IMPORTANCE OF MATHEMATICS TO SCIENCE AND TECHNOLOGY

[1]Gimba, R. W. (Mrs) & Prof, (Mrs) U. N. V. Agwagah
[1]Department of Science Education
Federal University of Technology Minna, Nigeria
[2]Department of Science Education
University of Nigeria, Nsukka, Nigeria
[1]Gsm No -: 08032853603
[1]E- Mail-: Gimrat09@Yahoo.Com

Abstract
Science has been and will continue to be of tremendous importance to humanity for its ability to explain everyday occurrences as well as its central role in the technological development of any nation. For any nation to survived and developed it has to improved on it technology which can only be achieved through effective teaching and learning of mathematics. Mathematics has its way of communication that is universally accepted as a medium for expressing, formulating, communicating and perpetuating scientific ideas and theories. Mathematics specifies, clarifies and establishes concepts and laws for the science and technology. However, mathematics is said to be one of the most pure, applied and social sciences, it has been very useful in various fields like chemistry, physics, biology, agricultural science, engineering, medicine, geology, architecture, industries and so on. Based on the above usefulness of mathematics, this paper focused on the importance of mathematics to science, as well as technology. Conclusion and recommendation were proffered.

Introduction
Mathematics is defined as the science of structure, order, number, space and quantity whose relationship revolves around the elementary practice of counting, measuring and describing the shapes of objects (Mukhtar, 2008). However, mathematics is a systematically organized and exact branch of science; it is a creation of human mind concerned primarily with ideas, processes and reasoning. Mathematics is the key and back bone of almost all the subjects. It has been known worldwide as a LIFE science because it is the knowledge that is required in many professions in the day- by – day activities of people (Ojo, 2002).Mathematics is the foundation of all sciences, technology and modern development, and for any nation to survive and develop, that nation has to improve its technology which could only be

achieved through effective teaching and learning of mathematics (Azuka (2001). Nigeria, like most African countries reposes implicit confidence in the power of science and technology to salvage her from the ravages of poverty, ignorance and diseases, the three indices which most effectively define the event of her under development. However, science and technology work hand in hand and mathematics is the language of science and technology, that is why mathematics is described and seen as the Queen of all sciences and technology. Therefore, mathematics is an important subject that is needed at any level of education. In respect of this the national policy on education (FRN, 2004) stated that mathematics should be taught as a core subject to all students at primary and secondary school level in order to give a sound basis for scientific and reflective thinking, and prepare them for the next level of education. The concepts and the disciplines in which mathematics is used as a tool required a thorough understanding of basic operations with numbers. In line with this Uwadiegu and Ejike in Gimba (2003) stated that preparation of students for University mathematics starts at the kindergarten. This is where recognition of shapes which is the beginning of Geometry and counting of natural numbers 1, 2, 3... are learnt.

Adewumi, (2004) stated the reasons why the Egyptian priest invented mathematics, these was to enable the priest have pleasure and solve the problems of the Nile overflowing its banks every year, which usually resulted in washing away of the land which was meant for agriculture. A conclusion was reached that the land must be measured on yearly basis in order to determine the land which would be available for crop production. This was how mathematics was employed to enhance the economy of the ancient Egyptians. This shows that mathematics is a subject which has practical applications to science and Technology.

Today, most of the technological developments owe their origin to scientific discoveries and most advances in science and engineering owe their origin to mathematics which is referred to as the language of science and technology. The computer which is the greatest discovery of this century owes its origin to mathematical theories too.

Mathematics makes it easier for scientist to state and analyses problems and to demonstrate the different effects change. As mathematics is living and growing worldwide, new mathematics techniques are being developed with the use of sophisticated computers, this makes it possible to do researches and solve real problems that would have been difficult or impossible to solve.

Importance of Mathematics to Science

Science according to Adebayo, (2008) is concerned with the acquisition of knowledge and explanation of phenomenon in man's physical environment while mathematics is the backbone of all sciences (Azuka, 2001). Mathematics is a subject that exists in all other subjects either partially or fully. Science subjects depend on Mathematics, because without mathematics science cannot stand on its own because of the calculations involved in science subjects. Science subjects like chemistry, physics, biology, geography, agriculture and so on solemnly depend on mathematics.

