respondents using a standardized instrument in academic self-efficacy developed by Downs (2005) and students' GPA to measure academic self-efficacy and performance respectively. The finding revealed that academic self-efficacy was closely related to students' academic performance. Similarly, Goulao (2014) concluded that self-efficacy has a significant positive relationship with students' academic achievement while carrying out a correlational study on academic self-efficacy and University undergraduates' academic achievement. The sample size for this study consisted of 663. An adapted self-efficacy questionnaire and GPA were utilized to elicit information from the respondents.

Bushra and Lubna (2014) equally reported that academic self-efficacy was positively related to University undergraduates' academic performance. This study was done in Gujrat University, Pakistan. The total number of 193 respondents participated in the study. Academic self-efficacy scale developed from four sources of self-efficacy propounded by Bandura and CGPA of Social and Basic Science students were utilized in the study and Pearson Product Moment Correlation statistical method of analysis was used. In a related manner, Tamannaeifar and Leis (2014) carried out a relationship study on self-efficacy and University undergraduates' academic achievement in Arak. Four hundred and thirty (430) respondents participated in the study. Standardized Self-Efficacy Scale and the GPA were used to collect data for the study. Pearson Product Moment Correlation statistical method of analysis was used and the findings revealed that there was a significant relationship between academic self- efficacy and students' academic achievement.

Gboyega and Abdullahi (2015) equally examined relationship among academic self-efficacy and gender as determinants of performance in English discourse writing in Ibadan, Oyo State. Descriptive survey design was adopted for the study. Purposive sampling technique was

used to select 40 male and female high achieving students. Three validated instruments which are English Language Essay Screening Test (r = 0.82), English Language Essay Achievement Test (r = 0.76) and Adapted Academic Self-efficacy Scale (r = 0.76) were utilized in the study. The findings revealed that academic self-efficacy had a positive relationship with performance in English discourse writing.

Similarly, Benaoui (2016) examined four major factors of self-efficacy in relation to students' performance in Mathematics involving 191 urban high school graduates taking Mathematics placement tests for Massachusetts Colleges. The finding of the study revealed that students' past performance, vicarious experience, verbal persuasion and emotion were positively related with the respondents' Mathematics performance. In agreement with this finding, Bayero, Dutse and Ahmad (2017) examined effect of computer self-efficacy on students' academic performance among Federal Universities in North-east Nigeria. Four hundred and sixty one students were involved in the study. The findings of the study revealed that computer self-efficacy has significant positive effect on student's academic performance in computer science.

Also, Achufusi, Utakaj, Onuh & Okonkwoe (2019) examined secondary school students' self-efficacy and motivation as correlates of their achievement in Enugu State. The research adopted a correlation survey design. The sample comprised of 384 SS II Physics students drawn from 12 out of 25 government owned schools in Enugu education zone of Enugu State using multi-stage sampling technique. The Physics self-efficacy (PSEQ) and Physics Motivation Questionnaires (PMQ) were used for data collection. Pearson Product Moment Correlation and Regression analysis were used to answer the research questions and test the hypothesis at 0.05 level of significance. The findings of the study indicated that self-efficacy was not significant on students' achievement.

Appraisal of Literature Reviewed

This review covered what other researchers had done on creativity, cognitive style, academic self-efficacy and students' performance. Creativity, in the classroom as discussed earlier, is found to be a strong predictor of students' academic achievement. This is because creativity means openness to new, relevant and original ideas in order to solve a given problem. From the literature, several studies indicated that creativity was positively related to students' academic achievement.

For instance, in a study, Habibollah, Rohani, Tengku, Jamaluddin and Vijay (2010), utilized Khatena-Torrance Creative Perception Inventory (KTCPI) in their study on relationship between creativity and academic achievement and found that creativity was positively related to the students' academic achievement and if ignored, can negatively affect students' achievement. Similarly, Kunjan and Richa in the same year (2010) affirmed that creativity was positively related to academic achievement while utilizing another instrument in Passi Tests of Creativity (PTC).However, controversy is noticed in the reported findings on the identified variables where researchers such as Olatoye, Akintunde and Ogunsanya (2010) and Candrasekaran (2013) observed that relationship between creativity and students' academic achievement was low.

This is identified as one of the gaps highlighted in the earlier studies. Also, in an attempt to examine variables that can improve academic performance, in addition to creativity of the students, individual difference in cognitive style was also found to be closely related to students' performance. The concept of cognitive style is seen as the preferred mode of acquiring and problem solving and is considered as one of the most important guidelines that determine the form of learning and how people deal with the environmental elements. In support of this submission, Njagi (2015), in his study, stressed the significance of cognitive styles of FI and FD

dimension on academic performance and if neglected can affect students' performance especially in Mathematics.

This is in congruence with the finding of Ramlah and Jantan (2014) who, equally, affirmed that there was a significant relationship between cognitive style and students' academic performance and that teachers need to be flexible in their approach of teaching so that individual's cognitive style would be given adequate attention. Despite the importance placed on students' cognitive style in relation to their academic performance, some researchers such as Azizi, Yusof and Wan (2002) and Rastegar and Honarmand (2016) affirmed that cognitive style was positively related to students' academic achievement. It was, therefore, noticed from the literature that there is also conflicting results in the reported findings. It appears that most of the researchers of cognitive style are foreign based and it would, therefore, be difficult to solely depend on their findings due to the variation in the cultural values that is capable of affecting the generalizability of those studies.

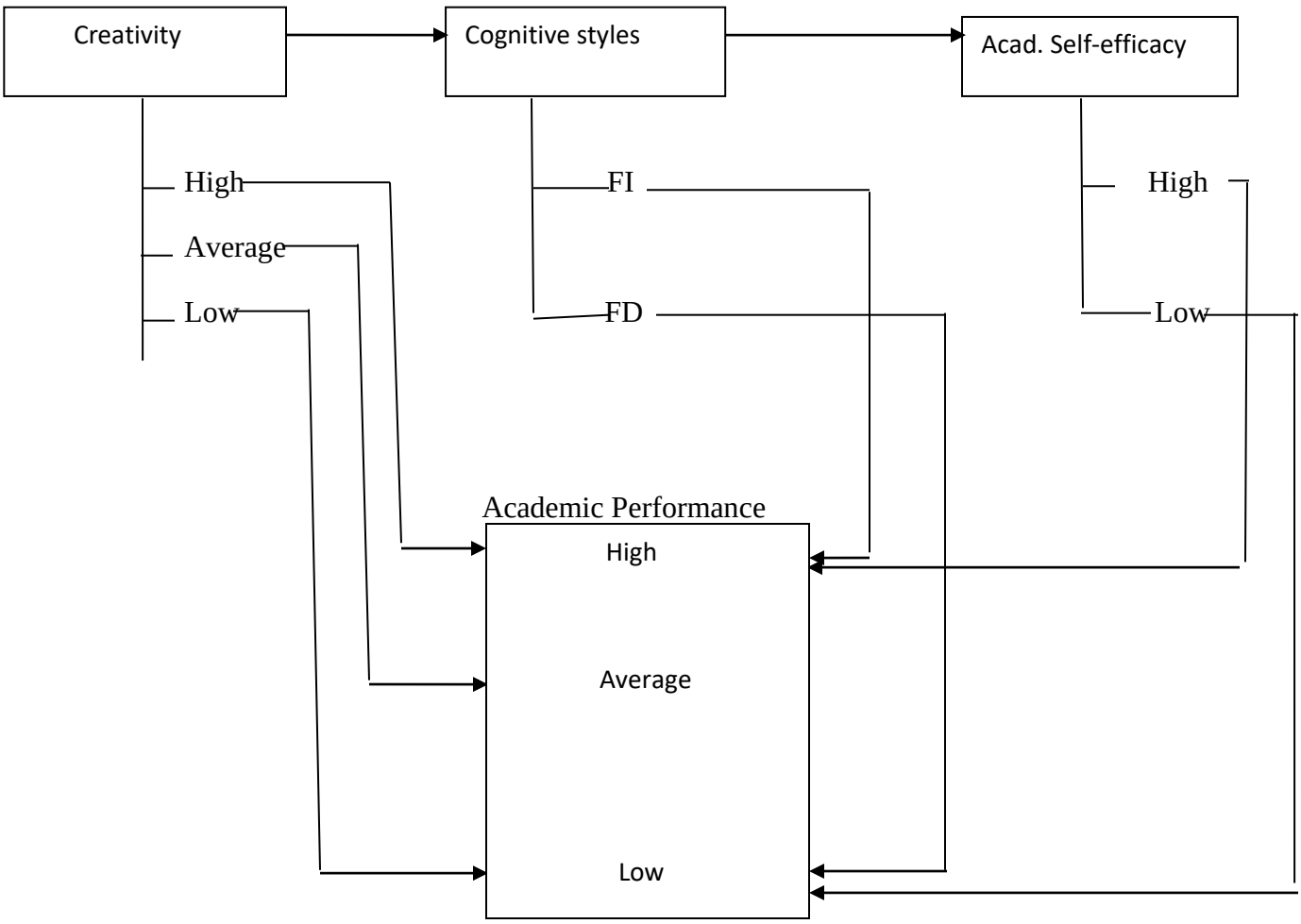
From the literature reviewed, academic self-efficacy is equally found significantly important in relation to the students' academic performance. For instance, Pajares (2002) opined that self-efficacy is an influential factor that determines an individual's choices of task and the course of action taken to achieve the set goals. Other researchers who have reported that self-efficacy was positively related to students' academic performance included Chemers, Hu and Garcia (2001), Mehjabeen (2013) and Bushra and Lubna (2014). They affirmed that student with high positive academic self-efficacy did better in their academic performance than their counterparts with low academic self-efficacy. This implies that self-efficacy is significantly important in the discussion of academic performance. Most important to note, in this review, is that no single study known to this researcher has combined these listed and discussed variables

together in relation to students' performance in Mathematics especially among secondary school students in South-west, Nigeria.

