ETHICAL IMPLICATIONS OF BRIDGING THE GAPS IN MATHEMATICS STEM TEACHER EDUCATION IN NIGERIA

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Abstract
This paper looked at ethical Implication in STEM education with the view of emphasizing the need for bridging the gaps in Mathematics teaching and learning in Nigerian schools. The concept of ethics and Science, Technology, Engineering and Mathematics (STEM) teacher Education were highlighted. The paper argued that ethics which is a mechanism that provides a set of standards for behaviour and makes it easy to take decisions on how people act under different situations is of great importance in the present-day STEM education for relevance and global competitiveness. The needs for Mathematics in Primary Education, the objectives of STEM education and Teacher education programmes, the importance of Mathematics knowledge and skills in teaching and learning STEM courses are examined, the Ethics of Teaching Profession, the Ethics of Mathematics. Furthermore, Importance of STEM in teacher education, Importance of Mathematics to STEM Education and practices were outlined and relevant recommendations and Educational & Ethical Implications were made. The paper therefore recommends among others that the concept of current status of teacher education and Mathematics teacher Education in Nigeria should be incorporated in Mathematics Education curriculum, provision of facilities, equipment as well as training and retraining of Mathematics teacher should be given due attention.

Key words: Ethical Implications, STEM Teacher Education, Mathematics teaching and learning, bridging gaps.

Introduction

Mathematics has a uniquely privileged status in education as the only subject that is taught universally and to all ages in schools. The quality of any teaching programme cannot rise above the quality of her teachers. Teaching is a highly individualized activity and the student-teacher interaction is an intense human relationship that encompasses a broad range of personalities and behaviour (Okolie, 2014). This implies that the importance of bridging the gaps in

Mathematics teacher education is as a result of good Mathematics teacher which is also a good STEM teacher. STEM education is multi-faceted and goes well beyond the main disciplines that constitute the acronym STEM. STEM education will go a long way to enhance teaching and learning of Mathematics in teacher education in Nigeria.

In educational system teachers are very important among the resources in students learning. The Primary objective of any educational or training institution is to teach learners (students) so that they may learn. The objectives of effective teaching as stated by Adegbile (2008) would include assisting learners to: conceptualize ideas, process thoughts and develop their potentials; contribute to thinking and creativity in the subject; nurture and sustain students' interest; suit the circumstance of teaching and learning; and suit the individual teacher ability and interest. Teaching is therefore, a necessary condition for learning. In order for learning to take place, teaching must be effectively carried out. This is to say, it is not every teaching that can promote learning. Imogie (2016) maintained that teaching is indeed a complex process consisting of several variables such as knowledge, styles, methods, techniques. The skills required in each of the processes are acquired during the training of teacher. According to Briggs (1969) in Imogie (2016) "Education should prepare us for a changing society and should itself generate social change to ensure that our children are adequately prepared today, to meet the needs and challenges of tomorrow.

Mathematics is a basic requirement for obtaining admission into higher institutions in the pure and applied sciences, engineering and medicine. It is also the most basic requirement for the attainment of technological self-reliance by any people. But the enrollment of the subject by students in Nigerian teacher education programme has been very low over the years. This has consequently affected the quality of teaching and the professionalization of Mathematics teaching.

Objectives of Teacher Education Programmes in Nigeria

The objectives of effective teaching as stated by Adegbile (2008) would include assisting learners to: conceptualize ideas, process thoughts and develop their potentials; contribute to thinking and creativity in the subject; nurture and sustain students' interest; suit the circumstance of teaching and learning; and suit the individual teacher ability and interest. Teacher education is that component of the educational system charged with the education and training of teachers to acquire the competencies and skills of teaching for the improvement in the quality of teachers for the school system. The national objectives stated in the Nigeria Constitution of 1998 and the various National Development Plans set the pace for educational development whose goals are still being pursued today through schools manned by teachers produced through Teacher Education.

