EFFICIENT INTERACTION/RAPPORT BETWEEN STUDENTS AND MATHEMATICS EDUCATORS FOR PROPER POSITIONING OF SCIENCE EDUCATION FOR ECONOMIC AND SOCIAL RECONSTRUCTION

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Abstract

This article examines the uniqueness of Mathematics in the effective and proper learning of the science subjects. It traces the causes of the non-attainment of the objectives of science education .The problem of students' dislike and apathy towards Mathematics is identified as the major obstacle in the way of the non -attainment of the goals of science education for economic and social development. The thrust of the article is on the origin of the apathy and dislike for Mathematics and its implications. Suggestions for a solid foundation of reconstruction of the already battered economic structure are proffered. The recommendation is on the need for an efficient interaction and rapport between Mathematics educators and students.

Introduction

The task of economic and social reconstruction is a topical issue that has been topmost in the mind of every government. The issue of reconstruction is an indication of the fact that the battered state of the economy has been identified. No one can embark on any meaningful form of reconstruction until the damage point has been known. In his broadcast to the nation on the 43rd birthday of the nation, Obasanjo (2003), states that "the desolate and dilapidated structures of the nation's economy needs nothing but a reconstruction and rehabilitation." That is, the government has identified the desolate and dilapidated structures, as the damage point of the economy.

According to him, the socio-economic reform program has programme.

(1) The people first (2) anti- corruption (3) Agriculture (4) Industries.

In other words the four points above are the causes of the damage to the nation's economic structure. Putting the people first more than anything else, points to the fact that the individual reformation is far more important. The question is, through what means can the individual be reformed? In his summary of the 1969 National Curriculum Conference titled, "A Philosophy for Nigerian Education," Aghenta J.A (1987), stated first and foremost, that "the inculcation of the right types of values and attitude for the survival of the individual in particular and the society at large through education," is a priority. Akubuilo D.U. (2003), stated that "education in a broad sense improves the capabilities of individuals and the capacity of institutions, and becomes a catalyst for the closely interrelated economic, social, cultural and demographic changes that become defined as national development." That is, the education of the individual needs to be taken with all seriousness for any meaningful development, hi her opinion, Onyeneho (2003), states that "development is associated with modernization, material advancement, industrialization, scientific and technological progress, the emergence of nuclear energy, electronic and biological revolution, new knowledge about man and the universe.

Still on national development, the National Policy on Education stresses the need to use science and technological education as tools for national development. With science education at the centre stage, to say that the pivot is on Mathematics is merely underlining the obvious. Hence the need to understand the origin and the remote causes of most people's dislike and apathy towards Mathematics. This needs to be necessarily and adequately addressed so as to place science education in its rightful position for economic and social reconstruction and development

The Uniqueness of Mathematics to Science Education

The Longman Dictionary of Contemporary English defines science as knowledge arranged in an orderly manner, especially knowledge obtained by observation and testing of facts. It goes further to classify science into:

(i) Natural sciences e.g. Botany, Zoology, Biology, (ii) The physical sciences e.g. Physics, Chemistry. (iii) The applied sciences e.g. Engineering, (iv) The social sciences e.g. Economics, Politics, Psychology; and,

(v)The science fictions. Similarly Mathematics is defined as the science of numbers. That is the numerical aspect of any form of knowledge, be it of the natural, physical, social and applied, is interpreted using the language of Mathematics. Based on correct interpretation, a systematic application of knowledge-(Technology) can be carried out in any field, either by the engineer in the industries, the medical doctor in

the health sector and the policy maker in the managerial field of social sciences.

Hence Alele Williams (1988), stated unequivocally that "simple and major local and national decisions emanating from sound economics and management analysis can only be tested on the principles of Mathematics e.g. operations research. In her submission any organization, government that overlooked this will simply be making policies and taking decisions on the basis of trial and error. Again according to Arubayi (1996), "of all the roles of Mathematics, the most important is considered to be the linking together of science and its application-Technology," In his opinion, to show relationship and put precision on the contents of science and its systematic application, Mathematics is called into play. That is, for a proper analysis, identification and interpretation of the "damage point" of the nation's economy, and hence its solid reconstruction, a Mathematical approach should not elude our memory. Mildly put, Mathematics form the pivot of the bedrock of all human endeavours that bring economic development.