The researcher, therefore, considered carrying out a research on the relationship among creativity, cognitive styles, academic self-efficacy and secondary school students' Mathematics performance in South-west, Nigeria, with the belief that the findings might shed more light on the variables that enhance students' academic performance in Mathematics. The researcher, therefore, considered the study a complementary to the existing studies of academic performance which is different from the previous studies that used mainly Pearson Product Moment Correlation method of analysis unlike this study that adopted a more robust statistical procedure of multiple regressions.

The conceptual framework of this study was based on the review of literature as shown in the diagram.

Conceptual framework



Key:

FI= Field Independent

FD= Field Dependent

Figure 1: Conceptual Framework on Creativity, Cognitive Style, Academic Self-efficacy and Academic Achievement (Saadu, 2019).

The conceptual framework model presented creativity, cognitive styles and academic self-efficacy which were treated as independent variables and while academic performance was treated as dependent variable meaning it is the variable whose variation was explained by the independent variables in the model. The correlation among independent variables was indicated

by a curve line with arrow head at both ends, which means the study does not conceive of independent variables as the cause of one another. It was assumed in the conceptual framework that independent variables might have positive relationship with dependent variable. This was represented with individual curve lines with arrow heads drawn from independent variables to the dependent variable. Curve lines with arrow heads drawn from the first box indicated that students with high creative ability might have high academic performance whereas students with average level of creativity might perform averagely in their academic performance. Likewise, students with low creativity might have low academic performance.

Curve lines with arrow heads drawn from the second box indicated that FI students might perform highly in their academic performance while FD students might have low academic performance. Similarly, individual curve line with arrow heads drawn from the third box showed that academic self-efficacy is positively related to students' academic performance. Thus, students with high academic self-efficacy might have high academic performance while students with low academic self-efficacy might have low academic performance. The conceptual framework above can, therefore, be explained as:

There is positive relationship among creativity, cognitive styles and academic self-efficacy and students' academic performance.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the procedure that was used in conducting the study under the following sub-headings:

(a) Research Design;

(b) Population, Sample and Sampling Techniques;

(c) Instrumentation;

(d) Procedure for Data Collection; and

(e) Data Analysis Techniques

Research Design

The research design adopted for this study was a descriptive design of correlational type. Correlation research design, according to Simon (2011), is a research design employed to examine the relationship that exists between two or among more variables to determine the extent of the relationship. It measures extent of relationship among variables using a correlation coefficient ranges from -1 to +1, which means the closer the coefficient is to +1, the stronger the relationship. The independent variables are creativity, cognitive styles and academic self-efficacy while dependent variable in this study students' academic performance in Mathematics. Correlation research design was, therefore, adopted in this study because the researcher investigated the relationship among creativity, cognitive styles and academic self-efficacy with senior secondary school students' performance in Mathematics. This research design enabled researcher to involve a large number of respondents that served as sample.

Population, Sample and Sampling Techniques

The population of this study comprised all secondary school students in South-west geo-political zone of Nigeria which according to Ministries of Education (2016) is estimated to be 1,961,505 while the target population was all senior secondary school students III in south-west, Nigeria and it comprised Ekiti, Lagos, Ogun, Ondo, Osun and Oyo States.

Table 2: Distribution of Senior Secondary School Students in South-west States, Nigeria

State	Ekiti	Lagos	Ondo	Ogun	Osun	Oyo	Total
No of Public Secondary Schools	255	389	314	330	265	397	**1950**
No of Private Secondary Schools	203	315	178	187	128	294	**1305**
No of Students per State	90370	564,758	338,679	324,591	233,748	409,359	**1,961,505**

Source: States Ministries of Education, South-west, Nigeria

The three states Ekiti, Lagos and Oyo were randomly selected out of the six states in Southwest, Nigeria and each state has three senatorial districts.

Table 3: Distribution of Senior Secondary Schools in South-west States, Nigeria

State	Ekiti	Lagos	Oyo	Total
No of Public Secondary Schools	255	389	397	1,041
No of Private Secondary Schools	203	315	294	812

Source: States Ministries of Education, South-west, Nigeria (2016)

The following sampling procedures were used to select the sample for this study:

At the first stage, simple random sampling technique was used to select three out of the six States in the zone. The researcher wrote the names of each state on a piece of paper, folded and mixed together in a container and three states were randomly selected without replacement. The following states were randomly selected; Ekiti, Oyo and Lagos states. This is in line with William's (2011) submission that simple random sampling technique gives every element of the population equal chance of being included in the sample without bias. Each state has three senatorial districts and all the nine districts in the three selected states were covered in the study. At the second stage, simple random sampling technique was then used to select six (three public and three private secondary schools) from each of the three senatorial districts of the selected States in the zone. A total of 54 schools (18x3) were, therefore, involved in the study. This gave every school an equal chance of being selected in the study.

Simple random sampling technique was also used to select thirty senior secondary school students III from each of the 54 schools selected making the total of 1,620 senior secondary school students III. Senior secondary school students III were selected because the researcher believes that, they would have covered the Mathematics syllabus. According to Research Advisor, a sample of 1,500 is considered appropriate in a population of 2.5million.

Table 4: Selection of Sample Size

State	No of Secondary Schools	No of Students	Total No. of Sampled Schools	Total No of Sampled Students per State
Ekiti	458	90370	18	540
Lagos	704	564,758	18	540
Oyo	691	409,359	18	540
Total	**1853**	**1, 064,487**	**54**	**1620**

Source: Saadu (2019)

Instrumentation

The instruments employed in collecting data for this study were questionnaire forms. Four instruments were used for collecting data for this study, namely: Creativity Assessment Scale (CAS) developed by Olatoye, Akintunde and Ogunsanya, (2010); College Academic Self-Efficacy Scale (CASES) developed by Owen and Froman (1988) and Field Independence-dependence Cognitive Styles developed by Wyss (2002). Each of these instruments was adapted for the purpose of this study while WAEC May/June 2017 multiple choice past question was adopted for measuring students' academic performance for the study.

Creativity Assessment Scale which was developed and used on polytechnic students in Oyo state by Olatoye, Akintunde and Ogunsanya, (2010) was adapted to measure creativity level of the students in this study. The questionnaire was used to measure the students' level of creativity in the area of originality, fluency, flexibility and elaboration traits. Cronbach's alpha coefficient of .86 and a test retest reliability coefficient of .88 of the instrument were reported. The items on the instrument contain 20 items after rewording items 2, 3, 8, 9, 10, 13, 15 and 17, because of the level of the students involved in this study. This is because the instrument was used on polytechnic students. The 20-items in CAS were rated on 5 point Likert scale ranging from very true of me =5 to very untrue of me= 1.

The researcher, in order to re-validate the instrument, gave copies to the supervisors and three lecturers in the Department of Social Sciences Education to ensure face and content validity. In order to determine the reliability coefficient of this instrument, the researcher employed internal consistency method of testing reliability coefficient using Cronbach Alpha. To ensure this, the instrument was administered to 40 senior secondary school students III in Kwara

state, who had the same characteristics with the proposed respondents in South-west, Nigeria. The scores obtained were subjected to statistical analysis using Cronbach Alpha with aid of SPSS. The instrument indicated a reliability coefficient of 0.84. This result re-affirmed the suitability of the instrument for the purpose of this study.

Field Independence-Dependence Cognitive styles Assessment Scale was adapted to collect data on cognitive styles of the respondents which was developed by Wyss (2002). The questionnaire contained nine statements for each of the two cognitive styles (Field Dependent or Field independence) which were used to measure the participants' preference for each cognitive style dimension. The highest score in the field dependence-independence is 45 (5x9). The highest score between the two dimensions (FD/FI) indicated strength or inclination to that cognitive style. The instrument was equally rated on 5-point likert scale as indicated:

Very true of me = 5

True of me = 4

Almost true of me = 3

Untrue of me = 2

Very untrue of me = 1

In a recent study, Winanti (2016) reported a Cronbach Alpha score of .94 and a test re-test reliability index of .84. For the purpose of this study, items 1,2, 3, 5, 7 in section 'A' and 2, 4 and 7 in section 'B' of the instrument were reworded. This is because the instrument is a foreign based one and some items needed to be reworded to suit Nigerian students. The researcher, in order to re-validate the instrument, gave copies to the supervisors and three other lecturers in the department of Social Sciences Education to ensure face and content validity. To test for reliability of cognitive style of field independence/independence scale, the researcher used

internal consistency method of testing reliability using Cronbach Alpha. To ensure this, the instrument was administered to 40 senior secondary school students III in Kwara state who have the same characteristics with the proposed respondents in south-west, Nigeria. The scores obtained were analysed using Cronbach Alpha with aid of SPSS. The instrument revealed reliability coefficient of 0.71 for field independence and 0.75 for field independence respectively. This attested to the reliability of the instrument in measuring what it intends to be measured.

College Academic Self-Efficacy Scale (CASES) developed by Owen and Froman (1988) was employed to measure students' academic self-efficacy. This scale was rated on a 5-point Likert scale ranging from Very confident = 5 to Not at all confident = 1. Higher scores on this scale indicate higher academic self-efficacy and vice versa. In their study, Owen and Frowen (1988) reported a Cronbach's alpha coefficient of .90 and a test retest reliability coefficient of .85. In a related manner, Choi (2005) reported a reliability coefficient of .92 for the instrument. The adapted version of this instrument used for the study contain 20 items after rewording item 1, 5, 7, 8, 10, 11, 14, 16, 18, with the same meaning for the purpose of this study. For instance item 18 which was stated as I have confidence that I can challenge a lecturer's opinion was reworded as I have confidence that I can challenge a teacher's opinion. This is because the original instrument was used to measure academic self-efficacy of college students. Scores on this scale range from 20 through 100 in which higher scores on the scale reflect higher level of academic self-efficacy and vice versa. Students with scores range of 20-60 were classified as low academic self-efficacious while those with scores range of 61-100 were classified as high academic self-efficacious (Owen and Froman, 1988).

