



# Teaching and Learning of Mathematics: Challenges and Prospect in Public Primary Schools in Rivers State

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## Abstract

The paper has highlighted a number of Mathematics issues that teachers and learners are likely to face while teaching and learning Mathematics. The paper anchored its discussion on issues in teaching and learning of Mathematics, based on the Radical Constructivism theory; such as pupils' phobia, application of teacher-centered pedagogy, unqualified and inexperienced teachers, the social and cultural issues of Mathematics language, gender bias as well as lack of hands-on resources and the issue of learner-centered teaching, learning and assessment strategies. The paper highlighted some interventions which when put in place can improve the teaching and learning process and enable the learners to performing better in Mathematics and move from being low achievers to high achievers in Mathematics. The paper highlighted suggestions, stating that the ratio of learners per teacher is too high for any effective teaching/learning process to occur, thus it is important that the government trains and employs enough teachers for the subject. There is a likelihood that learner's performance in Mathematics in internal and external examinations will improve with the implementation of these intervention measures to curb teaching and learning crisis in Mathematics.

**Keywords:** Teaching, Learning, Mathematics, Crisis, Primary School, Pupils.

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## INTRODUCTION

Mathematics is a subject that is made of figures, values and numbers, which empowers an individual to develop critical, analytical and creative thinking skills in solving problems.

Mathematics could be also described as a model of thinking which encourages learners to observe, reflect and reason logically about a problem and communicate ideas. It can be seen as a central intellectual discipline and a vital tool in science, commerce and technology. Mathematics plays an important role in the development of human thoughts and systematic intellectual procedures used in problem solving thus assisting people to be able to foresee, plan, choose and suitably resolve each problem in everyday life (Tatlah et al., 2017). Mathematics has been made compulsory by the Federal Government of Nigeria both at the primary and secondary schools due to its usefulness (FRN, 2014). It is a core subject in both primary and secondary school systems in Nigeria and many other countries due to its usefulness in different sectors of human endeavors. It is a compulsory requirement to gain admission into higher institutions of learning for science, Technology, Engineering and other Mathematics related courses. According to Eravwoke (2015), this compulsory status given to Mathematics was as a result of its importance in our day to day life.

Despite this importance, pupils' performance in Mathematics both in internal and external examinations (such as common entrance examinations) has consistently been low. Learners' poor performance in the subject in Nigerian national examinations year in year out remains a serious concern for teachers of Mathematics, parents, curriculum developers, and the general public. This is particularly worrying because of the importance attached to the subject in national development hence the need to find out what could be affecting learning of Mathematics in primary schools. The research on which this paper is based sought to examine the factors that cause crisis in teaching and learning of Mathematics in Nigerian schools; identify the teaching crisis, and learning crisis in Mathematics; determine how interventions can be applied in reducing or eliminating crisis in the teaching and learning of Mathematics in the primary school system.

This paper anchored on the Radical Constructivism theory which stated that pupils build their mathematical concepts of what they learn through active cognitive and adaptive process (von Glasersfeld, 1995). According to this perspective, pupils should be involved in critical reflection on teaching and learning mathematics. The teaching and learning undergo these processes through assimilation, accommodation, adaptation, and reconstruction (von Glasersfeld, 1990). The pupils learn mathematics through active construction of the meaning of concepts, they learn through individual re-organization, representation, and re-construction and social negotiation with peers, elders, and teachers (Belbase 2016). However, there are some major issues of radical constructivism in teaching and learning mathematics that arise from mathematically weak pupils, application of teacher-centered pedagogy, untrained teachers, the existing curricula, our diverse social and cultural context and general lack of hands-on resources for classroom practice. The theory of radical constructivism focuses on the cognitive process of learning and teaching mathematics which is entirely a mental process. For the success of teaching and learning of mathematics in the classroom, pupils are trained to go through individual and collective mental processes to make sense of concepts they learn and build upon them.

There is a growing concern from educators, teachers, parents, governments and other stakeholders as whether the poor performance in Mathematics is as a result of the teaching and learning crisis mentioned as major issues of radical constructivism in Mathematics education. Other teaching crisis such as; insufficient qualified Mathematics teachers, crisis in choosing inappropriate teaching strategy, lack of opportunities for in-service trainings such as workshops, seminars, conferences, and brainstorming of Mathematics teachers, inexperience and lack of

subject matter knowledge of Mathematics teachers, and lack of learning materials during teaching Mathematics in the primary school also constitute these crisis. Or as a result of learning crisis such as Mathematics phobia, lack of motivation and interest in the strategies used by the teacher, the inability to comprehend Mathematics language during learning, the issue of gender bias, and the influence of assessment practices on the learner.

