CRITIQUE OF DEVELOPMENT AND VALIDATION OF 4-FACTOR MATHEMATICS ANXIETY SCALE AMONG SECONDARY SCHOOL STUDNETS IN IBADAN, NIGERIA

ABSTRACT

Mathematics is a daily cultural activity of human in space and time concretized into symbols to be computed using mental computer or activities. This article critiqueddevelopment and validation of 4-factor mathematics anxiety scale among secondary school students in Ibadan, Nigeria. Mathematics is a subject that situates learners into phobia or and anxiety. The article posits that from psychological perspective, the general adoption of mathematics as a difficult and fearful subject is environmental effect. This is because prior scientific approach to mathematics, human beings have been solving daily issues, removing, adding, dividing and multiplying using available counters like fingers, toes, sticks, stones, grains, charcoal, seeds and others. Today, teaching and learning of mathematics is affected. Majority of the mathematics teachers teach mathematics in abstract; learners learn in abstract coupled with some psychological issues that may be opposing the mental ability as at the time of learning which also goes on to affect retention, remembering and transferring. The purpose of the critiquing is to inculcate into the scholars and researchers that mathematics anxiety is as a result of teachers', parents', government's and societal mathematics nature misconception and the verbalization influence that it is difficult, and thereby encourage learners to learn with confidence built on constancy for "constant practice makes for perfection". The study on mathematics anxiety was critiqued and recommendations made that would help educational development and management.

Keywords: Mathematics Anxiety, Teachers, Students, Teaching and Learning

INTRODUCTION

Mathematics is a school subject as well as a home or human daily activity practice. [1] added that, Mathematics plays a key role in shaping how individuals deal with the various spheres of private, social and civil life. Interestingly, life activities are carried out solving one mathematical

UNDER PEER REVIEW

problem or the other using subtraction, addition, division and multiplications; either progressively and/ or geometrically, substituting and balancing the thought processes. For this reason, mathematics is a must to deal with if any development and achievements must be attained and gained. Advanced English Dictionary sees Mathematics as a science dealing with the logic of quantity, shape and arrangement. Mathematics according to Cambridge Advanced Learner's Dictionary is the study of numbers, shapes and space using reason and usually a special system of symbols and rules for organizing them. The researcher refers to this as an advanced mathematics which must be taught by somebody in an organized structure with planned and organized methods and materials. From this context, come rules, regulations and formulas as well as expectations of what must be followed and arose at an acceptable conclusion.

Mathematics anxiety appears in all levels of life as well as levels of education and it can be triggered by family, age, sex, parents, school, teachers, peers, biological, sociological, physical and or psychological factors likely to be characterized by tension or mental disturbances from the learner's surrounding. Supporting this [2] opined, Mathematics anxiety established by is worry or fear about performing math calculations. Domestic or ordinary or life mathematics is never anxious driven. The examples are what [3]listed as: basic mathematics like estimating prices when shopping, fractions in cooking, decimals in financial transactions and measuring skills in sewing or woodwork. [2] further explained that, when people cannot use their working memory as they typically can, it can make it difficult to perform calculations in their heads. This may lead to a misconception that they are bad at math, reinforcing their anxiety. From the statement above, it indicates that Mathematics is domestically started but vulnerable to biological and psychological affect for inadequacy. It connotes that mathematics from home is what one engages daily unconsciously, democratically doing it at will with ease accomplishing a task at his own pace, making a good outcome or going back recalculating the result to see the error thereby making a correction that satisfies his reason. This kind of mathematics is devoid of other's judgment, therefore does not impose any anxiety. The mathematics that imposes anxiety is one that has judgment upon it like in school mathematics where academic performance is laid and measured on criterion excellence/standard pass mark or norm reference/expected pass mark. Collaborating with this, [3]confirmed that, pressure of examinations and tests and risk of public embarrassment are the main sources of unproductive tension among many students. It is naturally not alone in mathematics to exhibit anxiety when trying to take up a course especially

UNDER PEER REVIEW

when the situation is not familiar. The mathematics' own is that the materials requires more of abstract letters representing numbers like in x, y, xy, ax, bx, by, ay, 1x,1y, 2x, 2y among other abstract symbols. However, in so far as anxiety and mathematics are natural, mathematics anxiety is of great importance to the development and use of mathematical skills. The importance of it is seen in solving real life situations.

