MATHEMATICS IN THE EYES OF NIGERIAN YOUTHS: MYTHS AND REALITIES.

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By

Professor Stephen E. Onah
The Director/Chief Executive,
National Mathematical Centre, Abuja.

Introduction

- Studies have revealed that from east to west, north to south, Nigerian students from primary schools to universities and even youths outside schools exhibit phobia for Mathematics to the extent that many, out rightly hate it while others simply despise it. At the university level of education, especially at the undergraduate level, the subject often becomes the choice of last resort as a course of study for most candidates. These are not limited to Nigeria alone but to most countries of the world (Chinn, 2012; Dweck, 2012; Bramlett and Harron, 2009). Yet it is one subject that is almost indispensible for most candidates not just in school but also in our everyday life.

- I have chosen the above topic to speak on for two principal reasons. Firstly, the importance of Mathematics in today's world often referred to as "global village", particularly in science and technology and secondly, the rate of decline in interest by Nigerian youths in studying the subject.
- The two antitheses constitute a contradiction that portends danger for the country of which Nigeria can ill–afford now and in future.

- In order for Nigeria to be relevant in the increasingly competitive and Knowledge driven world, we need to engage in dialogue that seeks to evaluate and elevate status of the scientific and technological enterprise within the universities and outside environments. As Leaders of tomorrow who must be necessarily involved in seeking directions for national reorientation and the building of a prospective nation that provides sufficient space of wellbeing and opportunities for self-actualization, it is of utmost importance that students are adequately enlightened on the subject matter.

- I shall discuss the topic from the perspective of a supposedly informed community (the university, latently considered as the "gown") and the general public outside university that is conceived as the "town" and how a symbiotic engagement could bring about the desired result in the sense of positive attitude and mind set.
- After this brief introductory part, the rest of the paper shall discuss the myths surrounding the learning of mathematics, it effects and remedies; the realities about Mathematics and its impact on the society. Thereafter, the need, usefulness and relevance of Mathematics in today's Nigeria would be discussed. Finally, I shall draw some conclusions as a roadmap for the country.

Myths about Mathematics; Effects and Remedies

- Take an opinion poll on campuses or/and towns/villages on what they think about Mathematics, the unfortunate predominant answers may be; Mathematics is very difficult, Mathematics is very hard, I don't like Mathematics, Mathematics is meant for privileged few that are naturally endowed, etc. I consider all these as myths. The wrong notion about Mathematics does not come about just at the university level, it is often as a result of long standing misconceptions sometimes, right from the primary school days.

- Two major reasons standout from studies (Fishbein and Ajzen, 2005; Barrow and wood, 2006; Epstein et al, 2010) in the quest to identify the root cause of animosity that is often exhibited towards learning Mathematics by students in particular and youths in general: these are, teaching methods delivered by teachers and their general conducts (on the one hand) and the attitude of students towards the subject and learning habits (on the other hand). The two are like the case of the egg and hen, which one comes first? I have always posited that the former comes first. This is because; the attitudes of students to Mathematics of primary and secondary schools are influenced by what they encounter in classrooms.

- At the primary and secondary levels of education, the quality of teaching (teaching methods), availability of qualified teachers and teaching materials rank highest in that order as influencing factors for choice of Mathematics. This buttresses the fact that teachers influence on students cannot be over-emphasized and is very fundamental. (Bramlett and Herron, 2009).
- According to Aristotle, “quality is not an act, it is a habit” and Albert Einstein sums up the responsibilities of teachers in his golden words; “it is the supreme art of the teacher to awaken joy in creative expression and knowledge”.

- At the university level of education, the most influencing factors are in the descending order of job prospects, opportunities, past experiences and peer groups. It is therefore instructive that teaching should be innovative, creative, demonstrative, interesting and exciting. It is pertinent to point out at this juncture that the National Mathematical Centre (NMC), Abuja, has developed a number of teaching aids for primary and secondary schools in line with the above concepts. These include Mathematics text books, teaching modules, workbooks, digital resources like videos and Mathematical games. Other teaching aids such as whiz teacher software and Mathematical kits are essential tools for effective teaching of Mathematics.

