

Love Learning And Create Change In Science And Technology Through Effective Mathematics Education At The Upper Basic Education Level In Benue State, Nigeria.

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Abstract

It is obvious that change is the only permanent thing. This change however, require a pragmatic education to remain; and for this education to become pragmatic requires a change of attitude by learners from negative to positive especially at this era of science and technology. Science and technology is properly driven with sound mathematics. Implication of this is that adequate mathematics education is required at the foundational level of education. This paper therefore considered how improving learners' love (attitude) for learning mathematics could create change in science and technology if mathematics education is properly positioned at the upper basic education level in Nigeria. This is because the Nigeria nation intends to be one of the twelfth economically viable nations in the world by the year 2020. It is therefore, targeted at empowering both students and teachers at this level of education, for the purpose of actualizing this very import vision of the nation. The study was carried out in Benue State, Nigeria and covered all the upper basic education level students and their mathematics teachers. Simple survey design was adopted, while instrument of study was a questionnaire called upper basic education mathematics questionnaire (UBEMQ) with 40 items. Results collate was analysed using descriptive statistics of mean and standard deviation. It was found among other things, that learners' strong love for mathematics is a primary catalyst for actualizing the nations desire for scientific and technological development which is a basic ingredient for the nation's vision 20:2020. Recommendations such as improving the capacity of mathematics teachers should be encouraged as well as ensuring that mathematics teachers use instructional materials in their mathematics classroom among others. Adequate conclusion was made.

Keywords: Love learning, Create change, Science and Technology, Mathematics education, Upper basic education level

1.Introduction

Attaining the vision laid out in principles and standards will not be easy, but the task is critically important. There arise the need of providing our students with the best of mathematics education possible, one that enables them to fulfill personal ambition and career goals in an ever changing world. The principles must establish a foundation for school mathematics programmes by considering the broad issues of equity, curriculum, teaching, learning, assessment and technology. Bearing these principles in mind, the standard for school mathematics should describe an ambitions and comprehensive set of goals for mathematics instruction that will enhance students' learning and attitude. More importantly, the mathematics instruction should make them to have right attitude for problems, not only very simple problems which can be solved with the skills of the primary school, but more complicated problems of science and technology. United Nations Educational Scientific and Cultural Organization (2012) posit that mathematical literacy for all young people is not only the goal, but also the fundamental priority objective of mathematics taught during basic education. Every one recognizes for example, that mathematics is omnipresent in todays world-notably in the technological terms all round us and in exchange and communication process. The import of mathematics is indisputable. According to Yara(2009), the contributions that mathematical knowledge and skills have made to economic, industrial and technological growth of modern world are quiet obvious to almost everyone. Unlike science, mathematics must be taught to all pupils from the beginning of compulsory education. Mathematics education is not necessarily provided in a satisfactory manner, but it is accessible to all pupils enrolled in school (UNESCO, 2012). One important implication of this position is that mathematics instruction that is built on a student's life experience provides two mathematics learning environments- within- the- school and outside – the – school mathematics. Within – the – school mathematics aimed at preparing learners' mathematical content knowledge that will enable them succeed in public mathematics examinations. While outside – the – school mathematics position them for the challenges found at the world of work.

This means that students' positive attitude towards Mathematics is very important (Mohamed & Waheed, 2011). The main purpose of this study therefore, is to encourage effective Mathematics education at the Upper Basic Education (UBE) level that will result to students' change of attitude which will in turn result to the creation of change in science and technology. Specifically some research questions were asked. 1. How does effective

mathematics education affect students' love for learning mathematics? 2. What is the attitude of male & female students towards the learning of mathematics at Upper Basic Education level in Benue State, Nigeria? 3. To what extent does mathematics teacher's teaching affect students' love for the learning of mathematics?

