Improving Science, Technology, Engineering and Mathematics (STEM) Programs in Secondary Schools in Benue State Nigeria: Challenges and Prospects

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Abstract - *Benue State in Nigeria is a state that is well populated with brilliant youths of school age. The available Universities and other tertiary schools in the state yearly record huge applications from them seeking admission to study predominantly courses unrelated to; Science, Technology, Engineering and Mathematics (STEM). This paper investigates the challenges of improving STEM education at secondary school level as against prospects. This paper is motivated by the research question: what is the reason(s) responsible for lack of interest in STEM related subjects? The study employed a survey methodology. A sample of 300 including students and teachers was randomly drawn from 150 secondary schools to secure data for this study. The result shows that mindset rather than skills is the major impediment on the side of students and teachers in improving the study of STEM related subjects. The main conclusion is that, improving STEM education in Benue State is a multi-faceted and complex issue. To this end the need to embrace a range of new innovative teaching approaches is paramount. The major recommendation is that relevant stakeholders ie teachers, students and parents should be consciously encouraged to partner and combine informative and persuasive forces to tackle the challenges of STEM education such as facilities, interest, teaching methods via new innovations for the benefit of the state and Nigeria as a whole in enhancing economic development.*

Keywords: *Economic development, Mindset, Secondary education, STEM*

INTRODUCTION

The role of science and technology in national development cannot be exaggerated. Any nation which fails to adequately consider Science, Technology, Engineering and Mathematics (STEM) education has planned to be left behind in all spheres of development. Speedy and viable growth of a country can only be attained through scientific research, coherent application of STEM knowledge and skills[1]. STEM is a tool for economic, social, and political development of a nation. The contribution of STEM to social, industrial and economic life of the world in general and Nigeria in particular have been felt on all phases of human life [2]. The knowledge of STEM has enabled the provision of good water, food, and healthcare delivery, various materials for construction in industries, roads, automobiles, and houses. STEM related subjects are used in solving problems resulting from human interaction with the environment like water and pollution.

Despite the relevance of knowledge of STEM related subjects to the society, achievements of students in science subjects as measured by their scores in senior secondary school certificate examinations have been very poor. Presently, countries in the world are categorized as: developed, developing, and less/under developed. The difference between the developed, developing, and underdeveloped countries however rests on the ability of the developed countries to convert scientific ideas to usable technology while the developing and underdeveloped countries are yet to do so effectively [3]. Presently, Nigeria remains a developing country with low economic, social, political, cultural, and technological indicators[4]. In recognition of the impact of STEM development to the overall national development, Federal Government of Nigeria has been supporting it through policies, actions, and programmes. Specifically, science and technology is

inculcated in National Policy on Education [5] while there is National Policy on Science and Technology [6] which is prepared for a 25-year time and whose philosophy emphasizes Nigeria's commitment to the creation of independent, integrated, and self-sustaining economy with the Policy itself serving as the framework for effort towards the fulfilment of the commitment. Presently, Nigeria can also boast of educational institutions such as technical colleges, colleges of science and technology, polytechnics, monotechnics, research institutes, as well as specialized universities of science and technology, for provision of science and technology education for the citizens.

Science is concerned with search for and understanding of knowledge about nature while Technology is concerned with the application of knowledge (science) in solving practical problems of everyday living. Science and Technology education by implication deals with inculcation in the citizenry, skills of searching for, and understanding nature. The level of success of a nation to exploit the potentials of its environment depends on the quality of Science and Technology education provided to the citizenry, and how well the citizenry have imbibed the culture of science and technology.

An examination of the activities of the United Nations Development Programme (UNDP) reveals that substantial investment in science and technology education stimulates growth, and empowers the citizenry to achieve victory over ignorance, poverty, unemployment, and other indices of under development. For any nation to achieve substantial success in exploiting the potentials of its citizens to facilitate development, and on a sustainable basis, it must equip them with skills to dominate and maneuver the resources for better living.

In Nigeria, and indeed many other developing countries, the effort towards technological development has been more on transferred, borrowed, bought, or even stolen technology. Neither of these will lead a nation to attain an appreciable technological height. Technology is a culture that has to be developed from within. Development is an expression of change and growth. That there is development presupposes that change and growth have occurred. In view of the dynamic nature of societies, development should be an on-going process.