- The results of these efforts by the NMC, Abuja are self-evident in its demonstration secondary school, The International Science Academy, Sheda, Abuja. It is a secondary school established by NMC, Abuja to put to practice all the innovations developed towards simplifying and demystifying the teaching and learning of Mathematics with a view to improving performance among students. It is gratifying and heart-warming to state that the school has been recording 100% credit pass in Mathematics since its inception.

Realities and Impact

- The holy bible in the book of John, Chapter 8 verse 32 reads, “And ye shall know the truth and the truth shall make you free”. Here, I intend to distil the truth from falsehood, the grains from chaffs so that our cases shall henceforth be different and different indeed, in the learning and knowledge of Mathematics. The aim is for all of us gathered here who I call the “gown” to impact positively on our communities the “town” in whatever measure in the true knowledge of Mathematics in all its ramifications.

- It must be emphasized that universities worldwide are known for their knowledge generation leading to wealth creation. They should therefore serve as agents of change. The universities being acknowledged as citadel of knowledge and learning have the fundamental responsibility of identifying positive features of convergence and therefrom promote understanding, harmony and integration among gown and town. If all this are achieved, I shall consider this effort and all the time spent as fruitful and worthwhile.

- From dictionaries we all know what is Mathematics by definition. I will therefore explain Mathematics from the practical point of view as it relates to our everyday life. It is a well-known fact that we **count** virtually everything around us on a daily basis. We do **addition**, **subtraction**, **multiplication** and **division** in one form or the other daily. We plan (**arrange**) our daily activities, thereby carrying out some form of **ordering**. We narrate our genealogy or our descent, leading to our **family trees**. Most times we do these things mentally making us loose the sense and amount of mathematics involved. If only we express all these in writing, we would have appreciated the amount of Mathematics we do daily, even to an advanced level.

- From the foregoing, Mathematics is in us (our everyday life) just as we ought to be in Mathematics. Mathematics is therefore, an enabler of human life; it is a language, the language of science in particular and the language is universal. Hence, it is the mother of all sciences. Further, it is a disciplinarian. Hear this, according to Thomas Mann, "I tell them that if they will occupy themselves with the study of Mathematics they will find in it the best remedy against the lust of the flesh". Yes, Mathematics is abstract but only to the extent of low level of our imaginative powers. That is, the extent of low level of our imaginative powers determines the high level of abstractness we find in Mathematics in an inverse proportion. Mathematics is learned by doing, therefore one must imbibe the spirit of to do it yourself (DIY).

- Mathematics should be taught as a practical science subject where topics are taught from the point of view of objective, instruments, method, result and conclusion. With this approach, mathematics could be learned with joy and enthusiasm without much anxiety and fear as students would be able to virtualize what is being taught.

- Let me conclude this part by identifying the major mathematical skills needed to be developed by all Mathematics students in particular and youths of the country in general. These are: **concentration, curiosity, imaginative power, discipline, perseverance, attention to details, possibility, mentality** and **hard work.** Albert Einstein summed all these criteria in his statement, "I think and think for months and years, 99 times the conclusion is false. The 100th time I got it right". I call them skills instead of attributes because everybody is capable of being who he/she wants to be. They are not possessed necessarily on the basis of natural endowment. When you weigh yourselves on the scale of the above listed criteria, you will know which aspects need to be worked upon or sharpened.

Use of Mathematics in Todays Nigeria

- Globally, the need, usefulness and relevance of Mathematics in the development industry, environment, security, defence, ecology, economy, etc, are not in doubt. Unfortunately, we cannot say the same for Nigeria, hence the need for the emphasis on Nigeria.
- Generally a credit pass in Mathematics is a requirement for University admission into all courses in science and social science. This is a requirement for most of the Universities in Nigeria as of today. May I hasten to say that this underscores the need and relevance of Mathematics in the country's university education system. Mathematics could be used to measure the logical reasoning power of a person. It therefore, stands to reason why so much importance is accorded it. Also, its applicability in our everyday life as individuals (as earlier pointed out) and as a nation cannot be overemphasized.