2. Theoretical Framework

Realistic Mathematics Education (RME) is the main educational theory behind the development work at the Freudenthal Institution. It is based on the writings of Hans Freudenthal himself. The theory is linked to Freudenthal's notation of curriculum theory, which he claimed not to be a fixed set of theories, but a by-product of the practical enterprise of curriculum development (Van Amerom, 2002). Freudenthal was very focused on usefulness of mathematics in school. Realistic Mathematics Education is rooted in Freudenthal's (1971, 1973) interpretation of mathematics as a human activity. He said that students should be given the opportunity to reinvent mathematics by organizing or mathematizing either real world situations or mathematical relationships and processes that have substance for them. Freudenthal considered mathematizing to be the key process in mathematics education for three reasons. Firstly, mathematizing is a major activity of mathematician. Secondly, mathematizing fosters applicability by familiarizing students with mathematical approach to every day settings. And thirdly, mathematizing relates directly to the idea of reinvention, a process in which students formalize their informal understandings and intuitions. Hence the goal of Mathematics education should be to support students' mathematical learning as a process of guided reinvention. This study derives its fundamental consideration on the basis of RME. This is because basic education students require the type of mathematics education that will be relevant to their day – to – day living. Moreover, the mathematics that will facilitate the actualization of Nigeria attainment of her vision 20:2020 is much desired.

Since attitudes refers to those actions that results from and are influenced by emotion, consequently, the affective domain is thus concerned with students' perceptions of mathematics, their feelings towards solving problems, and their attitudes about school and education in general. Pleasant experience through innovative and clearly understood instructional methods employed by the teacher will surely facilitates positive attitude toward mathematics. Personal development, self-management and ability to focus on important aspect of classroom learning are key areas which instructional delivery pattern could be used to enhance, promote and facilitate mathematics learning. Attitude cannot be easily separated from learning because they are acquired through the process of learning. Learning is a process of acquiring and retaining attitudes, knowledge, understanding, skills and capabilities (Farrant, 1994). Since learners are not born with attitudes but instead they acquire them when they got in contact with the new world thus attitude can be learn and teachers should strive hard to develop the right attitudes in their students through various means especially instruction strategy. If learners are not assisted or encouraged to perceive positively most of the things they learning in mathematics classes, their performance will be affected. It depends entirely on the teacher to help learners develop positive attitude towards the learning of mathematics.

3. Significance of the Study

Mathematics is the most international of all subjects, and mathematical understanding influences decision making in all areas of life – private, social and civil (Anthony & Walshaw, 2009). Mathematics education is a key to increasing the post – school and citizenship of young people. The knowledge of mathematics is an essential tool in the society today. It is a tool that can be used in our daily life to overcome the difficulties faced (Bishop, 1996). Quality mathematics education should enable pupils to form a positive and appropriate image of mathematics. For that to be possible, it must be faithful to mathematics, both in its content and practice. It should enable pupils to understand which needs are met by the mathematics that they are taught and that mathematics forms part of a long history linked to the history of humanity. Quality mathematics education must thus be sustained by a vision of mathematics as a living science, grappling with the real world, open to relations with other disciplines and not confined to scientific disciplines alone.

It has been generally argued that students' attitude towards a subject determines their success in that subject (Akinsola & Olowojaiye, 2008). They therefore, posit that student's constant failure in a school subject and mathematics in particular can make such a student believe that he/she can never do well on the subject thus accepting defeat. The upper basic education level students were therefore, targeted to help them develop a positive attitude towards the learning of mathematics aimed at actualizing the nation's desire in the development of science and technology which will subsequently leap-frog her into achieving the vision 20:2020.

The Universal Basic Education lay strong emphasis on skill training and acquisition for persons who had left school before the completion of their training for various reasons, or individuals who desired to update their knowledge and skills (Iji, 2007), with provisions made to be achieved through out-of-school non-formal

programmes. In pursuance of the ideals of the UBE programmes, there arises a need for adequate focus on primary (foundational) mathematics. Federal Ministry of Education (FME) (2004), categorically made mathematics as one of the core subjects at the primary and junior secondary school levels. The inclusion of permanent numeracy as first among the goals for primary education stresses the need for every child to be mathematically literate. This poses a serious challenge to the primary school level and the UBE in particular. This is because the UBE programmes recognizes disadvantaged groups such as the rural community, the nomads and fishermen, the disabled (physically challenged), the street children (Alamajiris), the boy drop-out and the girl-child.

