Some aspects of modern mathematics

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We should be reasonably familiar with the meaning and nature of Modern Mathematics and its implications for School mathematics. It should be realized at the very outset that the meaning of Modern Mathematics varies from person to person, mathematician to mathematician. Here we will discuss two important points of view about Modern mathematics.

Modern mathematics in general

From this point of view modern mathematics means essentially that mathematics, which was not known as recently as about 150 years ago. Important among such ideas are sets, relations, mapping, non-Euclidean geometry, algebraic structures, logical foundation of mathematics, symbolic logic, functional analysis, abstract algebra, topology, game theory, theory of probability and statistical inference. These new ideas generally deal with the historical development of systems of numeration; evolution of the concept of number; the logical basis of the number system, measurement, functions and variables and other fundamental concepts; the role of postulates and definitions in mathematics; abstract formalism and generalization; the fundamental nature of symbols, relations, operations, intuitive set theory and mathematical proofs.

Modern mathematics in Schools

From this point of view the term modern mathematics essentially refers to the new subject matter of school mathematics which contains roughly all important and useful ideas of modern mathematics as well as traditional mathematics and is placed in the mainstream of expanding science and technology so that it can be more useful, interesting, exciting and stimulating. It stands for a new attitude and fresh understanding of the subject matter in which emphasis is placed on general structure of mathematics rather than on specific tricks and manipulation.

Traditional mathematics

Traditional school mathematics contained nothing that was discovered or created after the time of Newton. It is important to note that between the time of Newton and the beginning of the twentieth century, the major applications of mathematics were science and technology. But nowadays, there are new concepts and theories in mathematics, and it has been widely used in social and behavioural sciences, medicine, education, biological sciences, business and industry. Therefore, one of the important reasons to improve mathematics curriculum is to bring some current and recent developments in

mathematics to an average student. This does not, however, mean that all mathematics of the traditional kind is no longer necessary. Many useful and beautiful ideas were developed early, which promoted the growth of human civilization, science and technology. As a matter of fact classical mathematics is still of immense value for engineers, physical scientists, educationists, pharmacists, navigators, surveyors, accountants and various other experts; but it is insufficient for many of the needs of modern science and technology. In conclusion, the traditional mathematics is still useful, but some ideas of the modern mathematics are important. Therefore, we should include in school mathematics curriculum the best elements from the traditional as well as the modern mathematics.

SOME OTHER REASONS FOR INTRODUCING MODERN MATHEMATICS IN OUR SCHOOLS

People in general think of mathematics as an old science dealing with absolute ideas that never change and that the mathematical facts are final and unambiguous. They believe that arithmetic, algebra and geometry were invented and completely explored by the ancients and there is no scope for new inventions in mathematics. Most people are therefore surpriped when they hear of Modern Mathematics and they consider it a whim with some mathematicians, who may be presenting old wine in new bottles. Is not two plus two still four, as it was centuries ago? Many of those who are concerned with mathematics education, whether they are teachers, or administrators or guardians, generally feel that there is no need of shift from traditional mathematics to new mathematics. Until recently, this general attitude was even prevalent among mathematicians themselves. But now-a-days there are new concepts about numbers, new methods of performing computations, new revolutionary theorems have been proved in geometry, new applications of mathematics have been found, and completely new fields of mathematics have been invented, therefore we have to change this attitude.

Social Utility Movement

Education is a preparation of life. A child must leave school with such a background of mathematics which may enable him to apply himself to problems he will meet as a potential member of the society. For some years educationists and mathematicians have been advocating for the Social Utility Movement in mathematical teaching. The recent social changes have major implications for our school programme. New ideas such as set theory, statistics, probability, and mathematical logic have been introduced to satisfy the needs of most scientific research workers and professienals. Socialogists and psychologists need certain knowledge of game theory, statistics and probability in order to be able to carry on with his work efficiently. Engineers, scientists, economist and experts in various technologies and other field also need a good dose of mathematics. Therefore, we must teach best mathematics to more and more children, in a short time, so that they can pursue the many important careers that are dependent on a sound mathematical background. These aims can only be achieved with introduction of modern mathematics at our schools.