It is important to say that teacher education programmes in Nigeria are guided by the National Policy on Education (FGN, 2004, 2013) whose purposes are clearly stated, namely:

1. To produce highly motivated, conscientious and efficient classroom teacher;
2. To encourage a spirit of enquiry and creativity in teachers;
3. To help teachers to fit into the social life of the community and society at large and to enhance their commitment to the national objectives;
4. To provide teachers with the intellectual and professional background adequate to changing situations;
5. To enhance teachers' commitment to the teaching profession.

These objectives and purpose sound very meaningful and pragmatic. The question is: to what extent have these objectives been realized? To answer this question, there is need to consider some issues as follows:

a) The Content of Teacher Education Programme:

The curriculum content of any teacher education programme comprises four major components, namely, General Studies comprising basically "man's in society" "man in his environment" "man's survival" "ancient civilization" and the use of language for communication and so on. The second major component is Specialization in the Subject Discipline usually taught in public schools for example, English Language, History, Chemistry, Physics, and Biology. The third component is the professional courses programme reflected in "principles and practices" of educational psychology, teaching method and so on. These courses are taken by all students. The fourth component is the Teaching Practice programme during which student teachers are exposed to, through simulation and actual classroom teaching episodes over a given period. This is usually supervised, clinically, x-rayed and diagnosed by their lecturers and professors.

(b) T*he Quality of Teacher Education in Nigeria*

Oteze (2013) sees Teacher quality to include the degree, certification, teacher preparation, teaching experiences, classroom management, and instructional effectiveness and so on. The quality of Teacher Education is best measured through the quality of the teacher's effectiveness of the schools (education institutions). Some authors went further to say that the quality/effectiveness of the teachers and schools are reflected in the quality of the civil servants, traders, police, politicians and so on, especially as the vast majority of them passed through teachers. Baal (1995) in Imogie (2016) went further to say that quality is perceived as "the ability to attain optimal efficiency through the use and performance

of human resources. High quality standards can be enhanced in school by empowering the staff involved, by recognizing and utilizing skills and applying new management methods in addition to fostering a performance culture based on change.

Teaching is done systematically by professionals who have acquired some skills and knowledge either by training or experience or both. To make desirable impact, teaching must aim at total development of the individual, that is, to enhance intellectual capabilities, developmental and cognitive intellectuality, foster psycho-social skills, and draw out neuro-physical aptitude of the learners (Akinmusire, 2012).

(c) Challenges of Teacher Education

The academic and emotional qualities of intending teachers for training are critical for quality assurance and internal efficiency for professionalism in teaching in the future. Candidates who usually apply to higher institutions for teacher education in Nigeria are those who have either been denied admission or are basically unqualified for admission into such popular professions including medicine, law, engineering, architecture etc. The usual shortage of applicants seeking admission into teaching programmes in our national universities is a pointer to why admission selection could not be rigorous as it is in other notable and popular professions. The International Labour Organisation (ILO) recommends that teachers should be selected on the basis of moral, intellectual and physical qualities. The future challenges of teacher education in Nigeria are numerous Osokoya (2010) asserted as follows that:

Professionalization of Teaching

Teaching in Nigeria cannot yet be regarded as a profession in the true sense of the word. This is because a large number of untrained and uncertificated personnel are still retained on the job. Many unqualified teachers are still in the employment role of some States teaching service boards while most higher education lecturers are yet to undergo training in education. Until government makes it mandatory for all involved in the task of teaching to be any man's business and cannot claim professionalism as other notable professions such as law, medicine, engineering etc.

Brain drain syndrome.

The quality of education in Nigeria is reduced in the recent years because of the brain drain phenomenon which led to the drift of more able and more experienced university lecturers to countries where they were offered better remunerations. This brain drain syndrome are attributable to a large extent, to lack of incentives to improve performance, very poor equipped working environments, inadequate social recognition, lack of control over working conditions and late payment of salaries of teachers. The reliance on inexperienced lecturers in the various educational fields in the country definitely affects the quality of students work, and of course, the lecturers of the future. This vicious circle contributes to the low status of education in the universities, colleges of education as well as secondary and primary schools.