Statistics have shown that mathematics has a key role to play in job creation, wealth generation, poverty alleviation, economic and finance, management, business and enterprise, information technology, agriculture and natural resources which are the core components of vision 20:2020. The Nigerian government, having discovered the important role of mathematics and science in national development, declared 2012 “National mathematics year”. The Ministry of Education was mandated by the Federal government to demystify mathematics through innovative teaching since it is a key to national transformation. It was therefore, noted that government’s commitment to mathematical sciences will invariably enhance the capacity of citizens to contribute to national development and increase productivity of the GNDP (Uka, Iji and Ekwueme, 2012). Idoko (2012) and Olorokor(2012) opined that the country could not achieve its transformation agenda without mathematics. The prospect of a new beginning for mathematics education rests with the ability of mathematics teachers to provide pedagogy that builds and expands on the thinking and experience of the students. The onus therefore, lies on the mathematics teacher to consider what might be a suitable mathematics education that will prepare students for intellectual fulfillment as well as future citizens. In this regard, it is surely essential to make students aware of the implications of mathematization in their society.

4.Methodology

The research design adopted for this study was a simple survey design (Ndagi, 1984), a type of descriptive research. This was because subjects’ opinions were elicited on the issue under discussion with the use of a questionnaire. The study was carried out in Makurdi Local Government Area of Benue State, Nigeria. Population of the study consisted of all the mathematics teachers in the 245 upper basic education level classes. 54 upper basic education level classes were randomly sampled from the 254 upper basic education level classes. All students at the 9th year level of the sampled classes were used. This was because some of these students may end up their formal education at this level and are likely to face the challenges of the world of works. The instrument of this study was a structured questionnaire of a four-point scale called Upper Basic Education Mathematics Questionnaire (UBEMQ) in the form of Strongly Agree(SA), Agree(AG), Disagree(DA) and Strongly Disagree(DA). It was weighted in the order of 4,3,2,1 respectively for positively worded items and 1,2,3,4 respectively for negatively worded items. The instrument was validated by experts and yielded reliability index of 0.62. The UBEMQ was administered with the help of four research assistants. Subjects of this study were properly guided on how to respond to the instrument. Data collected and collated was analysed using descriptive statistic of mean and standard deviation.

5. Results

Results of this study is presented according to the outcome of data analysed based on respondents responses. This is done in the following order:

Research Question 1

How does effective mathematics education affect students’ love for learning mathematics?

The answer to this research question is presented in table 1.

Table 1: Mean rating and Standard Deviation of how effective Mathematics Education affects Students' Love for learning Mathematics.

S/N	ITEMS	Mean	SD	Rem
1	Good mathematics education helps me to develop interest in learning mathematics .	2.89	0.59	Agree
2	I do not believe that effective mathematics education is needed for proper learning of mathematics.	1.59	0.45	Disag
3	I love solving mathematics problems because of the ways it is taught to us	3.00	0.68	Agree
4	Learning mathematics increases my self-confidence	2.68	0.75	Agree
5	Proper mathematics education will help to develop my good reasoning ability	2.69	0.85	Agree
6	Learning mathematics help me to increase my love for learning a lot of things	3.00	0.68	Agree
7	Proper mathematics education will help in creating changes in science through the learning of mathematics.	2.58	0.96	Agree
8	Good mathematics education will help in creating changes in technological development of the country.	3.10	1.00	Agree
9	Learning mathematics teaches me to be logical in thinking.	3.08	0.77	Agree
10	Adequate mathematics education will help me to prepare my occupational life	2.99	1.10	Agree
11	I love the activities used by my teacher during mathematics lessons.	3.00	0.68	Agree
12	I like the way my mathematics teacher teaches the subject.	3.32	0.42	Agree
13	Other subjects are more important to the development of science and technology than mathematics.	2.05	0.98	Disag
14	I am not interested in the learning of mathematics.	2.25	1.25	Disag
15	I am always afraid when it is time to learn mathematics.	2.32	0.86	Disag
16	The ways use in the teaching of mathematics by the mathematics teacher help my learning of the subject.	3.00	0.48	Agree
17	I hate the methods used by my teacher in mathematics education lessons.	2.56	0.88	Agree
18	I am always very happy when it is time to learn mathematics.	2.56	1.12	Agree
19	Learning mathematics is not important because it is not useful to the society.	1.58	0.78	Disag
20	I do not like to learn mathematics because it is very difficult.	2.36	0.88	Disag
21	I do not find the activities in mathematics classroom to be very encouraging.	2.05	1.15	Disag
22	I feel relaxed when I am learning mathematics.	2.65	0.42	Agree
23	The activities in mathematics education lessons reinforces thinking faculties	2.86	0.99	Agree
24	Even if mathematics as a subject is not enjoyed, it should be taught.	2.97	0.60	Agree
25	I do not care whether my mathematics teacher teaches well or not.	1.13	0.34	Disag
26	To study mathematics at my private time is a waste of time.	2.09	0.88	Disag
27	It is important to be successful in mathematics examinations.	3.45	0.43	Agree
28	I am always very happy any time our mathematics teacher is teaching.	2.98	0.86	Agree
29	My liking of mathematics is because of the way my teacher teaches it.	3.12	0.55	Agree
30	Though my fellow students discourage me from learning mathematics, I will still like the subject because of the methods used by my mathematics teacher in teaching it.	3.22	0.48	Agree