It is worrisome to note that STEM has not been embraced as expected. Sustainable development suffers where such is experienced. It is a thing to worry about if a nation is lagging behind in this area as it concerns teaching and learning of these subjects.

The enviable position which science education system of most countries of the world occupies, including Nigeria is perhaps justifiable. The reason is that science can exert a dominant, if not decisive influence on the life of individual as well as on the developmental effort of a nation [7]. The universal recognition of the above submission is responsible for the prime position that has been accorded science and in particular, biology, chemistry, physics, mathematics and perhaps ICT worldwide. Within the context of science education, biology, chemistry, physics and mathematics has been identified as a very important school subjects and its importance in scientific and technological development of any nation has been widely reported. It was as a result of the recognition given these subjects in the development of the individual and the nation that they are made core - subjects among the natural sciences and other science-related courses in the Nigerian education system. The inclusion of these core subjects in science in the secondary school calls for effective teaching. This is because effective teaching can lead to the attainment of scientific and technological greatness.

In Benue State, they have been a low enrolment, achievement and interest in STEM subjects at the WASCCE/NECOSSCE as indicated in Table 6. The issue of the increase of academic failure among the secondary school science students is a menace that has stirred both the government and education stakeholders in the face [8]. This is due to the fact that science education is the foundation of scientific and technological breakthrough of any nation [9]. The research question is: what is the reason(s) responsible for lack of interest in STEM related subjects.

This paper wish to emphasize the impediments to the study of STEM and also look at the way forward inform of prospects.

BACKGROUND TO STEM EDUCATION IN NIGERIA

It is generally agreed that formal education into Nigeria by the Christian missions at about 1842[2]. However, Science was first taught in Nigeria in 1859 in CMS Grammar School, Lagos. Science was taught inform of arithmetic, algebra, geometry and physiology. Between 1859 and 1929, teacher training institutions were established to cater for the training of teachers in other science subjects such as astronomy, chemistry, geology and botany. However, science

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teaching and learning had series of challenges that led to poor achievement at end of school programme [10].

During the 1920's, the Phelps-Stokes Education Commission visited West Africa and noted that the learning/teaching of science education was backward. The commission recommended and ensured that science subjects were included in the secondary school curriculum in Nigeria. Teaching of science was difficult due to lack of teachers; very few qualified science teachers were available in few schools. Besides that, unsatisfactory teaching methods affected the teaching of science in Nigeria [11].

Before 1960, most secondary schools in Nigeria emphasized classics and art subjects with little emphasis on sciences. There was a remarkable improvement in the teaching and learning of science when Nigeria got her political independence in 1960. Before independence in 1960, science at the secondary school level was predominantly General Science since majority of the schools did not have academically qualified science teachers or even skilled personnel [2].

In 1963, the first organized curriculum development effort took place at the Comprehensive High School, Ayetoro. The formation of Science Curriculum Development Committees in 1968 under a cooperative agreement between the Comparative Education Study and Adaptation Centre (CESAC) and the Science Teachers Association of Nigeria (STAN) contributed greatly to the development of science. The membership of these committees was drawn from both bodies, the Universities and Ministries of Education.

The Committees produced the first set of indigenous curriculums in Integrated Science, Biology, Chemistry and Physics. Following the production of these curriculums, both CESAC and STAN developed science projects which proposed radical changes in content, context and sequence of teaching science in secondary schools. These included STAN Nigeria Integrated Science Project (NISP), CESAC Basic Science for Nigeria Secondary Schools (BSNSS) and CESAC Nigeria Secondary Schools Science Project (NSSSP) for Biology, Chemistry and Physics. In September 1969, there was a National Curriculum Conference in Lagos which drew a lot of participants from diverse backgrounds who were eager to see Nigeria chart a new course in its educational system.

At the primary school level, there were two pioneering projects developed between 1970 and 1977 by the Bendel State Ministry of Education and the Institute of Education, Ahmadu Bello University, Zaria. The projects had the support of UNESCO/UNICEF [2, 10]. The apparent success of these projects led to the production of a number of primary school courses by the State Ministries of Education, the Nigeria Educational Research and Development Council (NERDC) and individuals. A national curriculum in primary science was also developed with clearly stated objectives and activities [5].