Low morale of teachers

The problems of attrition in the teaching force and the dwindling enrolment in teacher education programmes had immensely contributed to the low social status of teachers in Nigeria. Teachers' conditions of service are not enticing enough to attract and retain the best brains in Nigeria.

Globalization and Insufficient Knowledge of Information Communication Technology (ITC).

Another major challenge to teacher education in Nigeria is that of globalization. The knowledge and use of computer is a necessity for all teachers if we are to be relevant in the future. Teachers need to be trained and re-trained in Information Communication Technology (ICT) more so that the world is gradually becoming a global village. For our future teachers to be able to operate effectively and efficiently, they must imbibe the new technologies and methodologies of the modern times.

Operation of Continuous Assessment Practice

Perhaps, a revolution in teacher education programme in Nigeria is the issue of improved assessment practice of students' learning outcomes. The National Policy on Education (1981) recommended the implementation of continuous assessment practice at all levels of education in Nigeria, Continuous assessment is finding out what the students have gained from learning activities in terms of knowledge, thinking and reasoning, character development and industry over a period of time. Scholars in evaluation adjudge continuous assessment as the best thing that could happen to the system of assessment in the Nigerian educational

Institutions. Yet, its implementation has been partially undertaken because teachers have not been well trained for it. It is necessary to include training in continuous assessment practice in the pre-service and in-service programmes of teacher education in Nigeria. From the look of things, the competency-levels of our teachers in the major areas of Teacher Education in Nigeria are very much in doubt, and hence the low quality and effectiveness of our teachers. Hence there is call on us to fill the gap in the Teacher Education Programmes in Nigeria.

Bridging the Gaps in Mathematics Teacher Education

Today, teacher education is much improved than it was before independence and few decades thereafter. Urevbu (2018) opined that creativity is the ultimate of human qualities; one of the key measures of intelligence is our ability to create, to innovate and close the missing gap. Researchers have found that purpose of education is to make a positive difference to students' lives, promoting their creativity should be exploited as part of their formal education. To this end we must seek to bridge the gap between the teacher and learner in Mathematics teacher education as well as exploring the gift of creativity and innovation in Science. These needs and challenges are best accomplished through education whose bedrock are teachers (Nwagwu, 1998), in (Imogie, 2016). NCTM (2000) asserted that educational technology (computer) can help teach Mathematics content. It can offer students a bridge from concrete to abstract thinking, enabling them to observe and create multiple representations of mathematical ideas. For instance, students can use geometric instruction software to investigate the relationship between circumference and diameter of a circle (Agwagah, 2013). Looking at the current status of teacher education and Mathematics teacher education in Nigeria today, is below expectations. The work of Eraikhuemen & Oteze (2015) on perception of undergraduates of Nigerian females' participation in Science, Technology and Mathematics in their findings revealed that a concrete steps need to be taken by stakeholders to change the status quo. Also to develop and implement strategies that will result in desirable level of participation of students in STM. Over the years, some persons observed that Nigeria Education had shortcomings in teacher education programme. Imogie (2016) had some reflections on teachers and teaching asserted that the growing shortcomings in teacher education programme in Nigeria have also been re-enforced by the following reactions/statements and gaps:-

Hanson (1964)

> An important sign of the long-range health of a nation is the spirit and quality of it teachers. The future of the nation rests in the hands of its teachers, for the qualities they posses today will inevitably be reflected in the citizen of tomorrow.

Kilpatrick (1976)

Although we recognize the existence of many variables in the teaching- learning environment, yet unless the student has learnt, the teacher has not taught.

Federal Government of Nigeria (1981)

No nation can rise above the quality of her educational system and educational system cannot rise above the quality of its teachers.