- I would like to briefly highlight some few areas where Mathematics could be applied to address some national challenges and other general human endeavour. Mathematics can be used to study the level of corruption in a country and its effects on national development. This is done through mathematical modelling. Research has advanced in this area for some years now (Waykar, 2013).

- Mathematics is used for fighting crime such as (Budd and Sangwin, 2012) finger-print detection, vehicle accidents (to determine speed at the time of accident) catching a getaway vehicle (by taking a blurred picture of number plate), investigating source of poison (when it was released into a water network). The Mathematics involved ranges from some form of integrals to general physical model of the events in the form of inverse problems using known mathematical principles. In the course of formulating the mathematical problems, data are collected and interpreted with the help of probability, prime numbers, cryptography. etc.

- A new area of research in Mathematics is being developed by Professor Nkechi (a Carnegie-African Diaspora Fellow) of Borough of Manhattan community College, the City University of New York, USA, Working currently under the sponsorship of Carnegie foundation in conjunction with the NMC, Abuja, Professor Agwu has published a number of journal papers and books in this interesting and fascinating area of Mathematics (see Agwu 2015, 2016). The research area entails African women's storey-telling using graph theory and group theory (vertex-edge graphs and number patterns).

- Her studies in African culture and women's stories in science, technology, engineering and mathematics (STEM) related fields are innovative, creative and inspiring. The study connects the teaching and learning of Mathematics to storey-telling about African culture where pictures and stories are converted into networks called graphs. For example a cultural bead, a group photograph, narration of a belief system of a people can all be represented by vertex-edge graphs from where the Mathematical analysis begins.

- From the foregoing, we have seen that abstract algebra (group theory) has again found applications in graph theory. Symmetric graphs can be studied through automorphism and geometric groups. Some of these symmetrical graphs have properties related to the structure of the group. Certain theorems exist and have been proved that all groups can be represented as automorphism groups of a connected graph.

- At this juncture, I would like to emphasize the need for all industries and multinational companies to establish functional research and development (R&D) department or unit to be able to utilize the needed experts in various disciplines including Mathematics in their organisations. Federal government Agencies like EFCC, NPF, ICPC, NNPC, National War College, etc, require Mathematicians in their research and development departments. That is what obtains in advance countries and part of the reason for their being ahead. A situation where graduates of Mathematics are largely condemned to mother classroom in Nigeria is unacceptable.

- The intent here is to draw public attention to the need for a stronger partnership and collaboration between universities and the larger society. It should be pointed out too, that universities and in particular, Mathematics departments should engage in original and strategic researches that are adaptive on one hand and are cutting-edge or groud-breaking for expanding the frontiers of knowledge on the other hand. At this point it is instructive to note the words of Albert Szent Gyorgi, “research is to see what everybody else has seen and to think what nobody else has thought”.

Conclusion

- I would like to state that training in mathematics aims at developing the reasoning capacity of the individuals concerned. It is therefore, a curious-oriented subject. From the foregoing, I would like to x-ray the status of Mathematics teaching and research at the universities and suggest strategies to making them sufficiently virile and qualitative as to be able to drive the nation toward economic prosperity.

- As a curious-oriented subject, high level Mathematics research is done first and foremost because of its intrinsic interest. The researcher has no immediate thoughts of the applications in mind. He is driven mostly by intuitive considerations in the effort to extend the frontiers of knowledge. This understanding of the driving force behind mathematics studies is important because the application of a research result in mathematics and indeed in any other natural science depend on the level of understanding of its significance and implications, the contemporary societal emphasis at the time of its discovery and the quality of interpretation of the research results.

- I am however of the view that in a developing country like Nigeria, scientific research in science like mathematics should be driven largely by issues that derive from national developmental interest as well as from the social and economic fronts, since the essence of research is in the main to solve problems of society.