Since Mathematics is the pivot and anchor on which rest the bedrock, why has the study of Mathematics not generated an unparallelled level of enthusiasm that ought to be the case? Why does the mention of Mathematics bring such a frightening look of disgust rather than joy?

Causes of Dislike and Apathy Towards Mathematics (A).

Ineffectiveness of the Methods of Teaching

Imparting Mathematical knowledge goes far beyond standing in front of a class to teach. It requires effective teaching. Teaching can only be deemed effective if the progress of the learning process is proportionate to the teaching process. According to Arubayi (1996), the concept of effective teaching depends on some operating factors such as:

(i). Course organization, (ii) Work load, (iii) Difficult level of course, (iv) Student-Teacher rapport and interaction.

Any good teacher can easily organize his coursework to meet up the normal workload. And with proper organization, the supposed difficult course can be made easy. But the time required to impart effectively, the now simple course to an unusual multitude of students becomes a serious obstacle in the way of the effectiveness of the teaching process. This makes the last operating factor above, a difficult goal to achieve. Unfortunately this is the only tool at the teacher's disposal to measure the effectiveness of his teaching.

The amount of time required to adequately interact with students varies with different subjects, with Mathematics requiring the highest amount of time. That is, the problem of time to adequately interact with individual student to know his or her difficulties more than anything else, is the origin of student's dislike and apathy towards Mathematics.

(B) Student-teacher Rapport and Interaction

David-Osuagwu M.N. (2002), noted the following as teaching guides to effectively teach and enable pupils to recognize the number 1;

-Pick up or point to one object in the class and say the word one, one, each time. -Get the class to repeat "one" after you.* -Get the individual pupil to do the same...*

- Repeat these activities many times.
- Get individual pupils to come out and pick objects saying one like you did... *
- Write the figure on the blackboard several times calling 'one' each time you write.
- Get the pupils to do the same in their books, trace the number 1 in their text...**
- Go round to help and encourage... .**
- Tick every attempt... * *

Observe that out of about 10 steps listed above only about 3 of them were done solely by the teacher. While the pupils participated actively in the rest steps. The rapport / interaction and participation are more in the last 3 (**) steps. In a particular research using a class of 46 pupils, the last three steps took about 70 minutes out of about 90 minutes spent on the mathematical class of that day. Even when this looks more like a simple exercise, so much time is required. Imagine the time and effort it will take to go round to help and encourage each pupil as well as ticking every attempt in a class of 90 pupils!

In similar vein, Channon et al (1996) noted the following as teaching guide to actually factorize a simple quadratic equation: e.g. $x^2 + 8x - 20$.

- Find the product of the first and last terms

$$x^2 * (-20) - -20x^2$$

- Find all the factors of $-20x^2$
- Combine all the factors by addition or subtraction or both.
- Pick the factor that when combined gives the coefficient of the middle term i.e. +8x
- Replace +8x with these factors in the given expression.
- Factorize by grouping.

In stating these steps the following assumptions were made, that each student

Can multiply numbers and letters together already.
Can find the factors of any number
Can carry out directed numbers operation
Can substitute numbers
Also that the teacher will
Get the students to do the exercise in their book
Go round to help and encourage each student
Tick every attempt.

Course organization involves all of the above steps and even more depending on individual teacher. A thorough simplification of each step requires further minute steps to be taken. This will make the course simple and not difficult. But again student to- teacher rapport/interaction and participation poses an insurmountable problem even with a class size of 45 students! In a particular research on this topic of factorization with a class of about 83 students, out of the 45minutes time allocated to each period, only about 20 students' exercises were checked in the class even with a double period used. To take the exercise notes out of the class kills the intended purpose of the much needed interaction and rapport with each student. The aim would have been defeated. Unfortunately most of the public schools if not all are filled with students up to 90 or more in each classroom. In a particular research conducted at a public school in Lagos State, 96 students were found in the classroom. There was hardly a space for the teacher to stand and talk, let alone go round each student to check their work.