Table 1 show that the mean of subjects' responses on the items of the instrument ranges from 3.22 to 1.13 with items 30 and 25 having the highest and lowest means respectively. On the other hand, their standard deviation ranges from 0.34 to 1.25. For all the positively worded items, their means met the cut-off mean of 2.50 and for negatively worded, they have a corresponding mean in the reverse order. With the majority of the items' standard deviations being quiet low, implied that subjects' opinions on the issue under discussion are very close and acceptable to them.

Research Question 2

What is the attitude of male and female students towards the learning of mathematics at the upper basic education level in Benue State? Answer to this research question is presented in table 2.

Table 2: Mean rating and Standard Deviations of Male and Female Students' Attitude towards the learning of Mathematics at the Upper Basic Education Level in Benue State.

S/N	ITEMS	MALE		FEMALE		Rem
		Mean	SD	Mean	SD	
1	Good mathematics education helps me to develop interest in learning mathematics .	2.61	0.58	2.95	0.78	Agree
2	I do not believe that effective mathematics education is needed for proper learning of mathematics.	2.06	0.76	1.56	0.76	Disag
3	I love solving mathematics problems because of the ways it is taught to us	2.68	0.58	2.76	0.61	Agree
4	Learning mathematics increases my self-confidence	2.56	0.76	2.98	0.55	Agree
5	Proper mathematics education will help to develop my good reasoning ability.	2.68	0.48	2.56	0.95	Agree
6	Learning mathematics help me to increase my love for learning a lot of things.	2.85	0.95	2.98	0.48	Agree
7	Proper mathematics education will help in creating changes in science through the learning of mathematics.	2.86	0.75	3.00	0.65	Agree
8	Good mathematics education will help in creating changes in technological development of the country.	2.68	0.89	2.50	0.98	Agree
9	Learning mathematics teaches me to be logical in thinking.	3.00	0.95	2.95	0.75	Agree
10	Adequate mathematics education will help me to prepare my occupational life.	2.89	0.86	2.95	0.56	Agree
11	I love the activities used by my teacher during mathematics lessons.	2.85	0.68	3.00	0.61	Agree
12	I like the way my mathematics teacher teaches the subject.	3.00	0.34	3.16	0.81	Agree
13	Other subjects are more important to the development of science and technology than mathematics.	2.16	0.18	1.45	1.01	Disag
14	I am not interested in the learning of mathematics.	2.31	0.56	2.11	0.75	Disag
15	I am always afraid when it is time to learn mathematics.	2.38	1.10	2.09	0.63	Disag
16	The ways use in the teaching of mathematics by the mathematics teacher help my learning of the subject.	2.98	0.83	3.13	0.33	Agree
17	I hate the methods used by my teacher in mathematics education lessons.	2.46	0.83	1.23	0.75	Agree
18	I am always very happy when it is time to learn mathematics.	2.60	0.54	2.98	0.66	Agree
19	Learning mathematics is not important because it is not useful to the society.	2.23	0.71	1.18	0.65	Disag
20	I do not like to learn mathematics because it is very difficult.	2.28	0.97	1.89	0.99	Disag
21	I do not find the activities in mathematics classroom to be very encouraging.	2.26	0.89	2.00	0.99	Disag
22	I feel relaxed when I am learning mathematics.	2.75	0.75	2.86	0.34	Agree
23	The activities in mathematics education lessons reinforces my thinking faculties.	2.76	1.00	3.00	0.65	Agree
24	Even if mathematics as a subject is not enjoyed, it should be					