The first major attempt at curriculum development in Africa which Nigeria participated was conceived in 1960 was the African Primary Science Programme (APSP). The programme which brought together educators and scientists from eleven English speaking African countries was the first of its kind. The APSP later metamorphosed into Science Education Programme for Africa (SEPA). The programme which was a research and development project was sponsored by the Educational Services Incorporated (ESI), which later became Education Development Centre (EDC), in Massachusetts, U.S.A in the 1960's [2]

The broad goal of the APSP with respect to the African child was to ensure the development of first hand familiarity with a variety of biological, physical and man-made phenomena in the world around them; interest in further exploration of the world around them on their own initiative and; ability to find out for themselves, i.e. to see problems and be involved in problem solving.

The program initially embarked on the production of science teaching materials which were mainly teachers' guide and to a lesser extent, pupil's books and a science library series for background reading. At a later stage, the program embarked on formative evaluation of science teaching activities to ensure functional teaching of science at the primary school level [2, 22].

The National Curriculum Conference of 1969 led to the formulation of the National Policy on Education. Curricula for primary and secondary science were designed by Nigerian educators from the conception that a curriculum be capable of anticipating future individual and societal needs and aspirations. Each of the science curriculum is a product of a multi-agency approach to curriculum development, the agencies that participated are: federal and State Ministries of education, science educators in Universities, Colleges of Education,

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Nigerian Educational Research and Development Council, National Teachers' Institute, West African examinations council and Science Teachers' Association of Nigeria[2].

ISSUES AND CHALLENGES FOR TEACHING AND LEARNING STEM

Factors that influence the teaching and learning at the secondary school are teacher or student related [12]. Let us outline those factors and discuss them with the understanding that the same apply for teaching and learning generally.

Teaching method as a factor: Student achievement in learning tasks is, to an extent, influenced by the method adopted by the teacher. Researchers [8, 13] observed that teachers' inability to use necessary techniques in teaching science subjects is a contributing factor to students' poor performance in school subjects. The studies observed that the teaching and learning of science is too teacher-centred and the teacher dominates in explanation of concepts, thereby making students passive. The studies also observed that the teachers mainly give directions or topics on the chalkboard for the students to copy. They also observed that the teachers rarely use innovative teaching strategies nor students' ideas in planning their choice of experiments and students rarely perform experiments on their own, nor do they use the library or other sources other than the textbooks. Therefore, the teaching and learning of science is mainly through the traditional approach rather than the science process skill approach.

Resource Utilization: Resources utilization is another factor that affects students' performance in STEM subjects. Resources are regarded as those facilities or materials that are used for the purpose of enhancing effective teaching and learning of STEM. Resources are the sum total of everything used directly or indirectly for the purpose of educational training to support facilities or encourage the acquisition of knowledge, competence, skill and know-how[14].

However, most science teachers teach their subjects without teaching aids. Most secondary schools lack basic laboratory apparatus, such as magnetic boards, resonance kits, iron filling, bar magnetic, projectors and accumulators. The science laboratories across the country are inadequately furnished, where they exist [14]. Also there are no dark rooms where experiments on optics can be successfully carried out. What it then means is that experiments in this area will be skipped and students will graduate from this level without sound background in optics.

Some experiments in science require electricity. Generally, power supply from the national grid is epileptic. Unfortunately, most secondary schools are in the rural areas and have no stand-by generators. Hence, electricity as a topic may not be adequately covered so external examination questions set in this area and other related areas might be difficult for the students to answer.

Most secondary schools in Nigeria have no laboratory personnel to assist in the process of teaching and learning of science. Where they are not available the work of the science teacher is doubled and highly demanding so the teaching and learning of any science subject may be hindered[15].

Class Size Factors:The population Nigeria has grown to about 140 million. The growth of Nigerian population has influenced student population and class size. Most secondary schools within Abuja Federal Capital Territory (FCT) and Zaria metropolis in Kaduna state have a teacher-student ratio between 1:100 and 1:130 per class against a teacher-student ratio of 1:35 as recommended by UNESCO [4].

Large class size does not allow free movement in the classroom resulting in ineffective classroom management and control. Also individual students are denied close classroom interaction and prompt attention from the teacher. Where students cannot get the attention they require for effective learning, they get frustrated and discouraged. All these contribute to low performance in Science, Technology, Engineering and Mathematics subjects. In addition, when there are large class sizes the weak students tend to hide under the cover of the brilliant ones.