The root of the difficulties experienced by students in mastering of all the required steps in order to be able to resolve mathematical problems alone could be traced back to the level of interaction and rapport given to each student at the formative stage. The formative stage takes its root also from the nursery and primary level when the mathematical symbols/operators were taught.

Learning the Mathematical Operators

Addition and subtraction

The task of teaching the mathematical operators of addition poses less problem compared to that of subtraction. The number of steps involved gradually lengthens to include counting of physical objects. Much time need to be spent with individual student. This means less attention should be devoted to writing and demonstrating on the board. However, observation reveals that much effort is devoted to the board instead. Most teachers of mathematics simply use the board to demonstrate their dexterity and skill of "seeking the answers to questions". Their ability to arrive at the right answers is taken to mean successful accomplishment of the task of teaching and learning process.

Students are then given "homework "which more often than not are worked alone by any of their elderly relatives while the student is playing around. Presenting the correct answer to the teacher the following day, for those who may manage to mark, is adjudged to mean that the students have understood the concept. The next concept is then introduced. The implication is that a vacuum in learning is gradually created.

Multiplication and division

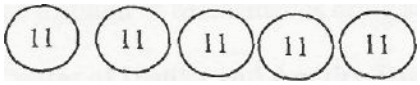
The vacuum gets more widened when the same casual approach is used in teaching the mathematical operators of multiplication and division. The implication is that multiplication could not be understood to mean addition of equal groups. For example that *2x5-2 + 2 + 2 + 2 + 2 OT 5 + 5.* And much later students would not understand that

$5x = 5 * x - x$ +x. Also the difference between 2x i.e. x + x and x^2 i.e. x * x will not be identified.

Rather, resort is made first to multiplication tables to learn multiplication by rote. And the brain being very good and fast at learning things in rhyme sequence, children sooner than later take to singing the content of the multiplication table. Parents smile admiringly at their children's "progress and intelligence". Parents and teachers get entertained by the chorus of singing the multiplication table. Teachers nod their heads in contentment and move on to introduce the next topic.

With the concept of division, the problem gradually assumes a grave dimension. Solace is found by students in the use of electronic calculators, Adewale (2003). Research study carried out made a startling revelation, that as early as primary III, some teachers encourage their pupils to use electronic calculators. The study of a particular primary school revealed that from primary III upwards the use of electronic calculators was not frowned at by both parents and teachers. The implication is that division could no longer be understood to mean counting in groups or sharing into equal groups.

For example that ~r~ =



= 5.

720

Long division of the form ~v~ i-e. 3^/220 could not be done mentally. And when much later the student is introduced to indices, an irreparable harm has been done, since the division of the type could not be done with an electronic calculator only. Subsequently factorization using the factor theorem i.e. $\frac{51aV}{3ax}$ -—~—:p—~ = x - 1V? $+3x^2$ -3x + 1 poses a grave threat that may lead to hatred for the teacher for teaching "too difficult problems or for going too deep beyond ordinary level". And subsequently avoidance of mathematical classes ensued.

The problem of dislike that may lead to the avoidance of classes and even hatred for the particular teacher does not just start in a particular day. Unknown to most students and parents, years of negligence on the part of the students, teachers and even parents have had this accumulated effect that has blossomed into hatred.

Remarks on Student's Conclusion About Mathematics

Faced with the above situation, the individual students concludes thus,

> **Mathematics is the Whiteman's magic.** According to Bajah (1983) students who have lost their bearing in this regard conclude that the idea of science is nothing but the Whiteman's magic. It is even said that some parents discouraged their children from going to school in order not to learn the Whiteman's magic!

> **Too demanding and academic:** Most educated people who could not understand the subject make comparisms with other subjects and conclude that it is too demanding and academic in nature.

> **Abstract in nature:** More deadly than the rest feeling is that of seeing the subject as completely abstract.