General View of Mathematics

A global view of mathematics as a subject reveals that it is widely recognized as a problem area and many students have phobia for it [2]. On this [4] asserted that attitudes to mathematics also involve conceptualization of what mathematics is, many people seem to regard mathematics as only school taught arithmetic but may not consider other cultural practices involving numbers as mathematics. That is to say that the global view of mathematics as a problematic subject is inadequate in reasoning, in the sense that mathematics is a cultural activity of man in daily encounters. Unfortunately, anxiety in mathematics in the recent times has assumed a worrisome dimension [2]. Mathematics is not worrisome by nature but the judgment brought into its operational nature is what makes it seems worrisome. The mathematics that poses anxiety on the engagers is what the researcher referred to as judgment oriented mathematics. Judgment oriented mathematics according to the researcher is autocratic in nature, having its rules, regulations, formulas and expectations a must to do; instilling anxiety. And it must be taught by a person who must judge at the end of the course with or within a limited time frame, marking scheme or with a pronounced arranged structure and materials. That shows apprehensive nature of school mathematics. A study online in support of the above statements, submitted that what brings about mathematics anxiety is time pressure, imposing authority figures and requirements of the common core standard, and risk of public embarrassment. The mode of operation of this kind of mathematics is what makes it anxiety prone because it is full of "I pray I get it"; an emotion that anticipates unpleasantness; worrisome actions. That is, it puts the engager into a state of fight or flight and this is anxiety.

ANXIETY AND MATHEMATICS

Anxiety is the uncomfortable feeling of nervousness or worry about something that is happening or might happen in the future (Cambridge Advanced Learner's Dictionary). To Advanced

UNDER PEER REVIEW

English Dictionary, it is psychiatrically, a relatively permanent state of worry and nervousness occurring in a variety of mental disorders, usually accompanied by compulsive behaviour or attacks of panic. Most times it comes inform of stress, tension or strain into one's body and mind. [5] furthermore out stated the two types of anxiety– somatic that involves loss of body control, sweaty palms, neck pains or sick to the stomach which involves loss of concentration, having negative self talk, feelings of doubt or mind wanders. Exactly this is what happens when one is unsure of what to do on a task, a must to do. It is pertinent to note that, however, anxiety is one of the normal and natural emotions in human life. Supporting this, [6]opined that, Anxiety is a normal emotion; it is brain's way of reacting to stress and alerting of potential danger ahead. In addition, [7], study emphasized that anxiety, is a common undeniable phenomenon in human beings' life that effect their performance and effectiveness in different situation. It implies that everyone feels anxious now and then that may influence his concentration and performance at any time, any place.

Anxiety is used so widely and is believed to be a general feeling of fear and apprehension whereby an individual anticipates some dreadful happening not objectively predictable from his actual circumference [8].[9] found that mathematics anxiety is negative associated with academic performance. Put in other way, Mathematics anxiety is described as experiencing feelings of panic and helplessness when asked to solve a mathematical task or problem [10]. It indicates that Mathematics anxiety is inability of one to manipulate figures that have rules and formulas sometimes, steps too. In corroboration, Mathematics anxiety is a feeling of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematics in ordinary life and academic situations [11]reported. Educators have strongly established that Mathematics anxiety is an intense emotional and irrational fear of mathematics based on unrealistic feelings of frustration, hopelessness, and helplessness associated with repeated failure or lack of experience of success. All the above assertions prove that, students do not just have anxiety for mathematics but do as a concern of how the condition of the mathematics would favour them to succeed since it is a law bounding activity. This means that the students are lured into mathematic anxiety by inadequacies created during teaching learning process and result dissatisfaction. Therefore the anxiety associated with mathematics is coming from negative factors probably from outside triggers interfering with emotions. It is a psychological and physiological state characterized by physical, emotional, cognitive and behavioural components. The cognitive dimension, labeled as worry,

UNDER PEER REVIEW

refers to concern about one's performance and the consequences of failure, and the affective dimension labeled as emotionality refers to nervousness and tension in testing situations and respective automatic reactions [4].