Language factor: Language is communication, verbal and nonverbal. For effective teaching and learning to take place, there must be proper communication between the teacher and the students. STEM subjects are taught and learnt in the English language in Nigerian schools. Both the teacher and the students must be able to express themselves in the language of sciences for better understanding and effective performance. Mathematics is another language of physics and chemistry which is expressed in symbols and equations. Therefore those who are poor in mathematics may not be able to handle calculations in physics and chemistry which are mathematical in nature.

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Researchers observed that the problems of language in science subjects run across all levels of education [16]. It is no longer surprising to find students even at tertiary level who are unable to express themselves in the English language.

Work Load Factor: The number of qualified STEM teachers at all levels of education in Nigeria is inadequate [16]. As observed earlier the ratio of STEM teachers to students across the country is an average of 1:130. This is too large for effective teaching and learning to take place. Most teachers have between 12 to 15 teaching hours per week. Where the teachers have to run at least one practical class per week, this will be too much to handle, especially since they have to also mark the students' practical notes.

THE CONCEPT OF EDUCATIONAL PLANNING

Generally, educational planning may be seen as the process of deciding in advance, what needs to be done, towards achieving a pre-determined goal, how it should be done, when it should be done, who is to do it, what resources will be required to do it, and indeed establishing standards of performance. Planning is necessitated by the desire for change. Researchers identified a number of situations that create the need for change to warrant planning [17]. They include: major breakthrough in the economy or social life of the people; significant devastation of the economy or society which creates the need to explore effective and efficient ways of coping with the situation, and emerging crisis within the education system leading to re-definition of the goals of education.

For whichever reason, planning is a process intended to effect change. In Nigeria, the challenges posed by vision 20-20-20; global competitiveness; and the scourge of HIV/AIDS, poverty, illiteracy, unemployment, global warming, examination malpractice, declining schooling effectiveness, e.t.c are situations requiring re-positioning the educational system to cope with the enormous challenges.

The first step towards planning is identifying the problem; it also involves specifying the problem. It requires that the two-extreme poles of the problem be identified and defined. The purpose is to establish the gap between the prevalent unfulfilling practice(s), and the desired fulfilling situation [18]. Another stage involves identifying and defining precisely the standard of achievement that will most effectively and efficiently affect the desired change providing basis for evaluation and revision.

Planning also requires the identification of the resources requirement for the intervention. It involves taking inventory of available resources, and of those required. The difference in the two inventories represents the resources required for the intervention, to be sourced for [18].

Also there is always the need to develop alternative solutions. At this stage a critical analysis of the numerous resources identified as required for the intervention is done. The purpose is to develop as many intervention alternatives as possible from the resources available. The procedures require professional and skilful treatment or consultation.

A critical analysis of the strengths and weaknesses of each alternative intervention strategy is made so as to establish viability of each. At this stage, the alternative solutions are rank ordered on the basis of effectiveness and efficiency in intervention. The determination of the cost implication of each of the alternative strategies is important and necessary.

Another stage is the determination implementation strategy. During this stage, preparation for introducing the intervention is nearly completion. The selected intervention solution is pilot tested to ensure that the desired objectives are achieved. If need be, it is reviewed. Thereafter, the commencement date for introducing the intervention can be named. After which the solution is implemented. It is at this stage of the planning that the intervention is introduced into the system. The task of intervention is accomplished. Prominent in the intervention stage is the provision of the wherewithal required to cope with the problem of logistics of implementation.

The next stage is to determine performance effectiveness. The functioning of the implemented intervention is examined in terms of process and product, against the performance criteria.

Lastly, the programme is revised as required. Revision in this phase of the planning is established on the basis that we cannot predict the future with complete certainty. It implies that even the 'Best' plans require revision after some time. The discrepancies between the functioning and predicted levels of performance further provide basis for revision or re-designing the programme. This very important feature of planning, establishes relevance of the system in meeting the changing needs of the society [18].

In order that education remains relevant in facilitating sustainable national development, it must

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submit to the planning rigors outlined and discussed above. This is so because the circumstance of the society, and of the education system, are constantly changing, and increasing in complexity.