Imogie (1989)

Teachers who think that they know how to teach are dead and don with. The only teachers, who are any good to themselves, to their pupils or society, are those who are always learning.

Ukeje (1998)

It is axiomatic that the educator must first be educated. But here in Nigeria, a situation has existed where most educators are, at best, half educated.

Imogie (1999)

Do you know who is teaching your child?(University of Benin Inaugural lecture No. 53 (1999)

Burtton (1999)

Information and Communication Technology (ICT) can be defined as diverse set of technology tools and resources used to process, communicate, create, disseminate, store and manage information. These technologies include others:- Computer, Internet, Radio, Hardware, Software, Satellite system, Video, Slides.

Urevbu (2004)

Clearly, we seem to be training teachers in a hurry. For example, in a teaching practice exercise which lasts for three to six weeks, there is very little time for student teachers to receive feedback from their lecturers so that they can improve on their practice before they are finally assessed. Thus, unfortunately, our teaching practice has become an exercise during which lecturers frantically move from school to school awarding grades.

Imogie (2005)

Nigeria cannot continue to train teachers in this decade as if we are in the Church Missionary Society era of 1867.

The forgoing reflections touch on the following key issues which are critical to Effective with particular reference to the application of ICT in Teacher Education: Teaching, Learning, Quality of Teachers, Teaching- learning environment, Productivity of teachers

Imogie (2016)

The problem hindering the effective integration and utilization of ICT into instructional processes in schools, colleges and universities are mainly the

lack of learning system in the sector under consideration. The end product of a further consideration of the various reflections is that "it is time for a new paradigm for Teacher Education in Nigeria" that is the development of ICT in training of teachers. The foregoing recent reflections point to the facts that all is not well with teacher education in Nigeria as emphasized by the following comments:

a) "We will begin the removal of unqualified teachers from the classrooms" Teachers Registration council. Registrar, Prof Ajiboye (The Nations/Saturday People).
b) "Upgrade colleges of Education to University Standard" Provost of the Delta College of Education, Mosogar (Prof. Emmanuel Ojeme, urges State and Federal Governments) The Nations.
c) "Deficit of Teachers Exists Nation Wide" Review of National Personnel Audits of UBEC, NTA weekend File.
d) "Edo State has not recruited Teachers in 10years" Edo State Commissioner for Education, the Nations Newspaper.

A cursory look at the Teacher Training Programmes across Nigeria show that enough constancy hours have not been given to the development and use of ICT in the classrooms (Ekpo, 2017). As such, the importance of teachers, the application of pedagogical knowledge into classroom oriented plan of actions constitute most essential fabric upon which the success of the school, its administration and the entire education system rest upon (Okolocha & Onyeneke, 2013). Education can bring about desirable transformation of one's culture of learning, mindset, and orientation values. This can only happen in learners when the teacher possess a good mastery of the subject matter, have a map to follow in terms of well prepared lesson, grab the students attention through effective class control mechanism, recognize student attention span, plan activity for the students by allowing them participate actively in the teaching and learning process.

Conceptual Clarification Ethics

According to Brown University (2017), ethics is viewed as mechanism that provides a set of standards for behaviour which makes it easy to take decision on how people act under different situations. Ethics is viewed as the branch of knowledge that deals with moral principles. It is therefore the moral principles that govern a person's behaviuor or the conducting of an activity. It seeks to resolve questions of human morality such as what constitute good and evil, right and wrong, virtues and vice ,justice and crime etc. Akpan (2018) argued that ethics involves making choices as well as providing reasons for such choices. He further argued that ethics in comparison with laws both tend to regulate how people live together but in practice it is often the case that ethics apply to how

person behave even when others are not involved. Thus, from the above one can infer that ethics is the fundamental principles of decent human conduct that embraces both behaviour and professional.