PERCEPTIONS AND BELIEFS

Perception is a process of by which individuals organize and interpret the sensory impressions in order to give meaning to the environment. 12] viewed it as a process through which we receive, select, organize and interpret information in the environment to be meaningful. The above statements imply that in daily life, the meaning people give to thing(s) they come across with is from how they perceive it with their sensory stimuli. The perception and interpretation towards mathematics is what makes it seems difficult and not the mathematics itself. This is not far from the words of Ellis Albert (1962) in Rational Emotive Therapy who opted that, it is not the event is the problem but the perception of the event. Therefore, the view of Bamidele by [1] that students' general impression is that mathematics is a dreadful subject is as a result of acquisition of irrational thoughts, beliefs and philosophies according to Ellis Albert (1962). He maintained that, emotional disturbances is sustained by continued illogical thinking and the persistence self verbalization of it. The expression people who had problem with mathematics come out to give to the world especially to the hearing of the upcoming learners leads to irrational and illogical views on mathematics. This aligns with the assertion of [3], which says, when parents with high mathematics anxiety try to help their children with their homework, they unintentionally convey the idea that mathematics is difficult and anxiety provoking. [13] stated that every parent has their own parental values, beliefs and practices which can affect students' behaviour towards school activities. In addition, they maintained that through words and deeds of parents, children's personality is shaped and their ways of doing things become habitual. That means what students keep hearing and mostly telling themselves about mathematics is the root of mathematics anxiety. Some advent of Mathematics anxiety is because it has been often verbalized that mathematics is difficult, then some individuals who have not tried, believed that it is difficulty, thereby decided blocking their self efficacy to sail through. Before entering school, they have pre determined. These irrational and illogical ideas on mathematics caused by illogical learning, lead students into self mathematics defeat and neurosis. It shows that mathematics ability can be influenced.

UNDER PEER REVIEW

It is obvious that failure to give a child basic foundation for mathematics, that is giving mathematics or calculation self-efficacy as early as time in lower elementary class together with what he hears from his siblings in school, is the root cause of inadequate relationship between a person and mathematics likes or dislikes. The inculcation of problem solving skill and self efficacy skill in a child as early as age 3 -5 is very paramount. It builds in the child, self knowledge, self capacity knowledge, self confidence, ability to strive, independence spirit, self influence, curiosity mind and positive attitude towards any task he may face. These skills enfold a learning child to be bold to kick off anxiety and tackle a confronting activity. Such a child sees every task as a mountain to crossover, which he must cross. The above assumption aligns with the view of 14] who citing Bandura's Social Cognitive Theory posited that, individual's beliefs about themselves propel them to act in ways to either overcome obstacles in pursuit of desired goals or cave in to them. Luszczynska and Schwarzerin [14]collaborated when he said, one's sense of self efficacy can play a major role in how approaches goals, tasks and challenges. Self efficacy according to [15]is a self judgment made about one's own ability to complete a task. Bandura's (1977) observed that self efficacy for mathematics is an individual's confidence in his or her ability to perform mathematics and thought to directly. When this self judgment is negative, or the self confidence is lacking, anxiety sets in. In terms of mathematics, previous studies and mathematics results have linked mathematics anxiety with a lack in mathematics self efficacy. That is there is still general fear of self ability in matters of computation among scholars.

The words of Ellis Albert which stressed that man's illogical ideas are rooted in biological limitations and mostly the teaching from the parents, teachers, peer group, mass media and society, as well as other studies carried out on mathematics anxiety like that of [16], which showed some correlations between some parts of parent's socio economic background with Mathematics anxiety and academic achievement disagreed with the findings of [1]on the result from table eighteen in the chapter four which revealed the relative contribution of each of the independent variables (teachers' factor, students' factor, parental factor and school factor)on the dependent variable (mathematics anxiety). The result shows that only students' factor made highest significant contribution to the prediction of mathematics anxiety, followed by school factor and teachers' factor .This implies that, school factor, students' factor and teachers' factor are the potent predictors of mathematics anxiety in this study. However, parental factor did not

UNDER PEER REVIEW

make any significant contribution to the prediction of mathematics anxiety. [13] supporting Albert Ellis underscored thus, every parent has their own parental values, beliefs and practices which can affect students' behaviour towards school activities. In addition, they also maintained that through words and deeds of parents, children's personality is shaped and their ways of doing things become habitual. It indicates that parents are big core factors that influence students' attitude towards mathematics. The fact stands that genetic factors play very important roles in domains of growth and development (cognitive, psychomotor, affective, social, emotional, language and physical development of every child) before the nurture factors.

Furthermore, [17]foundthat, in the home parents who themselves suffer mathematics anxiety can unintentionally transfer such anxiety to their children. [18]also identified how parents unintentionally raise mathematics anxiety in their children by providing them with an excuse to stop trying when they are frustrated or upset due to difficulties with a mathematical task using such response as: 'Don't worry, I've never understood fractions' or 'Never mind, mathematics was always tricky for me at school too', thereby planting a seed that may grow into a strong belief for children that they are incapable of learning mathematics during their own time.