The researcher, in order to re-validate the instrument, gave copies to the supervisors and three other lecturers in the Department of Social Sciences Education to ensure face and content validity. To test for reliability of the instrument for the purpose of this study, the researcher used internal consistency method of testing reliability based on Cronbach Alpha. To attain this, the instrument was administered to 40 senior secondary school students III in Kwara state who have the same characteristics with the proposed respondents in south-west, Nigeria. The scores obtained were analysed using Cronbach Alpha with aid of SPSS. The instrument showed reliability coefficient of 0.87. This result re-affirms the suitability of the instrument for this study.

Mathematics Performance Test in WAEC May/June 2017 multiple choice past questions was used to measure students' performance in Mathematics. This is a standardized test and the psychometric properties of the test had been determined. Fifty objective questions were used and each question attracted two marks making the total marks obtainable to be 100.

Procedure for Data Collection

The data collection exercise was done by the researcher and with the help of other trained research assistants who were experts in Mathematics. In order to facilitate data collection exercise, an introductory letter was collected by the researcher from the Head of the Department of Social Sciences Education, University of Ilorin, Ilorin, Nigeria. This letter was submitted to the authorities of the selected schools for necessary permission to administer the instruments on the students. The process of data collection was scheduled between 6 to 8 weeks with the help of the trained research assistants. The following trained research assistants participated in this study: Mrs. Lawal Medinat, an English Teacher from The Great Crescent Secondary School Alakuko, Lagos State who went together with the researcher to the selected schools to administer

the questionnaires on the students, Mr. Semiu Ola, a staff of National Examination Councils (NECO) assisted the researcher to go round the selected schools in Oyo state to administer the questionnaires on the students and lastly Mrs. Ayobami Ojuawo from Ekiti State, a Master student of Faculty of Education, University of Ilorin, Ilorin, Nigeria assisted the researcher to administer the questionnaires on the students in Ekiti State.

Ethical Consideration: The respondents in this study consisted of senior secondary school students III. In order to address ethical related issues concerning this study, the researcher enlightened the respondents on the purpose of the study and informed them that they could withdraw at any time if they wish to and their data would not be used. To attain this, consent form was attached to the instrument and respondents was asked to sign it before responding to the items on the instruments. Respondents were also assured of utmost anonymity and confidentiality of whatever information provided in the course of their response to the instruments. The researcher ensured that all information supplied by the respondents were kept confidential and only meant for academic research purposes. The report of the research work was subjected to the plagiarism test to ascertain the originality of the study.

Data Analysis Techniques

Descriptive statistics was employed to analyse the demographic data of the respondents in the form frequency and percentage. Also, percentage was used to test research question 1. All the null hypotheses generated were analysed using Multiple regression all at 0.05 alpha level of significance. Multiple regression is, therefore, a statistical tool suitable for this study because the researcher intended to investigate relationship among creativity, cognitive style, academic self-efficacy and senior secondary school students' performance in Mathematics.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

This chapter presents the analysis and results of data collated. Descriptive statistics were used to analyse the demographic data of the respondents and the research question 1, while stepwise method of multiple regression results were used to test the null hypothesis generated. Out of 1,620 respondents that were involved in the study, only 1,618 responded to and properly filled the questionnaires.

Demographic Description of Data

The results of demographic description of data are presented:

Table 5: Distribution of the Respondents by School Type and Gender

Variable		Frequency	Percentage (%)
School Type:	Public (SSS III)	810	50.1
	Private (SSS III)	808	49.9
	Total	**1618**	**100**
Gender:	Male	799	49.3
	Female	819	50.7
	Total	**1618**	**100**

Results in Table 5 reveal that out of the 1,618 students that participated in the study, 810 representing (50.1%) of the students were from public schools, while 808 representing (49.9%) of the students were from private schools. This showed that both public and private schools in this study were fairly represented. Also from Table 2, out of the 1,618 students that participated in the study, 799 representing (49.3%) of the students were male, while 819 representing (50.7%)

of the students were female. This implied that the number of female students that participated in this study is slightly higher than the number of male students.

Having presented the demographic data, the researcher proceeded to determine the significance of the zero order correlation coefficients of the measured variables.

Table 6: Cross Tabulation of the Zero Order Correlation Coefficient of the Students' Performance in Mathematics

	Creativity	Cognitive styles	Acad. Self-efficacy	Performance
Creativity	1			
Cognitive styles	.479*	1		
A. Self-efficacy	.505*	.634*	1	
Performance	.243*	.350*	.366*	1

**P<0.05= Significant*

Results in Table 6 show inter-correlations among the measured variable in the study as indicated in the calculated values. It can, therefore, be inferred from the analysis that there is no evidence of multicollinearity among the measured variables. To ascertain absence of multicollinearity, Pallant, (2011) affirmed that the observed correlation among the measured variables must not be greater than 0.7; as correlation coefficient that is above the said value (0.7) indicates the presence of multicollinearity which is capable of affecting the result of the study. The highest correlation coefficient of these measured variables is .634 which is the relationship between academic self-efficacy and cognitive style. This implied that none of the variables in the study has correlation coefficient that exceeds 0.7.

Having presented the significance of the zero order correlation coefficients of the measured variables, the researcher proceeded to answer the research question using descriptive statistics.

Three research questions were raised; research questions 1 was answered with the use of descriptive statistics, while research questions two and three that had corresponding hypotheses were tested with the use of stepwise method of Multiple Regression statistics.

Research Question 1: *What is the profile of creativity, cognitive styles, academic self-efficacy and academic performance of Senior Secondary School Students in Mathematics?*

The summary of the results are as shown in Table 3.

Table 7: Profiles of Creativity, Cognitive Styles, Academic Self-efficacy and Performance in Mathematics

Variables	Score Range	Frequency	Percentage	Mean Score
Creativity				
High	74-100	992	61.3	
Average	47-73	475	29.4	
Low	20-46	151	9.3	**77.50**
Total		**1,618**	**100.0**	
A. Self-efficacy				
High	61-100	1,339	83.0	
Low	20-60	279	17.0	**79.78**
Total		**1,618**	**100.0**	
Cognitive Styles				
FI		806	49.8	**35.50**
FD		812	50.2	**35.58**
Total		**1,618**	**100.0**	
Acad.Performance				
Passed		1,220	75.4	
Failed		398	24.6	**63.65**
Total		**1,618**	**100.0**	

Results in Table 7 revealed that, out of the 1,618 students that participated in the study, 992 representing (61.3%) had high creativity with the mean score of 77.50, and 475 representing

(29.4%) had average creativity while 151 representing (9.3%) had low creativity. This implied that respondents' creativity in South-West, Nigeria was high. It was further revealed that out of the 1,618 students that participated in the study, 1,339 representing (83.0%) had high self-efficacy with the mean score of 79.78, while 279 representing (17.0%) had low academic self-efficacy. This means that the total points scored by 1,339 respondents were above the mean score while the total points obtained by the remaining 279 (17.0%) respondents were below the mean score. This implied that, respondents' academic self-efficacy in South-west zone of Nigeria was also high.

Similarly, results in Table 4, further showed that out of 1,618 respondents involved in the study, 806 representing (49.8%) had field independent cognitive style with the mean score of 35.50, while 812 representing (50.2%) had field dependent cognitive style with the mean score of 35.58. This implied that the respondents that participated in the study had both field independent and field dependent cognitive styles. Finally, results in Table 4 show that out of 1,618 secondary school students that participated in the study, 1,220 representing 75.4% obtained the pass marks in Mathematics performance test with the mean score of 63.65, while 398 representing 24.6% failed the Mathematics performance test. This showed that majority of the respondents involved in the study passed the test in Mathematics.

Having answered the research question, the researcher proceeded to test the null hypotheses generated for the study.

Hypotheses Testing

The first null hypothesis was stated thus:

H_{01}: *There is no significant relationship among creativity, cognitive styles, academic self-efficacy and academic performance of senior secondary school students in Mathematics in South-west, Nigeria*

Table 8a: Summary of the Multiple Regression Analysis

Dependent variable = Mathematics

Multiple R = .387

R Square = .150

Adjusted R Square = .149

Standard Error of the Estimate =12.60211

Results in Table 8a reveal that creativity, cognitive styles, academic self-efficacy jointly yielded a coefficient of multiple regression (R=.387) and a multiple correlation square (R^2= .150) representing 15%. This implied that the combination of creativity, cognitive styles and academic self-efficacy accounted for 15% of the observed variance in academic performance of the students in Mathematics

Table 8b: Results of Regression Analysis of Relationship among Independent Variables and Dependent Variable

Model		Sum of Squares	Df	Mean Square	F	Sig	Decision
1	Regression	45267.065	3	15089.022	95.011	.000	Rejected
	Residual	256324.464	1614	158.813			
	Total	301591.528	1617				

a. Dependent Variable: Performance
b. Independent Variable: Creativity, Cognitive Styles, Academic Self-efficacy

Results in Table 8b reveal that creativity, cognitive styles, academic self-efficacy and students' academic performance had significant positive relationship as seen in the degree of freedom of 3 and 1614 with F-ratio of 95.011 which is significant at .000. Therefore, there exists a significant relationship among creativity, cognitive styles, academic self-efficacy and students' performance in Mathematics.