- Furthermore, the training of high level manpower takes place in the Universities and since the availability of human resources has direct relevance to national, industrial and economic development, the path to national self-reliance lies in ensuring that an enduring culture for “relevant” mathematics in particular and science in general, is cultivated in the universities.

- Lastly and probably the most important is the cross fertilization of ideas between the able young minds of the students and the experienced teachers. Perhaps, this is the single most powerful force for advancement in ideas and the generation of new knowledge. Hence, ensuring that good mathematics is taught and practiced in our universities is the only reasonable way of guaranteeing that Nigeria generates intellectual promise for home grown solutions to her peculiar problems, an indispensable requirement for sustainable development.

- Evolution of mathematics education in Nigeria at the University level since the establishment of the university college of Ibadan in 1958 revealed that pure mathematics courses have been shrinking in emphasis and coverage from the first generation federal Universities to the most recently established ones. It is an established fact that the first generation federal Universities were very strong in pure mathematics while the second generation universities shifted to an almost balanced mixture of both pure and applied mathematics courses.

- The subsequent ones started tilting more to applied areas of mathematics. This may have been a deliberate policy of Federal government for reasons best known to it. However, the unfortunate trend today is that most young lecturers are not interested in pure mathematics, thereby leading to a situation where the older Professors are retiring without commensurate replacement. Similarly, student's inclinations are shifting accordingly. In the long run, the branch of pure mathematics which is core to advancement of mathematics in its entirety may go extinct.

- I have therefore declared pure mathematics as an endangered area that is currently threatened by extinction. Every effort should be made to resuscitate it. Let me further opine that our universities curriculum in mathematics have remained largely irresponsive to trends in today's competitive and knowledge driven world economy.

- I would like to conclude on a happy note that the Executive Secretary of National Universities Commission in the person of Professor Abubakar Rasheed has almost concluded curriculum review in mathematics and indeed other areas towards making university education more functional and responsive. A number of other reviews and reforms are currently going on. These are in fulfilment of the educational reforms developed by the pragmatic Honourable Minister of Education, Adamu Adamu who is striving hard to ensure that university education in Nigeria and indeed the entire education system is competitive and responsive to national and global challenges and also conform to global trends. This is the right attitude that we need.

- Finally, permit me to conclude by saying: Remember, negative attitudes are often contagious, beware! It is not the destination; it is the journey; it is not the result, it is the method. That is what creates the appeal in any endeavour.

- Ladies and gentlemen, let us be part of the journey. Or what do you think?

- Thank you for listening and God bless.

References

Agwu, N.M (2015): God's Own: The Genesis of Mathematical story-telling, GGEC, UK, Empowerment House, London

Barrow, J.A & Wood, K.E (2006): Fenemma-Sherman Maths Attitude Scales: instruments designed to measure attitudes towards the learning of Maths by females and males – *Journal for research in Mathematical education*, 7(5), 324 – 326.

Bramlett, D.C & Heron, S (2009): A study of African-American College student's attitude towards Maths; *Journal of Mathematical sciences and Mathematics Education*, 4(2), 43 – 51.

Budd, C and Sangwin, C (2012): Mathematics Galore, Oxford University Press, London.

Chinn, S (2012): Beliefs, Anxiety and Avoiding fear in Mathematics, Child Development Research.

Dweck, C (2012): Mind set; How you can Fulfil your Potential, Constable and Robinson Ltd.

Epstein D; Mendick, H; Moreau M.P (2010); Imagining the Mathematician: Young people talking about popular representation of Mathematics, Discourse: Studies in cultural Politics of Education, 31, 45 – 60.

Fishbein, M. and Ajzen, I (2005): Belief attitude, intention and behaviour: An introduction to theory of research, Reading, M.A; Addison-Wesley

Waykar, S.R (2013): Mathematical modelling: A study of corruption in the society, International Journal of Scientific and Engineering Research, vol.4 no.7