Ethics and STEM Education

Herreid, Schiller & Herried (2012) described ethics simply as dealing with "questions of good and evil, right and wrong, virtue and vice, and justice and injustice". The dualism implied by those words suggests a way of thinking that does not do justice to the complexity of most ethical dilemma, and may therefore compromise the process of critical analysis .professionals and young students who engage in STEM classrooms are often passionate about their choices, but at the same time are still developing their ethical reasoning abilities (Reiss, 2010). To present either /or choices regarding ethical dilemma does not support student progress in learning to make complex reasoned decisions.

According to Moore et al., (2014) one of the most important indicators of development for a country is its advancement in science and technology. The fact that the integration of the fields such as Science, Technology, Engineering and Mathematics is required for the solution of many of the problem we face in an increasingly globalized world is the natural reflection of progressive situation. They further said that, countries especially the developed ones, are constantly striving to improve the quality of science and technology education considering its role in all round development .The science curriculum allows student to identify a daily need or problem which is related to the issues covered by the content within the scope of science ,engineering and entrepreneurship applications, to select the appropriate criteria by comparing the alternative ways of solution, and finally to come up with an appropriate solution by way of proper planning. Eraikhuemen & Oteze (2015) asserted that Science, Technology and Mathematics (STM) can be seen as a cord of three strings which are interwoven and interdependent. Advances in one field result in /from development in the other.

Importance of STEM in Teachers' Education

It has been asserted that no society can develop without the effective teaching and learning of STEM in schools (Ukeje, 2002) in Oteze and Aguele (2017). The four STEM disciplines are Science, Technology, Engineering and Mathematics and may be summarised as follows:

- Science enables us to develop our interest in, and understanding of, the living, material and physical world and develops the skills of collaboration, research, critical enquiry and experimentation
- Technology covers a range of fields which involve the application of knowledge, skills and computational thinking to extend human capabilities and to

help satisfy human needs and wants, operating at the interface of science and society

- Engineering is about the design and creation of products and processes, drawing on scientific methods to provide the skills and knowledge to solve real- world problems
- Mathematics equips us with the skills needed to interpret and analyse information, simplify and solve problems, assess risk, make informed decisions and further understand the world around us through modelling both abstract and concrete problems (STEM, 2017). STEM education will enable an individual to engage in creative experiences that develops curiosity, inquisitiveness, critical- thinking and problem-solving capacities. Azuka (2015), asserted that Mathematics has help to transform man's real society to a modern society. This stem from the fact that Mathematics is the foundation of science, which is the bed rock of modern development. It is well known that the level of social and economic development of any country is closely connected with the level of development in the mathematical sciences (KuKu, 2012).

The Ethics of Teaching Profession

Teachers Registration Council (TRCN) 2005 attests that professionalism guarantees that ethics are imbibed, the rules of the game exist and are obeyed by all, clients get value for their money and efforts, public interest is protected, priority is given to nation building, and above all that the professionals are regarded with dignity and awe. The ethics code in the teaching profession in Nigeria as stated by TRCN is fashioned after the UNESCO/ILO recommended codes of conduct as they can be grouped under the following headings which are:

1. Maintain trust in the profession;
2. Maintain Professional Relationships with Students;
3. Respect the Uniqueness and Diversity of Students;
4. Work in a Collaborative Manner with Colleagues, Parents, Guardians and Community;
5. Act with Honesty and Integrity; Keep their Professional Knowledge and Practice Up To Date.

The Ethics of Mathematics in Teacher Education

It is well known among educators that the education experience involving the learners' activity participating in concrete examples and making abstract concepts concrete and sustaining the interest and attitude of the students in Mathematics learning, thereby creating the atmosphere for effective knowledge and learning. Bridging the gaps in Mathematics teacher education in Nigeria, needs to be identified where the use of manipulative are often suggested as some of the

effective approaches to improve student Mathematics achievement (Gurbuz, 2010, Sherman and Bisanz, 2009).