### **Challenges of Teaching and Learning of Primary School Mathematics**

Teachers of Mathematics at the primary school level are faced with numerous challenges:

**Insufficient qualified Mathematics Teachers:** Shortage of teachers has become an alarming phenomenon over the years across the country, particularly in fields such as Mathematics, Science and bilingual/English language. As a result of teacher shortages in Mathematics, many teachers are required to teach outside their subject domain with little or no further training. In addition, the criteria for new recruits are lowered and the problem of poorly qualified practitioners becomes self-perpetuating (Sani, 2019). There are particular characteristics of why Mathematics suffers more from teacher shortages than many other educational disciplines, and why it is a peculiar stubborn problem. Mathematics graduates simply have more options in terms of employment. In looking for physicists and mathematicians, the competition is not just against other schools, but major financial institutions and blue- chip companies perceived as considerably more attractive than teaching (Smithers & Robinson, 2013). There are simply not enough graduates of mathematics and science, this creates lack of subject specialists in formative (primary) years, creates the conditions for future shortfall of graduates in Mathematics.

Teaching crisis is not only in terms of inadequacy in the number of teachers, but also in terms of quality of teachers in Nigeria. It is not difficult to see that a vicious cycle persists in which poorly qualified teachers produce poorly qualified pupils, some of who go on to become poorly qualified teachers. This creates an even bigger problem, semi-skilled mathematics teachers filling the void of teachers in classrooms but not filling the ‘expertise’ gap has a negative influence on the impact of Mathematics knowledge given to pupils.

**Choosing Appropriate Teaching Strategy:** Teaching mathematics has brought its own struggles for the teachers in the aspect of choosing appropriate teaching strategy in pedagogical delivery. Teaching strategies refers to the techniques and methods teachers employ to teach new knowledge or skills. Most teachers face difficulties while teaching mathematics lessons in the classroom by not being able to use the appropriate pedagogical approaches for the subjects. Teachers who have mastered effective approaches and strategies in teaching Mathematics can help increase pupils’ mathematical knowledge and achievement. Although teachers tried to teach mathematics content by employing several tools and strategies, they face difficulties when they try to explain new topics, complex calculations, and geometry concepts such as a circle to the pupils. According to Haser et al. (2022), face-to-face Mathematics teaching practices should be prioritized in classroom interaction strategies for pupils’ learning because it enabled teachers to monitor and assess pupils’ learning, and to establish a friendly classroom environment. Lack of effective interaction during teaching and learning could affect teaching and pupils’ learning of Mathematics. Unal (2017) opined that teachers are expected to use teaching techniques effectively and to have modern management skills in classroom environment.

The use of hands-on approach which is activity based and the incorporation of games and technology can make the lesson more engaging and interactive. By using online resources, pupils can practice their numerical skills in a fun and interactive way. Using a variety of teaching strategies or methods will help various pupils learn in different ways. Using visual aids, and verbal explanations can help reach all pupils learning styles and help them understand Mathematics concepts. Mathematics lessons can be engaged by use of explicit instruction, conceptual understanding by use of visual aids and manipulatives, use of concepts in Mathematics vocabulary, use of cooperative learning strategies for interactive purposes, use of meaningful and frequent homework, use of puzzle pieces Mathematics instruction motivates pupils to learn Mathematics, the ability of the teacher to verbalize Mathematics problems for example in algebra, and providing the learners' time to reflect in groups and individually in solving Mathematics problems enhances pupils ability in learning Mathematics concepts.

**Lack of opportunities for in-service trainings and brainstorming Sessions for mathematics teachers:** Teaching is a field that is dynamic, with innovations necessitating upgrading of skills and the education of teachers for the successful implementation of reforms. Lack of opportunities for in-service trainings such as workshops, seminars, conferences, and brainstorming of Mathematics teachers, is a major crisis in the teaching of Mathematics. According to Clooney and Cunningham (2017) some pre-service teachers have difficulty in identifying the source of learners' misconceptions and errors and generating effective ways other than rules or procedures to eliminate such misconceptions. According to them, teachers concerns include the lack of impact of current in-service training programmes on the educational system, no regular follow-up activities to support the one-off workshops and insufficient skills acquired to sustain the implementation of strategies solicited by the workshops, seminars and conferences.