EMPIRICAL EVIDENCE OF SCIENCE ACHIEVEMENT IN SECONDARY SCHOOLS IN BENUE STATE

Despite the importance of science subjects, the achievements of students in the subjects have been very poor. Low achievement of students in STEM subjects has continued to be a major cause of concern to all, particularly science teachers and other stakeholders [19]. The minimum entry requirement into Nigerian tertiary institutions is that candidates wishing to study science courses must possess credit passes in ordinary level science subjects, which include Biology, Chemistry, Physics and Mathematics. In Benue State, indices from examinations organised by WAEC and NECO showed both low enrolment and poor achievement in chemistry. Chemistry results of the May/June West African Senior School Certificate Examination (WASSCE) and June/July National Examinations Council Senior School Certificate Examination (NECO/SSCE) for Benue State from 2009 to 2013 reveals a low percentage pass at credit level (See Table 6).

The WASSCE and NECO/SSCE over these periods indicate low achievement in STEM subjects which implies that either the teachers are not teaching the subject properly or the students do not understand the subjects. It is pertinent to know that underachievement in sciences is the reason why there is greater number of student seeking admission in non-science courses. As emphasized above, planning calls for an estimation of what result that should be expected followed with requisite steps in addressing problems envisaged that has been impediments to achieving the desired results.

Another important variable in learning which is considered is interest of the learner. Interest is a subjective feeling of concentration or persisting tendency to pay attention and enjoy some activity or content [20]. Children's interest needs to be stimulated in order to learn, even though they are physically and intellectually capable of learning. Once stimulated, they continue to learn as long as the teacher is capable of sustaining their interest in the subject matter [20].

Benue State is a state in a developing economy that desire change in the right direction towards development. STEM study is a principal change agent in the 21st century; it is therefore an issue of concern which must be addressed in order to improve learning and performance.

RESEARCH QUESTIONS

What is the awareness of students to take to STEM subjects?

What challenges do STEM teachers face in applying innovative teaching strategies?

How often do regulatory agencies supervise teaching of STEM subjects?

Does the workload affect teaching of STEM subjects?

METHODOLOGY

The study employed survey design. The population of the survey study includes all STEM teachers and students. A sample of 300 STEM teachers and 300 science students were randomly drawn from 150 (50 schools each from the three educational zones) Secondary Schools in Benue State to secure data for this study. A structured questionnaire was used to collect data for the study. The instrument was validated by two experts. The questionnaire was divided into 4 sections. Section one which has three questions sought for personal data of the respondents such as qualifications, years of experience and subject taught. Section two which has six questions sought information from the respondents on whether awareness/ignorance was affecting the teaching of STEM subjects. Section three sought to know from teachers on their awareness of innovative teaching strategies. Section four is about science teachers' knowledge of ICT skills. Emphasis was on secondary schools because it is the most important stage of career development of a child. All the questionnaires were returned and well completed. Simple percentages were adopted to analyze the data collected.

RESULTS AND DISCUSSION OF FINDINGS ON THE BENUE EXPERIENCE

Challenges:

Table 1 showed out that students are Ignorant of the relevance of STEM subjects, hence lack the desired exposure. Data in table 1 showed that students had poor interest/enrolment in STEM subjects. The high mean score of 3.67 confirms lack of interest in STEM subjects amongst secondary school students.

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Lack of interest leads to poor attendance (mean score of 3.08)to lessons as shown in table 1.

RQ1: What is the awareness of students to take to STEM subjects?

Table 1. Problems associated with students

	Assessment Techniques	Means	S.D	Remarks
1.	Poor enrolment/interest in STEM subjects.	3.67	1.39	Poor
2.	Poor attendance to STEM lessons.	3.08	1.32	Poor
3.	Lack of counseling services rendered before choosing subjects at SS1	3.92	1.25	Poor
4.	Lack of text books and other relevant learning materials.	3.96	1.43	Poor

Table 1 also revealed that most schools lacked counsellors (mean score of 3.92). If properly counselled, students will take to science. One wonders how students placement done in SS1. This confirms the saying that, 'you cannot stretch if nothing is in view'. Most of the students including the parents were exposed only a few individuals working in administrative offices like local government which tend to narrow their minds.

Poverty: Most of the students come from poor backgrounds such that leaving the village to study in good science schools will deny the parents having them work on their farms not to talk of the inability of paying such fees and buying or relevant textbooks. Table 1 also revealed a mean score of 3.96 implying that because of poverty, their parents could not afford textbooks and scientific calculators.

RQ2: What challenges do STEM teachers face in applying innovative teaching strategies?

Data in tables 2 and 3 showed teachers' poor qualification, lack of basic laboratory infrastructure, lack of instructional materials, lack of cooperation from school management, inability of teachers to improvise materials and inability to use innovative teaching strategies to teach difficult concepts in STEM subjects could be responsible for the underachievement in STEM subjects amongst secondary school students in Benue State.