ATTITUDE TO MATHEMATICS

Self efficacy is people's belief in their capacity to undertake a particular programme of action. Attitude and concept is everything in life. Man is only limited in life by the limits of his mindset. Most mathematics teachers would agree that mathematics anxiety stems primarily from students' fears of failure and feeling of inadequacy [1]. From the research conducted on pre-service mathematics teachers by [19], the results showed that some teachers' mathematics reasoning ability is not wide, more than half of the people do not recognize half of the content, some teachers their cognition is not deep, while some their understanding of ability performance is simple. The question is, how can students not have lost self efficacy for mathematics since the mathematicians /teachers lack the right competency of giving out what they gained, claimed to be expert on and can do yet are anti questions for clarification during teaching-learning of mathematics?

UNDER PEER REVIEW

Anxiety in mathematics is thus a non-productive experience that harms future learning as the student's inability to do numerical operations leads to psychological pain, discomfort, reduced interest and motivation as well as avoidance of mathematics and mathematics lessons (Wagh; Richardson &Suinn; Mathison in [1]. Parents' attitude towards provision of learning needs like mathematics aids, government's attitude to providing enough mathematics trained 'teaching teachers' not 'lecturers' and mathematics learning materials, all contribute to mathematics anxiety. In fact, many students who suffer from mathematics anxiety have little confidence in their abilities to do mathematics. [1] found that many children and young adults develop a fear for Mathematics while they are in school, often as a result of inappropriate methods of teaching or lack of interest on the part of the students. It indicates that the reason for the students having phobia for mathematics is the approach given to it. Underachieving mathematical students can be assumed to have been affected by some factors such as biological, physical, social, cultural, emotional, psychological, socio-economical, socio-personal, socio-educational or environmental. But the 'choice to engage in, expand effort on and persist in pursuing mathematics' is dashed by seeing some of these people who are handling mathematics lacking teaching skills, techniques and teaching soft skills. Therefore the issue is not the students but the mathematics mode of operation and the experts giving it out. This is proving that both the teachers and the students are lacking mathematics efficacy when it comes in terms of verbal persuasion, performance establishment, and vicarious learning.

Anxiety in mathematics is a crucial challenge facing secondary school students in Nigeria especially non-science; whereas the study of mathematics is widely used in all spheres of human life many researches proved. The fact that it is widely used in all aspects of life does not remove the anxiety that is associated with taking up a task nor is it the fault of the students. The problem is that the mathematics foundation was not well laid in 97% of the earlier school age/time of the students, coupled with some lacks from parents, guardians and materials. It is approvable that only very few students were opportune to have good mathematics foundation, some with curiosity while in senior primary school and early secondary school assiduously learnt mathematics. The reasons were/are that, there were/are very few mathematics experts who are not enough to go round the classes in each school; some mathematics teachers available are not committed and humane in service; then in primary school, every class teacher including those with mathematics anxiety teach math in the class; some schools do not have a mathematics

UNDER PEER REVIEW

teacher or have a half baked math teacher and more to that. Corroborationally, [20]proposed that mathematics anxiety is likely to be due both to pre-existing difficulties in mathematical cognition and to social factors e.g. exposure to teachers who themselves suffer mathematical anxiety. With this it can be agreed that the most well known problem of mathematics anxiety is the mathematician teachers. They lack emotional intelligence, patience, collaboration and consideration during impacting knowledge. The students on their parts lack self efficacy and determination. Self determination in line with [21]requires that people accept their strengths and limitations, be cognizant of forces acting on them, make choices and determine ways to satisfy them. That means these factors are very crucial in child's school achievements. The absent of these factors is loss of interest in mathematics or negative attitudes towards mathematics which is a big stain in academics presently.

ONSET OF MATHEMATICS ANXIETY

Although many researchers Claessens & Engel; Fritz, Haase & Rasanen and others have written something on mathematics and its students' anxiety as identified by [10] but how many have written something on the onset of and the extent of the mathematics anxiety: the way out? Pointing out an issue is sharing and showings out a way out is solving the problem. The onset of mathematics anxiety could be traced to the onset of calculators and other calculating machines which lessened cognitive calculating activities (people can no more reason out simple value for two figures), psychomotor performance (people can no more patiently write and compute a simple equation), and mind strength to strive (people can no more concentrate or focus due to physical and psychological stress on increase). Secondly, action of employing non qualified teachers for less wages/salary payment. Thirdly, compulsory sitting for mathematics for any certificate award without consideration of cognitive efficiency (which brought about malpractice during mathematics exams, stealing or forging of mathematics results).