Pre-service teacher education and professional development are factors that may influence a mathematics teachers' effectiveness in an elementary classroom and the impact on pupils' achievement in the specific content (Gonzalez & Maxwell, 2018). Some schools do not permit their teachers to attend workshops, and conferences which can add value not only to the teacher, but to the quality of teaching in the school. There is little or no interaction between mathematics teachers with their colleagues in other schools for the purpose of brainstorming and collaboration targeted at enhancing mathematical skills and practices.

**Inexperience and Poor knowledge of Subject Matter:-**Teachers' experience and knowledge is essential to engage learners' in meaningful and effective Mathematical practices in the classroom in order to construct deep understanding of Mathematics (Chapman, 2015). A large body of international research suggests that many qualified and pre-service elementary teachers do not possess appropriate mathematics subject matter knowledge for teaching (Gonzalez & Maxwell, 2018). Also, most of the teachers teaching Mathematics in the primary schools are not professionals in the field. Content knowledge and personal teaching efficacy are positively related and their absence created crisis in teaching Mathematics. The experience a Mathematics teacher has can be a determining factor in success or lack of success of the teaching and learning process. The teacher's self-motivation, confidence and passion about Mathematics support the teacher's knowledge and pupils' achievement in the subject. Once these factors are not in place, the teaching and learning process encounters crisis and is inefficient.

**Lack of Instructional Materials:** Instructional materials are also known as teaching aids which are used by teachers' during teaching practice to demonstrate and explain procedures, concepts and phenomena under study. Teaching and learning of mathematics is easier, more interesting, and closely related to real life applications with the use of instructional materials like textbooks, manipulatives, technology tools and teaching aids. These are any kind of aids that assists in the teaching activities, including reference books, counting equipment like blocks, beads, or stones, charts, pictures, play materials, games and audiovisual equipment, these tools stimulate pupils' to learn and provide teachers the facility of explaining Mathematics concepts in meaningful ways. According to Umuhoza and Uworwabayeho (2021), some learners have difficulties in understanding certain mathematical concepts as a result of their beginner level of cognitive operation, however, standard instructional materials are scarce or unavailable in most schools and some teachers do not have skills to improvise.

Despite the importance of instructional materials for primary Mathematics teaching and learning, some teachers do not use instructional materials in teaching Mathematics concepts. Teachers and Pupils need instructional materials for the effective teaching and learning of any subject, the absence of this constitutes teaching and learning crisis in Mathematics education.

### **Pupils' Challenges in the Learning of Mathematics**

Learning crises are difficulties learners experience in Mathematics in the course of gaining knowledge in the subject. Learners who experience learning crisis or difficulties in Mathematics are identified by lower learning outcomes obtained when compared with other learners exposed to similar experiences (Sakilah et al., 2018). The following are factors which could constitute challenges learners' face in the course of learning Mathematics.

**Mathematics phobia:** The challenges pupils experience in Mathematics is more about fear of failure which produces Mathematics phobia. According to Slaton (2022) the pupils experience a frozen state of mind, described as Math phobia. Mathematics phobia may be a feeling of tension, apprehension, or fear of what interferes with Mathematics performance-anxiety. Some pupils have reported to feel sleepy once they open their Mathematics textbook. Mathematics phobia could be gained not only from personal fear, but from peers, parents and teachers, who are also suffering from Mathematics phobia themselves. This level of Mathematics anxiety appears as test or examination anxiety, fear of failure, and a feeling of inadequacy and incompetence in solving Mathematics problems, or questions that deal with figures, numbers and calculations. This creates learning crisis in pupils' and renders them totally incapacitated in solving Mathematics problems.

**Differences in learning abilities and learning styles:** Learning Mathematics is also affected by several factors that include short term memory, long term memory, and ability to memorize Mathematics facts, visual and spatial perceptual competences. The differences in the learner's Mathematics learning abilities and learning styles are as a result of cognitive, affective and environmental factors (Salihu et al., 2018). There is crisis in the learning of Mathematics in harmonizing the differences between learners learning abilities; high average and low learning ability, learners' styles of learning which could be visual, pictorial or kinetic and the learning strategies used in obtaining Mathematics knowledge. Effective learning and performance in Mathematics takes place when the learner's learning ability is enhanced by the teacher's style of teaching and the strategy used, which is in agreement with the learner's style of learning.