The findings show that some students would have gone for science subjects because they are exposed to the benefits and the parents are capable to sponsor them but the manner in which these subjects are impacted does not encourage the students. There are insufficient laboratories even in the town to help students practice and understand what they are being thought. Studies [8,13] have advocated for student centred lessons so as to encourage active participation of students.

Table 2: Problems associated with STEM teachers

	Assessment Techniques	Means	S.D	Remarks
1.	Poor qualification of teachers to teach STEM subjects.	3.89	1.66	Poor
2.	Lack of basic laboratory reagents /instructional materials	3.92	1.54	Poor
3.	Lack of cooperation from the school management.	2.86	1.72	Poor
4.	Lack of allowances and incentives.	2.26	1.21	Satisfactory
5.	Lack of improvisation.	3.77	1.83	Poor
6.	Lack of innovative strategies to teach difficult concepts.	3.95	1.86	Poor

Table 3: qualifications of STEM teachers

Qualifications	Percentage
SSCE	12
NCE	47
OND	9
B.Sc (Ed)	23
M.Sc (Ed)	8
Ph.DSc or Sc Education	1

RQ3: How often do supervisory agencies supervise teaching of STEM subjects?

Data in table 4 showed that they is lack of proper supervision by relevant bodies as indicated in items 2,3,4,and 5 with mean scores of 3.68, 3.89, 3.92 and 3.90 respectively. This implies that the teaching and learning of STEM and other subjects are left at mercy of the teachers and the schools' managements.

Lack of effective supervision hinders the achievement of educational goals and attainment of standards and suggests that, to achieve success and efficiency in any educational system, the role of supervision becomes indispensable because supervisors are better placed to see and feel the result of instruction through supervision [21]. These therefore function as agents of quality control.

When teachers don't understand the curriculum well enough to respond effectively to it,

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implementation becomes very difficult. Things keep changing in STEM and for effective teaching, curriculum development and readjustment are paramount. A teacher is duty bound to be abreast with the demands of current curriculum. Supervision is therefore the only tool to see that teachers are giving what they need to give out to students. Regrettably the results show low rate of supervision.

Table 4: Problems associated with supervision

	Assessment Techniques	Mean	SD	Remarks
1.	Lack of supervision by superiors within the school	2.16	1.34	Satisfactory
2.	Supervision by Teaching Service Board	3.68	1.72	Poor
3.	Supervision by Ministry of Education	3.89	1.67	Poor
4.	Supervision by Education Resource Centre	3.92	1.85	Poor
5.	Supervision by Examinations Board	3.90	1.81	Poor

RQ4: Does the workload affect teaching of STEM subjects?

Table 5: Students to Teacher ratio in a STEM class

No of students in the STEM class excluding mathematics	Percentage (%)
≤40	100
≥ 41	Nil

The data in table 5 revealed that 100% of the teachers responded their STEM population per class is below ≤ 40 indicating that the teacher to student's ratio of 1:40 is appropriate. This also implies that mathematics teachers would have a higher teacher to student ratio which is not appropriate.

For effective learning, the student-teacher ratio must not be compromised. This will improve student-teacher relationship which is key to academic excellence. This population also overstretches the available infrastructure thereby frustrating better learning conditions.

Prospects

Capacity: the Benue child has the capacity to excel in STEM. It now becomes easy to take advantage of this and build on it to improve the study of STEM in the state.

Parental guide: most parents are more knowledgeable now and are better positioned to guide and support their children in choice of career. This should be seen as a significant feet in improving study of STEM.

Holistic approach: Secondary education is actually a career development stage but all need to start from the primary school. Foundation is very important to any meaningful endeavour. In Benue state, the result shows that more attention needs to be given to students in order to encourage them take to science.

CONCLUSION AND RECOMMENDATION

The result shows that mind-set/interest rather than skills is the major impediment on the side of students and teachers in improving the study of STEM related subjects. Student, Teacher and the Government related problems have been identified.

Improving STEM education in Benue State is a multi-faceted and complex issue. To this end the need to embrace a range of new approaches to teaching highly recommended. The relevant stakeholders such as teachers, students and parents should be consciously encouraged to partner and combine informative and persuasive force to tackle the challenges of STEM education such as facilities, interest and teaching methods.