Table 8c: Parameter Estimate of Regression Analysis of Creativity, Cognitive Styles and Academic Self-efficacy and Students' Performance in Mathematics

Mode		Unstandardized		Standardized	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	15.099	2.196		6.876	.000
	Creativity	.044	.022	.055	2.037	.042
	Cognitive Styles	.210	.045	.161	4.671	.000
	Acad. Self-efficacy	.219	.035	.219	6.238	.000

Variables in the Equation:

a. **Dependent Variable:** Academic Performance in Mathematics
b. **Independent Variables:** Creativity, Cognitive Styles, Academic Self-efficacy

Results in Table 8c reveal the relative contribution of each of the cognitive styles to the academic performance. It reveals that creativity contributed Beta weight of .055 and the t-value of 2.037 which is significant at .042, cognitive styles contributed Beta weight of .161 and the t-value of 4.671 which is significant at .000 whilst academic self-efficacy, on the other hand, contributed Beta weight of .219 and t-value of 6.238 which is significant at .000.

From the values of beta weights and t-ratio for each independent variable, it was revealed that academic self-efficacy had highest contribution to the students' Mathematics performance

followed by cognitive styles while creativity had the lowest contribution to the academic performance at 0.05 level of confidence.

For in-depth understanding of how the variables in the research were entered in the model, stepwise regression analysis was done. The results are as shown in Table 6.

Table 9a: Model Summary of the Constructs

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.366	.134	.134	12.71261	.134	250.164	1	1616	.000
2	.385	.148	.147	12.61439	.014	26.264	1	1615	.000
3	.387	.150	.149	12.60211	.002	4.148	1	1614	.042

Variables in the Equation:

a. Predictors: (Constant), acad. Self-efficacy
b. Predictors: (Constant), academic self-efficacy, cognitive style.
c. Predictors: (Constant), self-efficacy, cognitive style, creativity

Results in Table 9a reveal a stepwise regression of the relationship among creativity, cognitive styles, academic self-efficacy and students' academic performance in Mathematics. When academic self-efficacy variable alone was introduced into the model, it revealed a coefficient of multiple regression (R=0.366) and a multiple correlation square (R^2= .134) representing 13.4% of the observed variance in the dependent variable (performance). Cognitive style variable was entered into the model 2 and it revealed the R and R^2 coefficients of 0.385 and 0.148 respectively. This shows R square change value of 0.14 which is significant ($p<.05$). This implied that cognitive style variable contributed 0.014 representing 1.4% in the equation. Finally, when creativity variable was introduced into the model it revealed R and R^2 coefficients of .387 and .150 respectively. This shows R square change value of 0.002 representing .2%. This

implied that the combination of academic self-efficacy, cognitive styles and creativity accounted for 15% of the observed variation in students' academic performance in Mathematics. The most contributed variable in the model is the variable of academic self-efficacy with R =0.366 and R^2= .134.

Table 9b: Results of Stepwise Regression Analysis of Relationship among Independent Variables and Dependent Variable

Model		Sum of Squares	Df	Mean Square	F	Sig.	**Decision**
	Regression	40429.107	1	40429.107	250.164	.000	Rejected
1	Residual	261162.422	1616	161.610			
	Total	301591.528	1617				
	Regression	44608.256	2	22304.128	140.169	.000	
2	Residual	256983.272	1615	159.123			
	Total	301591.528	1617				
	Regression	45267.065	3	15089.022	95.011	.000	
3	Residual	256324.464	1614	158.813			
	Total	301591.528	1617				

Variables in the Equation:

Dependent Variable: Performance in Mathematics

a. Predictors: (Constant), Academic Self-efficacy
b. Predictors: (Constant), Academic Self-efficacy, Cognitive Styles
c. d. Predictors: (Constant), Academic Self-efficacy, Cognitive Styles, Creativity

Results in Table 9b reveal that the variables of creativity, cognitive styles, academic self-efficacy and students' academic performance in Mathematics had significant positive relationship. This is shown in model 1 when the variable of academic self-efficacy alone was introduced as seen in the degree of freedom of 1 and 1616 with F-ratio of 250.164 which is significant at .000. When the variable of cognitive style was entered in the model 2, it revealed the degree of freedom of 2 and 1615 with F-ratio of 140.169 which is significant at .000. Finally, in model 3 when the variable of creativity was introduced, it revealed the degree of

freedom of 3 and 1614 with F-ratio of 95.011 which is significant at .000. Therefore, there exists a significant relationship among the three independent variables and the dependent variable.

Table9c: Results of Stepwise Regression Analysis of Relative Contribution of Creativity, Cognitive Styles and Academic Self-efficacy to the Students' Performance in Mathematics

Model		Unstandardized		Standardized	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.593	1.870		11.548	.000
	Acad. Self-efficacy	.365	.023	.366	15.817	.000
2	(Constant)	15.911	2.161		7.362	.000
	Acad. Self-efficacy	.237	.034	.238	6.986	.000
	Cognitive Styles	.226	.044	.174	5.125	.000
3	(Constant)	15.099	2.196		6.876	.000
	Acad. Self-efficacy	.219	.035	.219	6.238	.000
	Cognitive Styles	.210	.045	.161	4.671	.000
	Creativity	.044	.022	.055	2.037	.042

Variables in the Equation:

a. Dependent Variable: Performance

b. Independent Variables: academic self-efficacy, cognitive styles and creativity

Results in Table 9c reveal the relative contribution of each of the independent variables to the dependent variable. It reveals that when the academic self-efficacy alone was introduced into the model, it has Beta weight of .366 and T-value of 15.817 which is significant at .000. When the variable of cognitive style was entered in the model 2, academic self-efficacy has Beta weight of .238 and T-value of 6.986 which is equally significant at .000 while cognitive style has Beta weight of .174 and T-value of 5.125 significant at .000. Finally, in the model 3, when the variable of creativity was entered, the variable of academic self-efficacy had Beta weight of .219 and T-value of 6.238 significant at .000, cognitive styles had Beta weight of .161 and T-value of

4.671 significant at .000 while creativity had Beta weight of .055 and T-value of 2.037 which is significant at 0.042.

Based on the values of Beta weights and T-ratio for each independent variable, it is shown that academic self-efficacy had highest contribution to the students' academic performance in Mathematics followed by cognitive styles while creativity had the lowest contribution to the academic performance at 0.05 level of confidence. This implied that creativity, cognitive styles and academic self-efficacy was positively related to the students' academic performance in Mathematics.

The null hypothesis was therefore rejected and restated as research hypothesis1 that:

H_1: *There is significant relationship among creativity, cognitive Styles, academic self-efficacy and academic performance of senior secondary school students in Mathematics in South-west, Nigeria*

Having tested the first hypothesis, the researcher proceeded to test null hypothesis 2

H_{02}: *There is no significant relationship among field independent, field dependent cognitive Styles and students' academic performance in Mathematics*

Table 10a: Summary of the Multiple Regression Analysis

Dependent variable = Mathematics

Multiple R = .245

R Square = .060

Adjusted R Square = .059

Standard Error of the Estimate =16.29140

Results in Table 10a reveal that field independent and field dependent cognitive styles jointly yielded a coefficient of multiple regression (R=0.245) and a multiple correlation square (R^2= .60) representing 6%. This implied that the combination of field independent and field dependent cognitive styles accounted for 6% of the observed variance in students' academic performance in Mathematics.

Table 10b: Results of Regression Analysis of Relationship Among Independent Variables and Dependent Variable

Model		Sum of Squares	Df	Mean Square	F	Sig
1	Regression	27261.250	2	13630.625	51.357	.000
	Residual	428636.861	1615	265.410		
	Total	455898.111	1617			

a. Dependent Variable: Performance in Mathematics
b. Independent Variables: FI, FD

Results in Table 10b reveal that the variables of field independent and field dependent cognitive styles and students' academic performance in Mathematics had significant positive relationship as seen in the degree of freedom of 2 and 1615 with F-ratio of 51.357 which is significant at .000. Therefore, there exists a significant relationship among the two independent variables and the dependent variable.

Table 10c: Parameter Estimate of Regression Analysis of Field Independent and Field Dependent Cognitive Styles to the Students' Performance in Mathematics

Model	Unstandardized		Standardized	T	Sig.
	B	Std. Error	Beta		
(Constant)	22.252	3.368		6.606	.000
FD	.084	.049	.042	1.706	.088
FI	.821	.089	.231	9.267	.000

Variables in the Equation:

a. Dependent variable: Performance in Mathematics
b. Independent Variables: FI, FD

Results in Table 10c reveal the relative contribution of each of the independent variables to the dependent variable. It revealed that field independent cognitive style has a Beta weight of .231 and the T-value of 9.267 which is significant at .000 while field dependent cognitive style has Beta weight of .042 and T-value of 1.706 which is not significant at .088. Based on the values of Beta weights and T-ratio for each independent variable, it was shown that only field independent cognitive style had significant relative contribution to the students' academic performance in Mathematics.

For in-depth understanding of how the variables in the research were entered in the model, stepwise regression analysis was done as shown in Table 8a.

Table 11a: Model Summary of the Constructs

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.241	.058	.058	16.30103	.058	99.686	1	1616	.000

a. Predictors (constant): FI
b. Dependent Variable: Performance in Mathematics

Results in Table 11a show the result of a stepwise regression of the relationship among field independent, field dependent cognitive styles and students' academic performance in Mathematics. When field independent alone was introduced into the model, it revealed a coefficient of multiple regression (R=0.241) and a multiple correlation square (R^2= .058) representing 5.8% of the observed variance in the dependent variable (performance). This shows

that there is no R Square Change because the variable of field dependent cognitive style was not significant and was therefore automatically removed from the model.