taught.	2.85	0.66	2.95	0.66	Agree
25 I do not care whether my mathematics teacher teaches well or not.	2.08	1.16	2.19	0.61	Disag
26 To study mathematics at my private time is a waste of time.	2.33	0.98	2.09	0.78	Disag
27 It is important to be successful in mathematics examinations.	3.00	0.45	2.89	0.86	Agree
28 I am always very happy any time our mathematics teacher is teaching.	2.86	0.56	2.76	0.56	Agree
29 My liking of mathematics is because of the way my teacher teaches it.	2.72	0.65	2.98	0.46	Agree
30 Though my fellow students discourage me from learning mathematics, I will still like the subject because of the methods used by my mathematics teacher in teaching it.	3.00	0.58	3.44	0.045	Agree

Table 2 indicates that the mean response of the male students on the items of the instrument ranges from 3.00 to 2.06 with items 9,12,27 and 30 having the highest means while item 2 has the lowest mean. Their associated standard deviations range from 0.34 to 1.16. For the female students, their mean response range from 3.44 to 1.18 with items 30 and 19 having the highest and lowest mean respectively. Their corresponding standard deviations range from 0.33 to 1.01. The various means as observed from both male and female students met the cut-off mean mark of 2.50 for positively worded items, while negatively worded items have their means in their reverse order. Equally observed is the low standard deviations of the various items, this implied that majority of the respondents' responses were very close and agreeable to almost all of them.

Research Question 3.

To what extent do mathematics teachers' teachings affect the students' love for the learning of mathematics? The answer this research is presented in table 3.

Table 3: Mean ratings and Standard Deviations of the extent to which mathematics teachers' teachings affect students' love for the learning of mathematics

S/N	Items	Ters' Resp Mean	SD	Studs' Resp Mean	SD	Rem
1	Students are affected in the learning of mathematics if their mathematics teacher is not approachable.	3.16	0.90	3.25	0.59	Agree
2	If a mathematics teacher is harsh to the students, they will hate the subject.	3.30	0.75	3.36	0.58	Agree
3	Mathematics teachers with lukewarm attitude toward students questions affect their mathematics behavior.	3.38	1.10	3.10	1.10	Agree
4	The abusive posture of the mathematics teacher on a student when he/she fails to answer question correctly affect the learning of mathematics by the students.	3.32	0.86	3.00	1.02	Agree
5	If a mathematics teacher is found of not marking students' mathematics assignments, it will affect their learning of mathematics.	3.00	0.93	3.32	0.86	Agree
6	Constant missing of mathematics lessons by the mathematics teacher discourages the students from learning mathematics.	3.00	0.73	3.37	0.79	Agree
7	Unnecessary punishments of students by the mathematics teacher has adverse effect on students' learning of mathematics	3.02	1.01	2.67	1.01	Agree
8	The inability of mathematics teachers to carry the students along affect their learning of mathematics.	3.14	0.93	2.86	1.10	Agree
9	Mathematics teachers' lukewarm attitude in using instructional materials in their teachings, affect students' learning of mathematics.	2.94	1.08	2.99	1.13	Agree
10	Mathematics teachers' failure to recognize the individual differences in the students affect their learning of mathematics	2.87	0.65	3.00	0.93	Agree

Table 3 show that the mean response of the mathematics teachers on the issue at hand range from 3.38 to 2.87 with items 3 and 10 having the highest and lowest mean respectively. Their standard deviations range from 0.65 to 1.10. Also, the mean response of the students on the same items range from 3.37 to 2.67 with items 6 and 7 having the highest and lowest mean response respectively. Their associated standard deviations range from 0.58

to 1.13. Again, just like as stated elsewhere in the study, it could be observed that both mathematics teachers' and students' responses on the items presented were all above the cut-off mean of 2.50. In the same vein, values of standard deviations of the various items are an indication that both the mathematics teachers and their students have almost the same view on the issue under discussion.