The supervisory agencies such as Ministry of Education, Science and Technology, Teaching Service Board, State Universal Basic education Board, Education Resource Centre, etc should as a matter of urgency be proactive in supervision.

Science Teachers should learn to improvise teaching materials in situations where the authorities fail provide.

Regular training in form of workshops and seminars should be organized for Science Teachers should so that they can meet up with new challenges. Funds should be made available to sponsor teachers to local and international conferences. These would help them to rub minds together with counterparts in other parts of the world.

Science educational facilities (science and computer laboratories, workshops and libraries etc) should be upgraded to modern standards while teaching facilities should be adequately provided.

Limitation of the Study

The research could not involve all the science teachers because of time and funds. It is suggested that all STEM teachers in Benue State be involved in further research.

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Table 6: WASSC Results of Students in STEM Subjects in Public Schools in Benue State from 2009 to 2013

Year	Subject	Number Sat	No. With Credit Pass	% with Credit pass	No. With Ordinary Pass	% with Ordinary Pass	No. Failed	% Failed
2009	Math	18872	8612	45.6	7369	39.2	2864	15.2
	Chemistry	4257	1867	43.9	1555	36.5	835	19.6
	Physics	3934	2070	52.6	1145	29.1	719	18.3
	Biology	18080	5963	33.0	6956	38.5	5161	28.5
2010	Math	17799	7829	44.0	7497	42.1	2473	13.9
	Chemistry	3813	2441	64.0	1364	35.8	8	0.2
	Physics	3637	2004	55.1	1688	46.4	5	0.1
	Biology	14882	9151	61.5	5650	38.0	81	0.5
2011	Math	19765	8911	45.1	8711	44.1	2143	10.8
	Chemistry	4900	2507	51.2	1733	35.4	660	13.5
	Physics	4662	2785	59.7	1383	29.7	494	10.6
	Biology	18018	6960	38.6	7383	41.0	3675	20.4
2012	Math	21285	10532	49.5	8526	40.1	2227	10.5
	Chemistry	5268	2203	41.8	2261	42.9	804	15.3
	Physics	5223	3583	68.6	1360	26.0	280	5.4
	Biology	19537	8293	42.4	7293	37.3	3951	20.2
2013	Math	22278	11216	50.3	8835	39.7	2227	10.0
	Chemistry	5389	2379	44.1	2206	40.9	804	14.9
	Physics	5396	3676	68.1	1440	26.7	280	5.2
	Biology	19527	8247	42.2	7329	37.5	3951	20.2

Source: Benue State Ministry of Education, 2014.

NECO Results of Students in STEM Subjects in Public Schools in Benue State from 2009 to 2013

Year	Subject	Number Sat	No. With Credit Pass	% with Credit pass	No. With Ordinary Pass	% with Ordinary Pass	No. Failed	% Failed
2009	Maths	1260	3183	25.3	7923	63.1	1454	11.6
	Chemistry	2588	1133	43.8	1066	41.2	389	15.0
	Physics	2753	1116	40.5	1180	42.9	457	16.6
	Biology	1221	7088	58.5	3389	28.0	1644	13.6
2010	Maths	17518	4331	24.7	11209	64.0	1978	11.3
	Chemistry	4040	1790	44.3	1789	44.3	461	11.4
	Physics	4104	1708	41.6	1964	47.9	432	10.5
	Biology	17450	9686	55.5	5516	31.6	2248	12.9
2011	Maths	15793	5200	32.9	9780	61.9	813	5.1
	Chemistry	3966	1384	34.9	2422	61.1	160	4.0
	Physics	3909	1231	31.5	2557	65.4	121	3.1
	Biology	15580	6315	40.5	8635	55.4	630	4.0
2012	Maths	15728	8321	52.9	6646	42.3	761	4.8
	Chemistry	4009	2152	53.7	1755	43.8	102	2.5
	Physics	3943	2122	53.8	1723	43.7	98	2.5
	Biology	15430	8777	56.9	5766	37.4	887	5.7
2013	Maths	16565	9168	55.3	6636	40.1	761	4.6
	Chemistry	4518	2281	50.5	2135	47.3	102	2.3
	Physics	3709	1819	49.0	1792	48.3	98	2.6
	Biology	16242	9334	57.5	6021	37.1	887	5.5

Source: Benue State Ministry of Education, 2014.

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