Ogunleye in Gambari, (2004) observed that the language of science is a language within a language serving a purpose peculiar to the subject. Scientists use a special language that at times, builds a barrier between them and the layman. Part of these languages used by the scientist involves the use of signs, symbols and formula (Adebayo, (2001). All these have peculiar meanings that are distinct in themselves, that connote a particular understanding of the subject and which can be interpreted by anyone who understands its meanings. This implies that in the teaching of science, both the teacher and the learner must have a sound understanding of the language of science, including its signs, symbols, formulae and their meaning.

Biology

Mathematics concepts such as measurement, graphs, ratio, percentage and probability are applied in biology for example graphs are used to determine the ratio of growth of organisms under different environmental conditions. When rainfall and temperature requirements of a given plant are compared, graph is used to represent the result of the experiment. The calculations of Mendelian laws are a clear example of mathematical application in Biology. Barber and Hursch, in Ismaila, (2011) reported that Mendelian mathematical representation of some biological phenomena was registered by the anti mathematical preconceptions of the botanist. Epidemiological problems in medicine can be solved using data analysis. Ismaila, (2011) also stressed the need to use mathematics in science because the services of the former to the latter are becoming indispensable. For example, mathematics is used to explain relationships between variables such as volumes, pressure, temperature to extrapolate and interpolate data, interpreting scientific laws and theories to mention but a few. However, in spite of the usefulness of mathematics in the learning of science, science teachers' in Nigerian have not

effectively, conveyed to their students an understanding of the role of mathematics in biology. This generally apathy appears to draw inspiration from some historical antecedents (Chinweze, (2001).

Chemistry

Chemistry is another area where mathematics governs its study. Most of the topics treated in chemistry needs idea of mathematics for better understanding of the topic. In the aspect of chemistry, which involves the balancing of chemical equation, one need to weigh or consider the member of reacting substances and relate them to the number of products with an idea of simple equation from mathematics. Physical chemistry and organic chemistry cannot be tackled without good foundation of calculus and mathematical analysis in practical chemistry. Radioactivity, thermodynamics, calculation of empirical formula, volumetric analysis and so on depends on mathematics ideas for better understanding of the topics.

Some of the basic skills in mathematics which are usually used in chemistry include logarithms, ratio variations, percentage, decimals, proportion, graph and many others. Group theory in mathematics is used in chemistry to study spectroscopy, crystallography. Theory of algebra and topology is used in the study of large molecules.

Physics

There is a general consensus among educators that physics is a very important and useful subject for technology and manpower development of every nation (Yahaya, 2008, Xin, 2000). Physics as the subject implies has a great relationship with mathematics because without mathematics physics cannot stand on its own and vice versa. Therefore physics and mathematics are subjects that depended solely on each other. History has revealed that most of the great mathematicians are also great physicians; hence the two subjects cannot be separated.

Newton's law of motion, Archimedes principles, Lenz law, Ohms law and many others are expressed in Mathematical form. The physics teachers make use of mathematics in most of their calculations. The development of mathematical physics is really the handwork of the mathematicians. Most experiment in physics is represented in graphs, which illustrate fully the results of the application of geometry. Most of the geometrical shapes like triangles, squares, circles, rectangles and so on used in mathematics are also used in physics.

Agricultural Science

Mathematics has been very useful in agricultural developments. There is every incentive to the farmer to increase the quantity, quality and variety of his input. A farmer may try to improve his production by looking for more efficient ways of cultivating the land, seeking means of protecting his crops against pest and diseases. A pottery farmer will want to known the number of birds that a certain portion can freely carry. In solving these and many other problems, the farmer needed mathematical knowledge. The application of fertilizer and other chemical to farm requires the knowledge of measurement and calculations. Agricultural science and Agricultural engineering depends solely on mathematics. All measurements of land and average investment and preservation of agricultural products is another example of application of mathematics in Agricultural science.