Table 11b: Results of Stepwise Regression Analysis of Relationship among Independent Variables and Dependent Variable

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	26488.835	1	26488.835	99.66	.000
	Residual	429409.276	1616	265.724		
	Total	455898.111	1617			

a. Dependent Variable: performance
b. Predictors (constant): FI

Results in Table 11b reveal that the variables of field independent cognitive style and students' academic performance in Mathematics had significant positive relationship. This is shown in model 1 when the variable of field independent cognitive style alone was introduced as seen in the degree of freedom of 1 and 1616 with F-ratio of 99.66 which is significant at .000 while field dependent cognitive style was automatically removed from the model because it was not significant.

Table 11c: Results of Stepwise Regression Analysis of Relative Contributions of Field Independent and Field Dependent Cognitive Styles to the Students' Performance in Mathematics

Model		Unstandardized B	Std. Error	Standardized Beta	T	Sig.
1	(Constant)	24.027	3.206		7.495	.000
	Fi	.858	.086	.241	9.984	.000

a. Dependent variable: Performance in Mathematics
b. Predictors (constant): FI

Results in Table 11c reveal the relative contribution of independent variable to the dependent variable. It revealed that when field independent alone was entered in the model, it has Beta weight of .241 and T-value of 9.984 which is significant at .000 while field dependent cognitive style was automatically removed from the model because it was not significant.

Based on the values of Beta weights and T-ratio for each independent variable, it is shown that only field independent cognitive style has significant contribution to the students' academic performance in Mathematics at 0.05 level of confidence. This implies that there exists a significant relationship between cognitive styles of field independent/ field dependent and academic performance.

The null hypothesis was therefore rejected and restated as research hypothesis 2 that:

H_2: *There is significant relationship among field independent, field dependent cognitive Styles and students' academic performance in Mathematics*

Summary of the Findings

Arising from the result of data analysis, the findings of the study are summarized as follows:

1. The profiles of creativity and academic self-efficacy of senior secondary school students in South-west of Nigeria were above average;
2. Senior secondary school students in South-west zone of Nigeria were inclined to both field independent and field dependent cognitive styles but the number of students who inclined to field dependent cognitive style is slightly higher than the field independent;
3. Majority of the secondary school students sampled for the study passed the Mathematics performance test;
4. There was a significant positive relationship among creativity, cognitive styles, academic self-efficacy and senior secondary school students' performance in mathematics in South-west, Nigeria;
5. There were significant relative contributions of each of creativity, cognitive styles and academic self-efficacy to the senior secondary school students' performance in mathematics in South- west, Nigeria;
6. There was a significant positive relationship among field independent and field dependent and senior secondary school students' performance in mathematics in South-west, Nigeria; and
7. There was a significant relative contribution of field independent cognitive style to the senior secondary school students' performance in mathematics in South- west, Nigeria.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter presents the analysis and interpretation of the results generated in the course of the study. The presentation predicated on the statistical results of the data collected.

Discussion of the Findings

The study investigated relationship among creativity, cognitive styles, academic self-efficacy and secondary school students' performance in Mathematics in South-west zone of Nigeria. The results revealed that senior secondary school students that participated in the study had high creativity. This might be as a result of learning facilities available to the students in the zone. In the South-west zone, education is taken as an industry thus creating enabling environment for learners. Government, State and Local Government take education as priority and this had, therefore, created favourable academic environment and majority of the respondents felt they could be creative. This is because in an enabling environment, everyone will be motivated to display creativity in one way or the other and this result cannot be a surprise as such. The finding of this study corroborates the findings of Olatoye, Akintunde and Ogunsanya, (2010) who equally found that students in the South-west, Nigeria had high creativity. This study was conducted in Oyo State involving Polytechnic students offering Business Administration as a course of study.

Also, this study found that the respondents had high academic self-efficacy. This might be attributed to the parental level of education and good role models of the students. The finding of this study corroborates the finding of Bamidele (2016) who equally found that students in south-west, Nigeria had high academic self-efficacy in a study conducted in Ekiti State, Nigeria

on self-esteem as a predictor of secondary school students' academic self-efficacy. In a similar vein, this study revealed that respondents had more field dependent cognitive style than field independent cognitive style. This might be equally attributed to the calibre of role models and the learning environment available in the South-west, Nigeria. This is because the learning environment where a given task is to be carried out determines the approach used in handling such task. The finding of this study agrees with the finding of Idika (2017) who revealed that field dependent students are more than field independent in Oyo state.

Concerning academic performance, the respondents had high performance in Mathematics. This performance cannot be described as surprising because students in the south-west had always been rated highly in their academic performance when compared with students in other geographical zones. This might be as a result of calibre of teachers in the zone and parental involvement in the education of their children in south-west, Nigeria. This finding also agrees with the finding of Gboyega and Abdullahi (2015) who reported that students' academic performance in Oyo is high while examining academic self-efficacy as determinant of performance in English discourse writing in Ibadan, Oyo State and Idika (2017) who revealed that students' academic performance in Oyo state was equally high. This study examined relationship between cognitive styles and students' performance in Chemistry. A total of 208 senior secondary school students II were selected as sample for the study. Two standardized instruments in Chemistry performance test and Cognitive Style Scale were utilized for eliciting information from the respondents for the study. Also, this type of result is not a surprise because high creativity, high academic self-efficacy are pre-requisites of high academic performance.

The second finding indicated that creativity, cognitive styles, and academic self-efficacy are positively related to the students' performance in Mathematics. This result is also not a

surprise because high creativity, high academic self-efficacy should have significant relationship with academic performance. This finding corroborates with the findings of John (2016) who carried out a study on the influence of creative style and gender on students' achievement in physics in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria and reported that creative style has a significant influence on students' achievement in physics and that of Noori (2002) who observed that creativity was positively related to students' academic performance in English Language in a study conducted in Shiraz city using an Abedi creativity questionnaire and CGPA to elicit information from the respondents.

In the same manner, Anwar, Aness, Khizar, Naseer and Muhammad (2012) found that creativity was positively related to the students' academic achievements in science in a relationship study involving secondary school students in Pakistan using Torrance Tests of Creative Thinking (TTCT) and teacher-made test in science to elicit information from the respondents. Similarly, Elald and Batd (2015) found out that creativity was positively related to the students' academic performance while investigating relationship between creativity and students' academic performance using meta-analysis method involving Twenty (20) studies as sample from 2012-2015. The finding is also corroborates with the finding of Saadu (2017) who examined relationship among creativity, achievement motivation and secondary school students' performance in Mathematics and found that there was a significant relationship between creativity and students' academic performance.

In contrast, Olatoye, Akintunde and Ogunsanya (2010) observed that there was no relationship between students' academic performance and their creative ability. This study was conducted in South-west, Nigeria involving a sample size of 235 students offering Business Administration as a course of study in Oyo State Polytechnics and a standardized instrument in

creativity test and CGPA were used to elicit information from the respondents. The observed difference in this study might be as a result of the students with higher level of education involved in the study. Also, the finding of this study contracts the finding of Candrasekaran (2013) who found out that all aspects of creativity examined were not significantly predicted students' academic achievement while using Khatena-Torrance Creative Perception (KTCPI) Test for measuring creativity of University students in India. This study is a foreign based carried out among University students. The level of students involved and the instrument used for the study might have played a role in the observed difference in the reported findings. Despite this contradictory result, it was noticed that this study and several other related studies in the past affirmed the importance of the identified and discussed variables to the students' academic performance.

The finding of this study equally agrees with the findings of Jantan (2014) who affirmed that cognitive styles (field-dependence and Field vs. independence) were significant predictors of the primary school pupils' performance in Mathematics. The study was conducted in Malaysia. Similarly, Onyekuru (2015) equally investigated field dependence/field independence cognitive styles and academic achievement of secondary school students in Emohua Local Government Area of Rivers State and found out that there was a significant relationship between cognitive styles and students' academic performance in science and art subjects. In agreement with the finding of this study, Ogunmakin and Akomolafe (2013) similarly observed that academic self-efficacy was a significant predictor of students' academic performance in a study conducted in Ondo State, Nigeria using Self-in-School Scale by Downs (2005) and students' GPA to elicit information from the respondents. In agreement with the finding of this study, Gboyega and Abdullahi (2015) revealed that academic self-efficacy had a positive relationship with students'

performance in English discourse writing in a study conducted in in Ibadan, Oyo State. Honicke and Broadbent (2016) found a significant positive relationship between academic self-efficacy and students' academic performance.

In a related manner, Bayero, Dutse and Ahmad (2017) reported that computer self-efficacy has significant positive effect on student's academic performance in computer science while examining effect of computer self-efficacy on students' academic performance among Federal Universities in North-east Nigeria. Four hundred and sixty one students were involved in the study. Similarly, However, the finding of this study contracts the finding of Achufusi, Utakaj, Onuh & Okonkwoe (2019) who examined secondary school students' self-efficacy and motivation as correlates of their achievement in Physics in Enugu State and found out that self-efficacy was not significantly related students' academic achievement.

Also, the result of the study revealed that there was a significant relationship among field independent, field dependent cognitive styles and the students' academic performance in Mathematics. This result is possible because cognitive styles determine how students acquire, process information and solve a given problem in the classroom. Several studies in the past had reported similar results. For instance, this finding corroborates with the findings of Ramlah and Nasir (2007) who reported that cognitive styles (field independence vs. dependence) was a positive predictor of students' performance in Mathematic in a study involving primary school pupils. Group Embedded Figures and Mathematics performance test were used to elicit information from the respondents. The study also revealed that FI students performed better in their academic achievement than FD students. In the same vein, Ahmadzade and Shojae (2013) while investigating the relationship between cognitive style (Filed Dependence and Independence) and Academic Achievement of undergraduates of Behbahan Islamic Azad

University using the Latent Patterns Test developed by Witkin to measure cognitive styles (field dependence-independence) and students' GPA to determine students' academic achievement, found out that there was a significant relationship between students' cognitive styles and academic achievement and that field independent students performed academically better than field dependent students.