**Lack of motivation and interest in the strategies used by the teacher:** The poor performance in Mathematics is often attributed to learners' negative attitude towards the subject. According to White (2017), the negative attitude arises primarily from negative experiences encountered during learning, hence the need for intentional and purposeful use of instructional approaches that promotes affective development while working toward cognitive outcomes that affect the process through which learning occurs. The negative affect (the process through which learning occurs) in learners could lead to propagation of a culture of negativity towards Mathematics. The teacher has the important role in the classroom to engage highly the pupils' and motivate them to learn by the use of teaching strategies used in explaining Mathematics concepts (Bouزيد, 2020). To have a high motivation to learn and do well in Mathematics depends on if the learner is interested in the content and in achieving the goals and this can be achieved by the choice of learning strategy used by the teacher. The learning strategy should be activity-based, cooperative and collaborative, the strategy should also be learner-centered.

**Inability to comprehend Mathematics language during learning:** The language is not merely a means of communication, but it is also a vehicle of understanding. Pupils make sense or create meaning in their language. The most efficient way to make meaning or creating a concept of mathematics is in one's mother language. Lack of ability to speak Mathematics language and lack of understanding is a crisis in learning because the learners' languages are different in our school and home context. According to Mandy and Garbati (2014), in the mathematics classroom, multiple registers are used, and for pupils to succeed in a mathematics classroom, they need to not only be familiar with and competent in their ordinary English register, but must also have fluency in what can be termed multiple mathematical registers. They emphasized that the mastery of mathematical registers, and the strong ability to switch between them, requires strong linguistic and metalinguistic skills. These skills are necessary for pupils to be able to communicate concepts in Mathematics using its terms. For a student from an English speaking background, mathematical registers can pose a significant challenge, as a new form of language which must be learned and mastered in order to learn the subject. To be able to perform competently, pupils must understand the highly technical language used specifically in mathematics such as addition, subtraction, multiplication, division among other mathematical terms and expressions.

**Issue of gender bias:** The issues of gender are more challenging in teaching and learning mathematics in providing equal opportunity to both boys and girls in schools. Reasons abound for disparity of male and female child due to social and cultural factors. Our society is the male dominated, and our mathematics classrooms are also male dominated. Researchers have recorded that females have poor participation and performance in mathematics classroom in general. This can be seen in their performance in mathematics.

**The influence of assessment practices on the learner:** Assessment is used for different purposes in Mathematics education, such as providing pupils' grades, national accountability, system monitoring, resource allocation within a district, student placement and monitoring, determining interventions, in improving teaching and learning, or in providing individual feedback to pupils, teachers and their parents. Monteiro, Mata and Santos (2021) opined that pupils' and teachers conceptions of assessment are important because they guide how teachers assessment are implemented in the classroom and determine how pupils study.

## Prospects in the Teaching and Learning Mathematics at the Primary School Level

The following are ways to eliminate teaching and learning crisis in Mathematics education in the primary schools, for an effective and efficient teaching and learning process:

- Recruiting more Mathematics teachers with attractive employment benefits in the teaching profession and increasing the use and effectiveness of technology could help relieve the shortage of Mathematics teachers.
- Teachers should be able to choose appropriate teaching strategies which are learner-centered in teaching Mathematics content which are activity-based and interactive in nature. This will encourage collaboration among the pupils which leads to knowledge discovery, cognitive development and creative skills in solving problems.
- Pre-service teachers should be well equipped with the subject matter they are required to teach during their trainings. Also, the in-service teachers should be given opportunities to attend seminars, workshops, conferences and other educational activities that can help improve on their teaching skills and embrace curriculum reforms as they brainstorm with other Mathematics teachers from other schools.
- It is important that both teachers and pupils use instructional materials in the course of teaching and learning of Mathematics, using visual aids as much as possible. This will reduce the phobia the learners have as a result of perceiving Mathematics to be abstract in nature, thereby enabling them to relate its knowledge to real life problems. Schools should have Mathematics laboratories and teachers should also be able to creatively improvise teaching aids for each concept to be taught. Teachers can also engage pupils in the construction of these materials.
- Flexible deadlines policies can be adopted by schools to encourage learning through error and failure to give pupils the courage to try again, also using peer group teaching and group discussions as found necessary.
- Learning should be presented to be very meaningful to the learner; this will motivate the learner to be more receptive to challenges in doing Mathematics. The teacher should explain mathematics terms to the learner to enable a better comprehension of mathematical instructions.
- The government should train and employ more teachers: The ratio of learners per teacher is too high for any effective teaching/learning process to occur. Thus, it is important that the government trains and employs enough teachers for the subject.

## CONCLUSION

The paper emphasized the need to ameliorate the issues associated with the teaching and learning of mathematics thereby disapproving the wide and internalized view that only a selected few are capable of success in mathematics, and that mathematics is not 'for everybody'


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