Speaking more, Mathematics anxiety can be caused by unpleasant teaching and assessment strategies for students, like time testing [22] and assigning mathematics as punishment, the methods which are still widely used in schools today. Also according to [4] some aspects of mathematics appear to be cognitively difficult for many people to acquire; and some people have moderate or severe specific mathematics learning disabilities. Shy children will be weary in new social situations, will perceive such instances as threatening, and may experience high levels of anxiety [23]. Shy students will very likely withdrawal from mathematics class activities such as

UNDER PEER REVIEW

asking or answering questions and will not participate in many academic and social growth opportunities [1]. The fear of being ridiculed by the teacher which will open avenue for other students to follow suit is what could make a student with anomalism of shy to shy away from mathematics class participation as well as asking questions. Shyness is the "tendency to feel awkward, worried or tense during social encounters, especially with unfamiliar people" (APA, 2012). It implies that a child with shyness will definitely show up with anxiety during mathematics learning not because it is mathematics.

[24] in a study, "Overcoming Mathematics Anxiety Multitudes" revealed that, Mathematics anxiety could also develop as a result of a student's prior negative experiences learning [1] mathematics in the classroom or at home. And, [1] added, students whose fathers were professionally employed were found to be lower in mathematics anxiety than those whose fathers were laborers. Then, the researcher putting objection on that maintained that, students found "lower in mathematics anxiety" could be as a result of learning aids provision or extra mathematics class lesson which may have put them through in understanding the fundamental rudiments in mathematics not that their fathers were labourers. For observations have shown where poor students performed better than the rich students. In such cases gene or parental commitments play upper hands but more researches need to be carried out to ascertain the fact.

LEARNERS' MODE OF LEARNING

Learning agreed is a relative permanent change in behaviour as a result of practice or experience. Learning is a continuous process that occurs differently in individuals based on their biological or psychological make –ups. Thus, there are individualities in learning. [25] defined learning style as differential preferences for processing certain types of information as observed among learners. Recent on line publication revealed that leaning style is the way learners gather, sift through, interpret, organize, come to conclusions about, and store information for further use. It aligned with what [26] opted, that, different individuals differ in the modality of instruction that is most effective to them. This is a fact the teachers and the government need to know. This will help government in choosing teachers and the teachers in choosing methods and instructional materials as well as psychologically prepare positively to influence the learners effectively and positively.

UNDER PEER REVIEW

CONCLUSION

Ellis Albert opined that man's illogical ideas are rooted in biological limitations and mostly the teaching from the parents, teachers, peer group, mass media. [10]revealed that, little research has investigated the relationships between mathematics anxiety, mathematics self efficacy and approaches to learning in the context of mathematics education among STEM and social students. Therefore, improving student's mathematics self efficacy will be helpful to curbing the issues of anxiety on mathematics but that is not enough to solve the problem. Since mathematics is generally seen as to be very difficult, the attention should be on making the learners relax with it and not as why student's mathematics anxiety? No matter how mathematics has been made a core subject in school, there is still a lack in teaching and learning mathematics. On this context, a study suggested, instead of instructing the content and practices of mathematics, the main focus should be on students' experience of the discipline and providing mathematics sense making.

A WAYOUY OF MATHEMATICS ANXIETY

Mathematics anxiety is accompanied with lack of attitudinal and environmental motivations. For this reason, to reduce anxieties of all kinds, during and after teaching and learning of mathematics, the researcher suggests that the mathematics facilitators have greater functions to display in the class and at home to assess the cognitive competency of the learner, facilitate interests, willingness and readiness for mathematics learning.

This entails the teacher creating an attractive entering behaviour associated with previous life daily mathematics knowledge in simple naturally perspective format. This stands with [27] who stressed that the teacher plays important role in making the class more attractive and reducing anxieties. Therefore that mathematics teacher can create a learning environment in which the students have a positive expectation about their learning as well as the parents' behaviours.

Moreover, before teaching any class, the facilitator should always enhance his competence for teaching that class type mathematics; fathoming daily the cognitive level and readiness of the students for learning mathematics and enhance mathematics environment for attractive mathematics learning, assimilation and participation.

UNDER PEER REVIEW

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UNDER PEER REVIEW

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UNDER PEER REVIEW