Worthy of note in this finding is that academic self-efficacy had the highest contribution to academic performance and it is a variable that can bring about improved performance of students in Mathematics. This is because self-efficacy helps students to have positive thinking about their capability in handling a given academic task. Creativity also deserves more attention as it allows students to try out new ways of solving problems especially in Mathematics. It can therefore be rightly said that creativity, cognitive styles and academic self-efficacy need to be given the deserved attention as a means of improving students' academic performance in the research area.

Conclusion

The study concluded that students' academic performance in Mathematics is positively related to creativity, cognitive styles and academic self-efficacy. It was also concluded that field independent cognitive style has positive relationship with students' academic performance in Mathematics.

Recommendations

Based on the findings of the study, the following recommendations were made:

i. It was recommended that teacher should sustain creativity among students in the teaching and learning process in order to improve students' academic performance.

This is because the creativity of students in South-west, Nigeria is high.

ii. It was further recommended that teachers should sustain positive self-efficacy among students by giving words of encouragement as a means of improving students' academic performance in Mathematics. Similarly, students should be encouraged to be field independent as field independent cognitive style is a positive factor of students' academic performance.

iii. Curriculum planners should make curriculum flexible to accommodate individual difference in cognitive styles.

iv. Finally, it was recommended that Educational psychologists, as one of the main stakeholders in educational setting, should be well-involved in the education policy and implementation so as to give the deserved attention to these identified salient variables as positive factors of students' academic performance.

Implications of the Study

Based on the findings of this study, the implication of the study is that students' academic performance in Mathematics may be enhanced by sustaining creativity, academic self-efficacy and field independent cognitive style. This implies that students' academic performance in Mathematics is better through creativity, cognitive styles and academic self-efficacy.

Limitations of the Study

The limitation of the study can be listed as follows:

i. One thousand six hundred and twenty questionnaires were administered but one thousand six hundred and eighteen were recovered and this might have influenced the finding of the study.

ii. The study covered only South-west in Nigeria as a result of financial implication involved in covering other geo-political zones in Nigeria.

iii. Secondary school students were involved in this study. Had students in higher institutions been involved in the study, possibly the results might have been different.

iv. Three out of many factors of academic performance of students were considered in the study. Had more variables been taken into consideration, possibly different results might have been obtained. However, these salient variables (creativity, cognitive styles and academic self-efficacy) are considered important factors by psychologists.

Regardless of these identified limitations, the findings of this study are still considered valid because it employed empirical method in gathering and analyzing the data. In essence, these limitations do not, in any way, render the results and the conclusions inferred from the study invalid because the researcher involved a representative sample of the population. The results might, therefore, be considered valid, reliable and generalizable to states within the study zone.

Contributions to Knowledge

In addition to the existing body of knowledge of factors on academic performance, this study empirically established that creativity, cognitive styles and academic self-efficacy have positive relationship with students' academic performance in Mathematics. This is the modest contribution to knowledge because while other studies considered environmental factors and teacher factors, this study discussed factors mostly inherent in the learners.

Suggestions for Further Studies

The present study focused on the variables of creativity, cognitive styles, academic self-efficacy and secondary school students' performance in Mathematics in the South-west zone of Nigeria. In view of the findings and scope of this study, the researcher hereby suggested that further studies could be carried out as listed.

i. The study locale should be expanded to cover other geo-political zones in Nigeria. Studies conducted in other schools, states and geo-political zones might produce different results.
ii. The factors considered as variables in this study could be increased. The independent variables of creativity, cognitive styles and academic self-efficacy might not be sufficient criteria for judging students' academic performance. Several other variables need to be included as predictors of students' academic performance in Mathematics and other subjects.
iii. This study considered Mathematics as a subject. Other subjects should be considered in the future studies.
iv. A longitudinal study covering three to five years might be a more valid option.

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APPENDIX I

UNIVERSITY OF ILORIN, ILORIN, NIGERIA FACULTY OF EDUCATION DEPARTMENT OF SOCIAL SCIENCES EDUCATION

MEASURES OF STUDENTS' CREATIVITY, COGNITIVE STYLE, ACADEMIC SELF-EFFICACY AND ACADEMIC PERFORMANCE

Dear respondents,

This instrument is designed to enable the researcher obtain information from you for pure academic research purpose. It consists of six sections and information provided by you in this regard shall be strictly used for academic research purpose and treated with utmost confidentiality. Thanks for your cooperation to be part of this research work.

DEMOGRAPHIC DATA

Please, indicate your responses by ticking (√) the correct options

Name of School: ----------
School: Public ( ), private ( )
Gender: Male ( ), Female ( )

SECTION A: CREATIVITY ASSESSMENT SCALE

Instruction: Read each of the following statements carefully, and then rate yourself on a five-point scale according to how far each statement is true of you by ticking the correct options. Please thick the one that best describes you from the following.

Very true of me VTM = 5
True of me TM = 4
Almost true of me ATM = 3
Untrue of me UM = 2
Very untrue of me VUM = 1

S/N	**Items**	VTM	TM	ATM	**UM**	**VU**M
1	I always make discoveries through trial and error					
2	I am always motivated to find solutions to problems					
3	I always dream of many ideas of solving problems					
4	I engage in systematic problem solving					
5	I have sudden moments of inspiration in problem solving					
6	I find solution to a given problem through rational thought					

7	I communicate with a deeper sense of self					
8	I carefully select ideas					
9	I have no fear of failure in solving problem					
10	I consider several options before providing answers to a problem					
11	I pay attention to visual images					
12	I have experiences of taking much time in creative work					
13	I am inquisitive in searching for facts					
14	I have a sense of purpose that seems to come from beyond the self					
15	I love recombining existing elements in new ways					
16	I do work with a set goal or outcome in mind					
17	I pay attention to auditory impressions					
18	I do not dwell on negative experience					
19	I have positive emotions when I face challenges					
20	I pay attention to bodily feelings					

SECTION B: FIELD INDEPENDENCE/DEPENDENCE QUESTIONNAIRE

Instruction: Read each of the following statements carefully, and then rate yourself on a five-point scale according to how far each statement is true of you by ticking the correct options. Please thick the one that best describes you from the following.
Key: Very True of Me = VTM; True of Me =TM; Almost True of Me = ATM; Untrue of Me= UM; Very Untrue of Me = VUM

S/N	**Statements**	**VTM**	**TM**	**ATM**	**UM**	**VUM**
1	I have no problem concentrating when there is noise and confusion while solving problem.					
2	I enjoy analysing topical issues in mathematics personally in order to understand it better					
3	I feel I must understand every topic I read in Mathematics with little or no supervision					
4	I think individual study is the key to effective problem solving					
5	I prefer working alone to working with other people in solving problem in Mathematics.					
6	Feedback from other people really doesn't affect my way of addressing issues					
7	I usually look for solutions to my learning challenges in Mathematic based on my skills and experiences					
8	I usually pick my books and read even when my classmates are relaxing in the fields					
9	I don't like it when other activities interfere with my learning timetable					
	SECTION C					
1	I need a quiet environment in order to concentrate well in my studies.					
2	I find it tedious and boring to analyse the topical issues in Mathematics					
3	I don't mind reading or listening to others on the topic under consideration so as to get the main idea.					
4	I think peer discussion is the key to effective Problem solving in Mathematic.					
5	I really enjoy working with other people in pairs or groups.					
6	I find feedback useful as a means of understanding my problem areas.					

7	I usually seek to know how other people would handle similar challenges in Mathematics and try out the various ways of solving them					
8	I can read well when my classmates are settled and focused for individual studies around me					
9	I like it when I am exposed to various activities in between my learning timetable to break the monotony of continuous studying					

SECTION D: STUDENTS' ACADEMIC SELF-EFFICACY SCALE

Instruction: Please thick the one that reflects your feelings as they best describe you.

Not at all confident (NC) = 1

Less confident (LC) = 2

Unsure (US) = 3

Confident (C) = 4

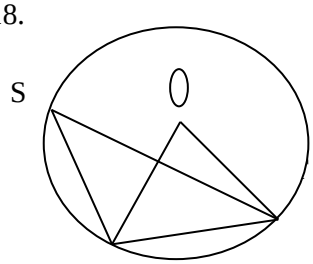
Very confident (VC) = 5

S/N	**Items** **I have confidence that I can:**	**NC**	**LC**	**US**	**C**	**VC**
1	take well-organized notes during a class.					
2	participate in a class discussion.					
3	answer question in a large class.					
4	Take objective tests (multiple choice, T-F, matching) in Mathematics					
5	handle word problems in Mathematics					
6	successfully handle difficult topics in Mathematics					
7	listen carefully during a class even in a difficult topic in Mathematics.					
8	ask another student to explain some topics to me in Mathematics.					
9	explain a concept to another student in Mathematics.					
10	ask a teacher in a class to review a concept I don't understand in Mathematics.					
11	earn good marks in Mathematics.					
12	study enough to understand Mathematics contents thoroughly.					
13	participate in Mathematics quiz competition					
14	understand most ideas I read in my texts.					
15	Understand most ideas presented in class.					
16	perform some simple math computations.					
17	use a computer.					
18	challenge a teachers' opinion in class.					
19	make good use of the library.					
20	apply the knowledge of Mathematics to solve problem in other related subjects.					