6. Summary of Major Findings.

Based on the analyses of data collected and collated for this study, the following major findings have been made.

1. Good mathematics education is the only thing that will help students develop more interest in learning mathematics.
2. Proper mathematics education is a catalyst to creating changes in science and technological development of the country.
3. Proper mathematics education will serve as a basis for preparing the upper basic education level students for their occupational life.
4. Both male and female upper basic education level students have positive posture towards the learning of mathematics. However, the female students appear to have a very high positive attitude.
5. The mathematics teacher, his/her teachings and attitude appear to be very strong variables in the extent to which the students will love the learning of mathematics.

7. Discussion of findings

From the analysis of data presented herein, it has become obvious that good and effective mathematics education is bedrock to students showing their love for learning mathematics. This finding is not far from UNESCO (2012) which stated that the importance of mathematics education is indisputable. The students themselves may have been aware that irrespective of their various career choices, mathematics is required. This could be seen where the students on their part responded overwhelmingly, that being successful in mathematics examinations is very important to them.

Again, the outcome that proper mathematics education will help to create changes in science and technological development of the country is in line with Idoko(2012) and Olokoro(2012) who stated that the country could not achieve its transformation agenda without mathematics. This further buttresses the fact that mathematics has a key role to play in actualizing the vision 20:2020 of the nation. This vision has the following major components: job creation, poverty alleviation, information technology among others.

Furthermore, the finding that proper mathematics education will serve as a basis for preparing the upper basic education level students for their occupational life is quite exciting. This appears to be in agreement with Bishop (1996) who stated that mathematics is a tool that could be used in our daily life to overcome difficulties faced. Anthony and Walshaw(2009) found that mathematical understanding influences decision making in all areas of life-private, social and citizenship of young people. The implication of this finding is that quality mathematics education must be maintained and sustained in Benue State, Nigeria at this level of our educational system.

Also, the finding that the female students appear to have a very high positive attitude towards the learning of mathematics is a good omen for the nation. If this trend is sustained, the nation is expected to have a good number of female mathematicians, scientists and engineers. This will obviously serve as a boost to actualizing the nation's vision 20:2020.

Finally, the finding that the mathematics teacher is a very important key element in helping to develop students' attitude towards the learning of the subject, especially at the upper basic education level is a good revelation. The implication of this is that the mathematics teacher must not be taken for granted. He/she must be holistically taken care of. In agreement with Akinsola and Olowojaiye(2008) and Yara(2009) the revelation that there is equally a strong link between effective instructional practices and students' love for mathematics is perfectly in order. Since the subject of this study were at the level of education that is more or less foundational, their strong love for mathematics was found to be a catalyst to achieving the nation's desire for scientific and technological development.

8. Recommendations

Based on the findings of this study, the following recommendations are made:

1. Realizing the importance of effective mathematics education, the government should make a deliberate policy that will encourage the study of mathematics and mathematics related subjects among the student.
2. The making of mathematics as a core school subject may not be enough, stakeholders must come out clearly with programmes targeted at making it explicitly clear to the learners the indispensability of mathematics especially at this era of information and communication technology.
3. Mathematics teachers must make it a matter of necessity to more often than not embark on the development of their capacities. This they should do whether they are sponsored by the relevant authorities or not.
4. Mathematics teachers should learn to put human face in their mathematics classroom. In line with this, they should therefore, endeavour to utilize instructional materials in their teachings. Where there are not available, efforts should be made to improvise them.

9. Conclusion

To say that mathematics is an important tool in creating changes in science and technological development will be an understatement. This study actually considered the fact that attaining any goal(s) set required a task that must be taken very seriously. It maintained the fact that the Nigeria nation currently desires to become one of the twenty industrially developed nations in the world by the year 2020. This, the study posited could only be achieved by repositioning mathematics education properly at the upper basic education level which may serve as a terminal education for some of the students. The study therefore, looked at the Realistic Mathematics Education theory of Freudenthal to buttress this argument. This is because he considered mathematics as a real human activity.

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