Geography

Mathematics permits better formulation of geographical and astronomical information. The invention of navigational table to calculate longitude and latitude during mathematics renaissance period makes people to be interested in Astronomy. Through the knowledge of coordinate geometry scientists were able to travel in space and determine the radius of the earth and know about the eclipse of the moon and sun. Construction is also aspect of survey, architecture and town planning which involves geometry that can better be understood in mathematics

Importance of Mathematics to Technology

Technology can simply be defined as a means or ability by which man seeks to change or manipulates his environment (Yusuf, 2006). Technology can also be defined as the systematic study of techniques for making and doing things (Encyclopedia Britannica Vol 18 pg 9)". The history of technology is in a sense of history of man essentially. Techniques and methods of creating new tools, products of tools and the capacity for constructing them all solely depend on mathematics principles. Technologist should be resourceful and ready to improve when the ideal materials or conditions are available. Technology has changed radically in quality and quantity over the millennium but with the knowledge of mathematics.

A great deal of mathematics is required in manufacturing industries. Most of the machineries are constructed and build by using a lot of mathematical ideas. Some scientific equipment such as screw gauge, calipers and other

measuring instruments are calibrated with numerical figures designed by mathematicians. A great deal of operation research is required if an industry is to function effectively. A lot of mathematical calculations are made in manufacturing companies to enable the companies to maximize their profit. A great knowledge of calculus, analysis, geometry, quantum mechanics and some other areas of mathematical knowledge are required in designing bridges, buildings and other architectural works.

Computer

The history of computer was dated back to 1617 when John Napiers (the inventor of logarithms) produced a device known as Napiers Bones which was used in the principle of logarithms. In 1682, the Frenchman Blaise Pascal invented the 1st digits calculating machine which he used in his father's business accounts. Later in 1927 Howard Aiken of Howard University built automatic calculator called Mark 1 which was used for computations.

Computational mathematics is an integral part of mathematics which has become a powerful tool in the solution of many sensitive non-linear equations. There are three important observations worthy of emphasis about this relatively new branch of core mathematics. It consists of three basic operations, computation, construction and generalization. Recent mathematics has focused more on concrete problems than on obstructions.

Computational methods persuade almost all aspects of science and technology. Mathematics is the foundation of these methods. However, complex problems involving computational solutions range from the design of computer architecture found itself through mathematical modeling of physical, chemical, biological and engineering processes. Therefore, mathematics which is the intellectual basis of computational science has been the key to the dynamic revolution being created by the computer in science and engineering.

Computational results produce the insight for the development of mathematical theory, for example, the Matrix theory which was first discovered numerically from concrete examples. The mathematical theory in turn provides deeper understanding of the models revealing the phenomena that enable people to analyses and test previous computational results and conceive of new computations that will facilitate further theory.

Recommendations

Based on what has been discussed so far, the researcher wish to make the following recommendations:

1. Government should employed qualified mathematics teachers to teach mathematics in both primary and secondary schools in Nigeria.
2. Mathematics teachers should be motivated by including mathematics allowance in their salary for better and effective teaching of the subjects.
3. Workshop should be organized for both mathematics teachers and students on the importance of mathematics to other subjects so that the teaching and learning of mathematics will be improved in schools
4. Pre-lesson programmed should first be organized for young learners to disabuse their minds of the wrong notion that mathematics is difficult before presenting the real concept to them.
5. Mathematics being one of the basic entry requirements for university education, Student should be cancelled to take mathematics very serious at secondary school level if they want to further their education after secondary school.

Conclusion

It is interesting to note that the teaching of mathematics starts informally at home and later through formal education in school. All science subjects depend on mathematics. A study on relationship between science and mathematics revealed that all science subjects geography, biology, chemistry, physics require some aspects of mathematics particularly ratio, proportion scale factors, geometry, trigonometry, statistics, probability and graphs for effective understanding, representation and communication of results and data.

Mathematics has its way of communication that is universally accepted as a medium for expressing, formulating, communicating and perpetuating scientific ideas and theories. Mathematics specifies, clarifies and establishes concepts and laws for the science. Mathematics being an important subject to science and technology does not only limit itself to science and technology alone, but also stretches its hands into art subjects too, that is why mathematics is very important in all aspects of life. However, mathematics is not just a subject, it is a language through which scientist express their ideas, laws and principles. Science teachers and student should be able to interpret

the language currently for effective teaching and learning to take place in schools. Therefore, qualified hand should be employed to teach the subject effectively in schools in order to reduce the poor performance of students in external examinations like WEAC and NECO SSCE and also to improve on science and technology for the betterment of the nation.

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