MATHEMATICS TEST

1. Express 0.0000407, correct to 2 significant figures.
   A. 0.0 B. 0.00004 C. 0.000041 D. 0.0000407
2. If x varies inversely as y varies directly as z, what is the relationship between x and z?
   A. X ɑ z B. x ɑ 1/z C. x ɑ z^2 D. x ɑ $1/z^2$
3. Evaluate: $\frac{3\frac{1}{4} \times 1\frac{3}{5}}{11\frac{1}{3} - 5\frac{1}{3}}$
   A. $\frac{14}{15}$ B. $\frac{13}{15}$ C. $\frac{4}{5}$ D. $\frac{11}{15}$
4. The ages of Tunde and Ola are in the ratio 1:2, If the ratio of Tunde's age to Musa's age?
   A. 1:4 B. 1:5 C. 2:5 D. 5:2
5. If M={x:3≤ x < 8} and N={x:8<x≤ 12}, which of the following is true?
   I. 8 ϵ M ∩ N II. 8 ϵ M ∪ N III. M ∩ N= ∅
   A. III only B. I and II only C. II and III only D. I, II and III
6. Given that a = log 7 and b = log 2, express log35 in terms of a and b.
   A. a + b + 1 **B**. ab – 1 **C**. a – b + 1 **D.** b – a + 1
7. If x = 2/3 and y = -6, evaluate xy – y/x.
   A. 0 B. 5 C. 8 D. 9
8. Solve the equation: 1/5x + 1/x = 3.
   A.1/5 B. 2/3 C. 3/5 D. 4/5
9. A sum of ₦18,100.00 was shared among 5 boys and 4 girls with each boy taking ₦20.00 more than each girl. Find a boy's share.
   A. 7x + 5. B. x – 2. C. 7x – 2. D. x – 5.
10. One factor of $7x^2 + 33x – 10$ is
    A. 7x + 5. B. x – 2. C. 7x – 2. D. x – 5.
11. Solve: ¼ < ¾ (3x - 2)< 1/2.
    A. 5/9 <x < 8/9 B. -8/9 < x < 7/9 C. -8/9 <x < 5/9 D. -7/9 < x < 8/9
12. Simplify: 3x-(p-x) – (r-p).
    A. 2x – r B. 2x + r C. 4x – r D. 2x – 2p – r
13. An arc of a circle of radius 7.5cm is 7.5cm long. Find, correct to the nearest degree, the angle which the arc subtends at the centre of the circle. {Take π 22/7}
    A. 29^o B. 57^o C. 65^o D. 115^O
14. Water flows out of a pipe at a rate of a rate 40π cm^3 *per second* into an empty cylindrical container of base radius 4cm. Find the height of water in the container after 4 *seconds.*
    A. 10cm B. 14cm C. 16cm D. 20cm
15. The dimensions of a water tank are 13cm, 10cm and 70cm. if it is half-filled with water, calculate the volume of water in litres.
    A. 4.55 litres B. 7.50 litres C. 8.10 litres D. 9.55 litres
16. If the total surface area of a solid hemisphere is equal to its volume, find the radius.
    A. 3.0 cm B. 4.5 cm C. 5.0 cm D. 9.0 cm
17. Which of the following is true about parallelograms?
    A. Opposite angles are supplementary B. Opposite angles are complementary C. Opposite angles are equal D. Opposite angles are reflex angles.

18.

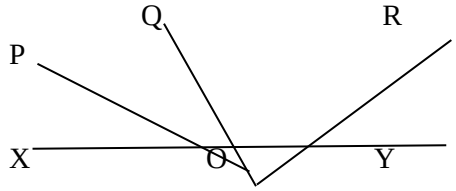


The diagram shows a circle centre 0.

If <STR=29^{o} and <RST = 46^{o} , calculate the vaue of <STO.

A. 12^{o} B. 15^{o} C. 29^{o} D. 34^{o}

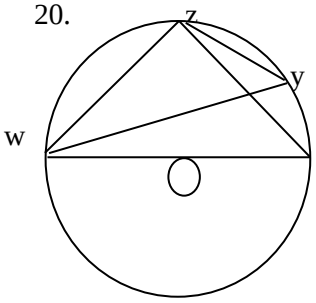
19.



In the Diagram, XY is a straight line, <POX = <POQ and <ROY = <QOR. Find the value of <POQ + <ROY.

A. 60^{o} B. 90^{o} C. 100^{o} D.120^{o}

20.

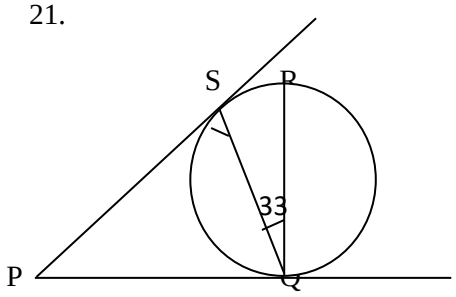


The diagram shows a circle centre O.

If <ZYW = 33^{O}, find <ZWX.

A. 33^{O} B. 57^{O} C. 90^{O} D. 100^{O}

21.



In the diagram, PQ and PS are tangents to the circle centre O. If <PSQ = m, <SPQ = n and <SQR = 33^O, find the value of (m+n).

A. 103^O B. 123^O C. 133^O D. 143^O

22. Calculate the gradient (slope) of the line joining points (-1, 1) and (2, -2)
    A. -1 B. -1/2 C. -1/2 D. 1
23. If P (2, 3) and Q (2, 5) are points on a graph, calculate the length PQ.
    A. 6 units B. 5 units C. 4 units D. 2 units
24. A bearing of 320^O expressed as a compass bearing is
    A. N 50^O W B. N 40^O W C. N 50^O E D. N 40^O E
25. Given that cos $30^{0=}$ sin $60^0 = \sqrt{3}/2$ and sin 30^0 =cos 60^0 =1/2, evaluation $\frac{\tan 60^0 - 1}{1-\tan 30^0}$
    A. $\sqrt{3}$ -2 B. 2- $\sqrt{3}$ C. $\sqrt{3}$ D.-2
26. A stationary boat is observed from a height of 100m. If the horizontal distance between the observer and the boat is 80m, calculate, correct to two decimal places, the angle of depression of the boat from the point of observation.
    A. 36.87^o B. 39.70^o C. 51.34^o D. 53.13^o
27. The average age of a group of 25 girls is 10 years. If one girl, aged 12 years and 4 months joins the group, find, correct to one decimal pace, the new average age of the group.
    A. 10.1 years B. 9.3 years C. 8.7 years D. 8.3 years
28. In a class of 45 students, 28 offer Chemistry and 25 offer Biology. If each student offers at least one of the subjects, calculate the probability that a student selected at random from the class offers Chemistry only.
    A. 2/9 B. 4/9 C. 5/9 D. 7/9
29. In what number base was the addition 1 + nn = 100, where n > 0, done?
    A. n -1 B. n C. n + 1 D. n + 2
30. Simplify: $\sqrt{2}\ (\sqrt{6} + 2\sqrt{2}) - 2\sqrt{3}$
    A. 4 B. $\sqrt{3} + 4$ C. $4\sqrt{2}$ D. $4\sqrt{3} + 4$
31. Three exterior angles of a polygon are 30^o, 40^o and 60^o, if the remaining exterior angles are 46^o each, name the polygon.
    A. Decagon B. Nonagon C. Octagon D. Hexagon
32. Simplify the expression $\frac{a^2 b^4 - b^2 a^2}{ab\ (a+b)}$
    A. $a^2 - b^2$ B. $b^2 - a^2$ C. $a^2b - ab^2$ D. $ab^2 - a^2b$
33. Find the 6^{th} term of the sequence: 2/3, 7, 15, 4/15 ……..
    A. – 1/3 B. – 1/5 C. 1/15 D. 1/5
34. The diagonal of a square is 60cm. calculate its perimeter.
    A. $20\sqrt{2}$ B. $40\sqrt{2}$ C. $90\sqrt{2}$ D. $120\sqrt{2}$
35. The roots of a quadratic equation are – ½ and 2/3. Find the equation.
    A. $6x^2 - x + 2 = 0$ B. $6x^2 - x - 2 = 0$ C. $6x^2 + x - 2 = 0$ D. $6x^2 + x + 2 = 0$
36. Make x the subject of the relation d = $\frac{\sqrt{6-y}}{x \quad 2}$

A. $x = 6/d^2 + 12/y$ B. $x = \frac{12}{2d2-y}$ C. $x = 12/y - 2d^2$ D. $x = \frac{12}{2d2+y}$

37. Two bottles are dawn **with replacement** from a crate containing 8 coke, 12 fanta and 4 sprite bottles. What is the probability that the first is coke and the second is **not** coke?
    A. 1/12 B. 1/6 C. 2/9 D. 3/6
38. If the simple interest on a certain amount of money saved in a bank for 5 years at $2^1/_2$ % per annum is ₦ 500.00, calculate the total amount due after 6 years at the same rate.
    A. ₦2,500.00 B. ₦2,600.00 C. ₦ 4,500.00 D. ₦ 4,600.00
39. Calculate the variance of 2, 3, 3, 4, 5, 5, 5, 7, 7 and 9.
    A. 2.2 B. 3.4 C. 4.0 D.4.2
40. A circular pond of radius 4 m has a path of width 2.5 m round it. Find, correct to two decimal places, the area of the path {Take $\pi = 22/7$}
    A. 7.83m^2 B. 32.29m^2 C. 50.29m^2 D. 82.50m^2

	0	1	2	3	4
0	0	1	2	3	4
1	1	2	3	4	0
2	2	3	4	0	1
3	3	4	0	1	2
4	4	0	1	2	3

Fig. 1

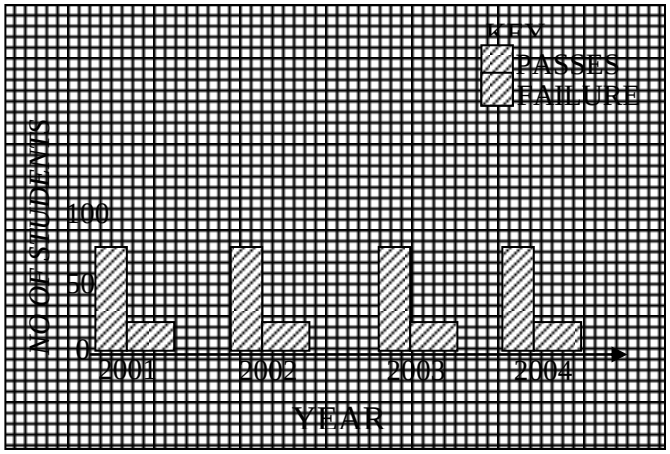
	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	3
3	0	3	1	4	2
4	0	4	3	2	1

Fig. 2

41. **Fig. 1** and **Fig. 2** are the addition and multiplication tables respectively in modulo 5. Use these tables to solve the equation (n x 4)+ 3 = 0 (mod 5).