Level of Difficulties and Stages of Learning Mathematics

a) **Primary 1-3:** This level is not yet above what most educated parents can cope with. That is, pupils could be assisted with their assignments. Most parents or elderly relatives actually prepare pupils assignments for them while they play around. This is a very dangerous approach towards teaching and learning. Infact the child learns nothing from this approach. Though the problem is not apparent yet.

b) **Primary** 4 - 6: A few parents are still able to cope with their children's assignments. Teachers' inefficiencies are not yet very obvious, though a good number of pupils from most public schools start having difficulties. Though still not very apparent.

c) **Jssl:** Much of JSS 1 work is actually a repetition of primary (VI) work. Pupils from schools that were able to complete their syllabus have not started showing noticeable weaknesses yet. Very few parents are able to cope with their wards' assignments. Some immediately opt out for a private lesson teacher.

d) **Jss2** - 3: Quite a good number of pupils start showing noticeable weaknesses. Only parents with a mathematical education background can cope with their children - if ever they have time to attend to them. The impact of not giving enough attention or having adequate rapport and interaction with the child at school now begins to manifest vividly. According to David-Osuagwu M.N (2003) "the apathy and dislike children generally have toward Mathematics are due to the mishandling of the teaching of math at the early stages of primary school education. "

e) In her submission, she stressed the need for parents to assist in explaining and making clarification to students at home.

Impact of Parents' Assistance and Limitation

Parents' impact in assisting their children at home goes a long way to encourage the child to cope to a very considerable level. Parents' lethargy or attitudes have a lot of positive and negative influence on their

children's behaviour in society. Some parents, because of their absence from home, are unable to monitor what their children do after school hours, Adewale (2003). However, parental ability to help children in mathematic exercise is within a limited level, Primary I - V, in most cases.

The Impact of the Dislike And Apathy Towards Mathematics on the Present Day National Economy

1. **Lack of science educators:** Iwuozor (2003), noted that not until the 20th century that the country started producing professionals in the fields of engineering. medicine, pharmacy and technologist. This explains why most of our early Nigerian scholars major only in either Religious studies, History, Literature in English and English, Social Studies and Political Science. The crop of science teachers were either those recruited from Pakistan, India, Ghana or our colonial masters. Their exit has created the greatest vacuum that the nation is still battling to fill.

   According to Nwadiani (2003), our salvation is in the classroom. In his submission, our policy makers plan after implementation, they make their research without statistics-mathematics and the result is, all our efforts, their effort is nothing but investment in frustration! If truly our salvation is in the classroom, then it is also true that no country can ever be greater and mightier than the quality of her teachers.

2. **A certificate oriented education:** The military regime era, a common feature of the Nigerian Politics places so much emphasis on paper qualification. Their impacts are still very much felt. Historians with no other training become bank managers, lawyers become ministers of power and steel. Anything goes. If so why bother about mathematics, when a godfather is waiting just to see your certificate before making you head of one thing or the other. Business boys and spare part dealers are in control of wealth. According to Nwadiani (2003) that about 12% of a total students population where ready to collect their certificate at a matriculation ceremony.

Recommendations

» Teachers should de-emphasize the assessment method of 'take home assignment'. Except for certain types of questions of practical requirements in nature. <* On-the-spot assessment method should be encouraged even if it requires encouraging students to practice just one question each time a class is held. <* The number of students per classroom should be reduced to not more than 30 for any Mathematics class from nursery to end of secondary school.

•I* Non-qualified persons should not be allowed to teach Mathematics at any level, even if the person studied physics or the applied science subjects. <* Mathematics educators should pay more attention to individual students' not collective attention. In order to know each particular student's problem.

Conclusion

All the noble aims and objectives of economic and social reconstruction, the sincere intentions of positive economic growth and development, as well as the concerted effort of a few towards achieving these aims and objectives will amount to nothing if the government, our policy makers, fail to corne to terms with the stark reality of the situation. As it is said "no country can ever grow richer, mightier and develop beyond the quality and intelligence of her teachers."

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