For effectively understanding of Mathematics and for student teachers to perform better in Mathematics, there is need to examine the impact or effect of the use of manipulative on students performance in Mathematics with the aim of stimulating the interest of the student teachers in the subject, through the use of manipulative in teaching in Mathematics teacher education in Nigeria. Since concrete objects that resemble everyday items can assist students in making connections between abstract mathematical concepts and the real world. Teacher Education can bring about desirable transformation of one's culture of learning, mindset, and orientation values with the use of manipulative resources in teaching. This can only happen in learners when the teacher possess a good mastery of the subject matter, have a map to follow in terms of well prepared lesson, grab the students attention through effective class control mechanism, recognize student attention span, plan activity for the students by allowing them participate actively in the teaching and learning process. To Ademola (2007) an educational system with low quality teachers will produce students with poor inspiration and aspiration. Such students, Ademola opined will not grasp enough of the subject matter and cannot learn with ambition.

Importance of Mathematics to STEM Education

Mathematics is frequently encountered in associated and interaction with astronomy, physics and other branches of natural Science. This symbiotic relationship between Mathematics and it area of application is ever deepening as more area of Science, Technology and Engineering become almost indistinguishable from sub area of Mathematics and this relationship is producing existing and intriguing Mathematics. For example dynamic related to Physics, calculus related to Physics and Chemistry, Mechanic related to Physics and Chemistry even the use of mathematical modelling in Biology, Physic and Chemistry. The cross-disciplinary collaboration between Mathematics and professionals in order field is accelerating. The importances of Mathematics according to Ernest (2018) are as follows:

- Mathematics expands the human intellect, broadening our conceptual horizons and opening up vast areas of pure thought.
- Mathematics is known as both the queen and servant of science (Bell 1952) in Ernest (2018). As its servant Mathematics provides the language through which modern science is formulated. Models, laws, theories and predictions could not be expressed without Mathematics.
- Computing and the information and communication technologies that form the language and basis for all our modern media, knowledge systems and control mechanisms, rest solely on Mathematics and logic.

Ernest (2018) also maintained that more human beings than ever live longer, healthier, better educated, more comfortably and wealthier as a consequence of the Mathematics-led developments in the sciences, technology and engineering. He further said that to these social benefits shared by so many, Mathematics has great personal value. Learners and persons in general benefit from Mathematics as:

1. an enlarging element of human culture,
2. a means of personal development and growth,
3. a valuable tool for use socially, both as workers, and citizens in society
4. a means of gaining certification for entry to employment or further education

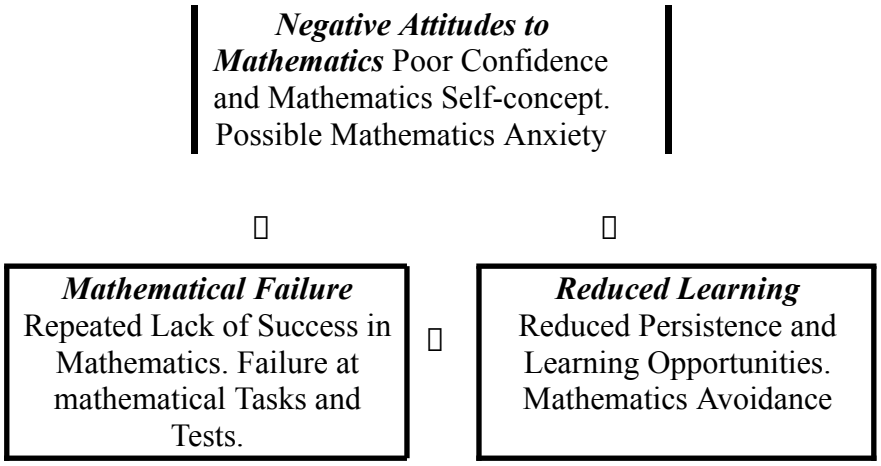
Apart from the well known characteristics of teacher there are other required characteristics Mathematics teachers must possess which include;

- Using Mathematics language and following Mathematics rules with great precision.
- Sharing mathematical knowledge with other STEM teacher.
- Learning and adapting to innovations on STEM education.