A. 1
B. 2
C. 3
D. 4

42.



The bar chat shows the statistics of the number of passes and failures in an examination in a school from 2001 to 2004. What is the ratio of the total number of passes to the total number of failures.

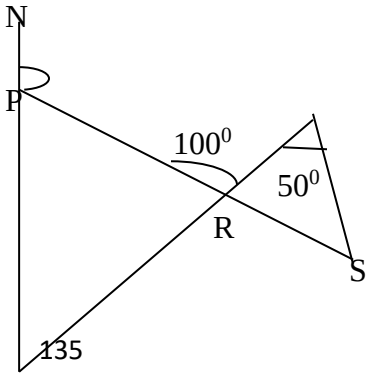
A. 60 : 13
B. 10 : 3
C. 5 : 1
D. 40 : 13

43.

Marks	0	1	2	3	4	5
Frequency	7	4	18	12	8	11

The table gives the distribution of marks obtained by a number of pupils in a class test. Use this information to answer questions **30** and **31.**

44. Find the median of the distribution.
A. 4
B. 3
C. 2
D. 1
45. Find the first quartile.
A. 1.0
B. 1.5
C. 2.0
D. 2.5
46.



Q

In the diagram, NQ//TS, < RTS = 50^0 and < PRT = 100^0. Find the value of < NPR.

A. 110^0

B. 130^0

C. 140^0

D. 150^0

47. Consider the statements:

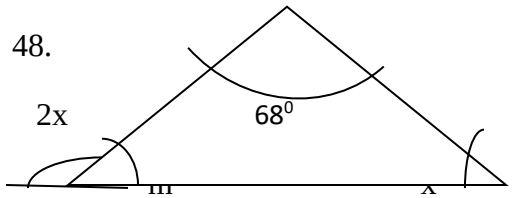
P : it is hot

q : it is rainy

which of the following symbols **correctly** represents the statement "it is rainy if and only if it is cold"?

A p.$\Longleftrightarrow$-q B. q$\Longleftrightarrow$p C. -p$\Longleftrightarrow$ -q D. q$\Longleftrightarrow$-p

48.



find the value of m in the diagram

A. 72^0

B. 68^0

C. 44^0

D. 34^0

49.

The graph of $y = ax^2 + bx + c$ is shown in the diagram. Find the minimum value of y.

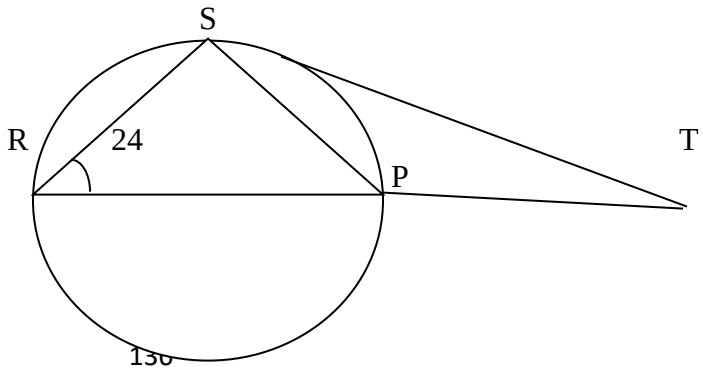
A. – 2.0

B. – 2.1

C. – 2.3

D. – 2.5

50.



In the diagram, *RP* is a diameter of the circle *RSP*,*RP* is produce to *T* and TS is a tangent to the circle at S. if <*PRS*=24, calculate the value of <STR.

A. 24
B. 42
C. 48
D. 66

Appendix II

Key: Mathematics Performance Test

1. C	**22. A**	**43. B**
2. A	**23. D**	**44. B**
3. B	**24. B**	**45. B**
4. C	**25. C**	**46. D**
5. A	**26. C**	**47. D**
6. C	**27. A.**	**48. B**
7. B	**28. A**	**49. A**
8. B	**29. A**	**50. B**
9. A	**30. A**	
10. A	**31. C**	
11. D	**32. B**	
12. C	**33. A**	
13. B	**34. C**	
14. A	**35. B**	
15. A	**36. B**	
16. B	**37. A**	
17. C	**38. A**	
18. B	**39. D**	
19. B	**40. C**	
20. B	**41. C**	
21. C	**42. A**	

Appendix III

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

UNIVERSITY ETHICAL REVIEW COMMITTEE

Vice Chancellor: Prof. S.A. Abdulkareem
B.Che, M.ChE, (Detroit); Ph.D. (Louisville),
MNAICh, MNSE, MACS, R.Eng. (COREN).
Registrar: Dr, (Mrs) F.M. Olowoleni
B.Sc (Zaria); MBA, M.Sc. PGDE (Ilorin)

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Our Ref: UIL/UERC/07/25OD082

Date: 14th February, 2019

Protocol Identification Code: UERC/EDU/276
UERC Approval Number: UERC/ASN/2019/1559

RELATIONSHIP AMONG CREATIVITY, COGNITIVE STYLES, ACADEMIC SELF-EFFICACY AND SENIOR SECONDARY SCHOOL STUDENTS' PERFORMANCE IN MATHEMATICS IN SOUTH-WEST, NIGERIA.

Name of applicant/Principal Investigator: **SAADU,** Kayode Yunusa
Address of Applicant: Department Social Sciences Education
Faculty of Education,
University of Ilorin, Ilorin.
Type of Review: Full Committee Review...
Date of Approval: 14/02/2019

Notice of Full Committee Approval

I am pleased to inform you that the research described in the submitted proposal has been reviewed by the University Ethical Review Committee (UERC) and given full Committee approval.

This approval dates from 14/02/2019 to 13/02/2022, and there should be no participant accrual or any activity related to this research to be conducted outside these dates.

You are requested to inform the committee at the commencement of the research to enable it appoints its representative who will ensure compliance with the approved protocol. If there is any delay in starting the research, please inform the UERC so that the dates of approval can be adjusted accordingly.

The UERC requires you to comply with all institutional guidelines and regulations and ensure that all adverse events are reported promptly to the UERC. No charges are allowed in the research without prior approval by the UERC. Please note that the UERC reserves the right to conduct monitoring/oversight visit to your research site without prior notification.

Thank You,

For Ismaila Isah
For: University Ethical Review Committee

UNIVERSITY ETHICAL REVIEW COMMITTEE
University of Ilorin, Nigeria

"....If it's not ethical, it's not scientific, if it's not scientific it's not ethical"

Appendix IV

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

POSTGRADUATE SCHOOL

Vice-Chancellor:
Prof. S. A. Abdulkareem
B.ChE (Detroit); Ph.D. (Louisville);
MNAICh; MNSE; MACS; R.Eng (COREN)

Dean:
Prof. R. A. Bello
B.Sc., M.Sc., Ph.D.; Economics (ABU)
MNES; NHEA

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UIL/PGS/42 **15th August, 2019**

SAADU, Kayode Yunus
Matric. No.: 07/25OD082
Department of Social Sciences Education
Faculty of Education
University of Ilorin
Ilorin.

Dear **Saadu,**

APPROVAL OF DOCTORAL RESEARCH PROTOCOL

I am pleased to inform you that, the Board of Postgraduate School at its 281st Meeting held on Wednesday, 17th July, 2019 considered and approved your Doctoral Research Protocol titled:

Relationship among Creativity, Cognitive Style, Academic Self-efficacy and Senior Secondary School Students' Performance in Mathematics in South-west, Nigeria

You are therefore, to proceed with your Ph.D. programme accordingly, please.

Congratulations.

Yours sincerely,

M.A. Alfanla
Secretary, Postgraduate School

MA/JB

Appendix V

UNIVERSITY OF ILORIN, ILORIN, NIGERIA
DEPARTMENT OF SOCIAL SCIENCES EDUCATION
FACULTY OF EDUCATION

Head
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Our Ref: _____ *Your Ref:* _____ *Date:* 25th October, 2018.

UNIVERSITY of ILORIN

TO WHOM IT MAY CONCERN
REQUEST FOR RESEARCH ASSISTANCE

SAADU, Kayode Yunusa (Matric No: 07/25OD082) is a Postgraduate Student of the Department of Social Sciences Education, University of Ilorin. He is currently undergoing a Research Project on:

"Relationship among Creativity, Cognitive Styles, Academic Self-efficacy and Senior Secondary School Students' Performance in Mathematics in South-west, Nigeria"

Kindly render him all possible assistance in this regard.

Thanks for your anticipated understanding and cooperation.

Head
Department of Social Sciences Education

Prof. Bolanle. O. Olawuyi
Head of Department