Enemali and Adah (2015); asserted that we can use proportional to make conservation from unfamiliar to the familiar, from the foregoing, in all spheres of life including all subjects. Mathematics has been found to be a key. While mathematical knowledge has important uses and applications in modern societies, the status and value of mathematical achievement is elevated beyond its actual utility. One of the most important ways that a social training in obedience is achieved is through the universal teaching and learning of Mathematics from a very early age and throughout the school years. The central and universal role of arithmetic in schooling provides the symbolic tools for quantified thought, including not only the ability to conceptualize situations quantitatively, but a compulsion to do so (Ernest, 2018).

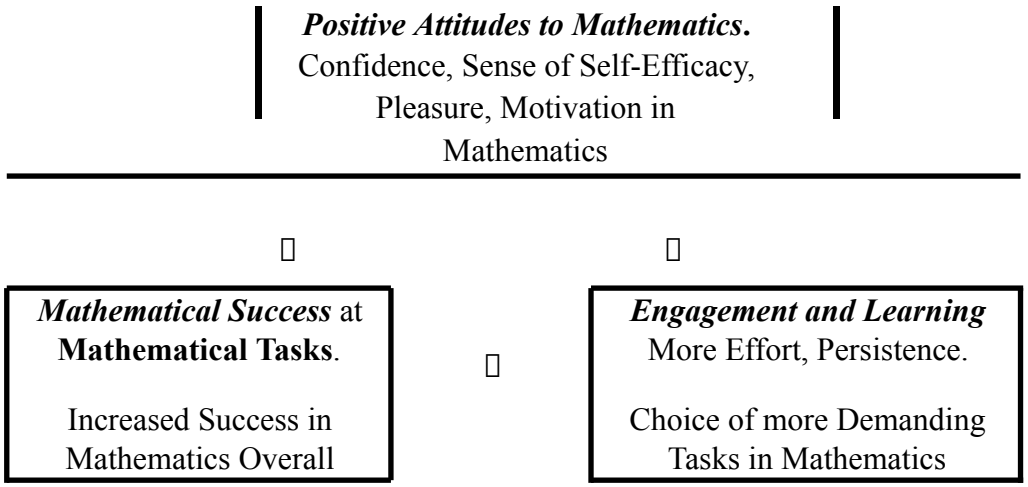
To Ernest (2018) the consequence of this is lack of success in Mathematics, which is the strong case in failure. Students who experience an overall lack of success and repeated failure at mathematical tasks and tests develop or strengthen their negative attitudes to Mathematics, completing a self-reinforcing cycle, leading to a downward spiral in all three of its components, illustrated in Fig. 1.

Figure 1: The Failure Cycle (adapted from Ernest 2013).



In this, as in any proper cycle, there is no identifiable beginning point. All three elements develop together, and any one of them could be nominated as a starting point. Thus, outcomes shape attitudes, and in particular failure often leads to poor attitudes. Negative attitudes impact upon behaviours, such as disengagement and low effort. Disengagement in turn reduces the chances of success. So once the cycle is started it becomes self-reinforcing and self-perpetuating, a vicious cycle. It is difficult to isolate the problems of Teacher Education from the problems of Education generally in Nigeria. The basic goals of education are processed and realized through the organization of schools at many strata. The students are actually the objects used by the society through the instrumentality of schools to achieve its objectives.

Figure 2: The Success Cycle (adapted from Ernest 2013).



In contrast, positive student attitudes to Mathematics, including confidence, a sense of mathematical self-efficacy, pleasure in and motivation towards Mathematics lead to increased effort, persistence, and the choice of more demanding tasks. This is because of the intrinsic rewards gained, such as intellectual satisfaction and pleasure gained through success. The increased efforts and engagement in turn lead to students' improved learning, as well as their experience of further success at mathematical tasks and Mathematics overall. Consequently, positive student attitudes to Mathematics are reinforced, completing a success cycle, in an enhancing upward spiral. Baal (1995) in Imogie (2016) went further to say that quality is perceived as "the ability to attain optimal efficiency through the use and performance of human resources. High quality standards can be enhanced in school by empowering the staff involved, by recognizing and utilizing skills and applying new management methods in addition to fostering a performance culture based on change.

Conclusion

In reassessing the trends and dynamics of teacher education in Nigeria in recent time, some major mile-stone were identified in the growth of teacher education. The needs to meet the basic teacher education requirements for the new universal basic education as well as the implementation of 2004 National Policy on Education was recognized as historical landmarks. It is noted that access to teacher education programmes in the Nigerian higher education did not conform with the international standards as laid down by the International Labour Organisation (ILO). There was the brain drain syndrome as well as insufficient knowledge of Information Communication Technology among the Nigerian teachers.

STEM Education in Teacher Education is imperative to national development is not in dispute. This is because the products of Teacher Education are the critical tools required for the production of the required manpower in all sectors of the economy. Thus, teachers just have to be effective and productive. In essence, effective teachers can only be produce by quality Teacher Education Programme in Nigeria. Despite all the effort so far made in improving teaching and learning of Mathematics in teacher education as promoted by Science Teachers Association of Nigeria (STAN) and Mathematics Association of Nigeria (MAN) through online training, seminars, workshop and conferences to enhance effective teaching of Mathematics in schools to achieve high performance by the students. The subject is still a cause of concern to Mathematics teachers/lecturers, stakeholders, parents and students in particular.

Recommendations

Teacher education has been considered very relevant for Nigeria's societal development in this paper because it serves as the foundation for quality and relevant education at all levels of the system. Also STM have been identified as the bedrock or foundation of wealth and consequently an imperative for national development. It has also been argued that in this era of globalization only persons with appreciable knowledge, skills and abilities in STM are required in the job market. Any country that has not embraced or made significant efforts to advance STM education is said to be on the wrong or negative side of the international digital divide.

Base on the submission above, the following recommendation were made:

1) The basic qualifications of candidates for training as teachers should be re- examined. The maintenance of standards and ensuring professionalism in Teacher Education can hardly succeed as long as there is an unending proliferation of Teacher Education institutions.
2) Teacher Education curricula in the proposed Universities of Teacher Education should be restructured and integrate STEM and ICT in order to equip the products to teach effectively either at the Primary, Secondary or Tertiary level. It is only when we are well equipped in computer that we can imbibe the new technologies and methodologies of the 21st century.
3) STEM curriculum should be slightly adjusted to accommodate ethics and ethical principles for global relevance and competitiveness. Also STEM practitioners should be given adequate motivation and encouragement to inculcate ethical principles to upcoming professionals.
4) There is also the need for training our future teachers on entrepreneurial skills development. It is only when teachers are well equipped with such skills that they can transfer them to students. Also relate their lesson to real life situation in order to reduce abstract nature of the subject.
5) Finally, the task of improving teachers' welfare must be addressed by our governments in Nigeria. The working environment must be well equipped to retain qualified and experienced teachers in our classrooms. Teachers' salaries should be paid regularly while other social benefits should be provided to motivate and retain teachers.

Educational and Ethical Implications

The following Educational and Ethical Implications are put forward for improvement:

1. Bridging the gaps in Mathematics teacher education activities would help to develop right interests, attitude and values in teachers by relating Mathematics teaching and learning to real life situations and serve as enrichment content in Mathematics teachers' education.

2. Mathematics teachers will required not only finding a solution but also interpreting that solution in the context of the problem and learn to use Mathematics language and follow its rules with great precision
3. Bridging the gaps in Mathematics teacher education in Nigeria, can have an effect on teachers' moral and ethical behaviour within and outside classroom by cultivating in their personal honour, virtue and character in Mathematics teaching and its applications to real life situations.
4. Frequent assessment and teaching meta-cognitive skills can significantly raise outcomes.

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