Computerization of our culture

Nowadays a great deal of concern centres about the place of computer science to serve the professional needs of our computing

community. We can speak without reservations of a computerization of our culture that is already broader, though less deep, than its mathematization. Nowadays computing has become important in mathematics, but it is relatively minor fraction of the total volume of computing done today. Others include experimental and theoritical physics, business data processing, economic planning, library work, engineering design, education, inventory management, space science, police operations, musical performances, nuclear devices, political strategy, automated factories, medicine, social science etc. Modern industry is being reorganized due to the invention and utalization of the electrical computers. Most important mathematical components of computer science are numerical analysis and programming languages. Computer science deals with information in an abstract way, the meaning of the symbols and number may change from problem to problem. Presumably, it will soon be taken for granted that all graduates of applied sciences, engineering and business administration will have to learn computer sciences, during the course of their university education. Therefore, it is not merely necessary but it is urgent to introduce such aspects of modern mathematics at school level.

Modern mathematics is more meaningful.

As a matter of fact the modern mathematics offers an opportunity to learn mathematics in a more meaningful way then before. It offers a new approach and fresh understanding of the mathematics, which is enriched by new insight. As for example, the simple arithmetic operations (addition, subtraction, multiplication and division) have been seen to have aspects that make of them more than simple mechanical operations that have baffled several geneaations of students. In an algebraic equation the concept of x, the unknown, takes a new meaning. Geometry is now not only arbitary repetition of series of proof of obvious. but a new depth has been given to it, which is placed on sound footing in the mainstream of mathematics. Modern mathematics, therefore is meaningful mathematics both in point of view and subject matter.

Modern Mathematics Unifies all branches of mathematics.

The modern critics pointed out that the trouble with traditional school mathematics was that it offered little or no correlation among different disciplines of mathematics. Arithmetic seemed to have little or no relationship with Algebra or Geometry. It has been felt strongly that mathematics should be presented as a unified science and all its branches should be inter-related to each other so that the contributions of each branch can be used to the best advantage. The new mathematics provides the opportunity to unify all branches of mathematics.

Modern mathematics improves the teaching of mathematics.

One of the most important aims to introduce modern mathematics at schools is to improve the teaching of mathematics and make mathematics an interesting subject. Traditional methods of teaching mathematics induced great fear for mathematics among children, they found it very ugly and unpleasing. A child could easily tell his teacher that he did not know mathematics, and mathematics did not know him. This attitude has been changed to a great extent by introducing modern methods of teaching mathematics.

It should be realized that major changes in school mathematics are in the approach of

teaching rather than much change in its content. In short the changes are more in method than in content. It seems new in content to old generation because it uses more precise language and symbolism. If somebody has good knowledge of traditional high school mathematics, he can understand all new mathematics that is prescribed in elementary schools, but the symbols and notations are different, so that he fails to appreciate it.

Modern mathematics introduces new ideas and symbols from the beginning.

To add precision and undesstanding to mathematical operations, modern mathematics introduces new mathematical ideas, new words and symbols much earlier than the traditional mathematics used to introduce. Experiments in many parts of the world have proved that children learn complex ideas, words and symbols at much earlier age than what we expected earlier, provided they are taught by modern methods.

Modern mathematics provides intellectual challenge.

Some people are of this view that children are forced to study difficult subject matter at a very young age. However this view is not true, much of the new subject matter is basically easier than the traditional school mathematics. Although traditional mathematics's meaningless long and repeated drills can produce the desired proficiency in accurate computation, but they ultimately lead to a permanent distaste for mathematics. Traditional mathematics proved tasteless to students, beçause it presented no intellectual challenge. One of the aims of modern school mathematics programme is to avoid this unfortunate situation, and cultivate the desire of creation, intellectual curiosity and scientific foundation of thinking among the children.

Modern mathematics is based on the fundamental structure of mathematics.

Psychologists are of the opinion that the best study of a subject is only possible when it is based on its fundamental structure of the subject. This stress on the structure is also in agreement with modern theories of education. Therefore another important aspect of introducing modern mathematics is that it is based on the fundamental structure of mathematics.

Mathematics has been also defined as the science of logical thinking and systematic reasoning, therefore each mathematical problem should be proved by a logical sequence of steps and arguments. The basic elements of mathematical structure are definitions, assumptions, the concepts of sets, logical basis of the number system, abstract formalism, generalization, the role of axioms, postulates and theorems etc. Mathematics involves the process of abstraction, starting with concrete situation, recognizing corresponding structures and using one structure to solve problems presented in other structure. Modern mathematics, presents mathematics in such a way that involves the whole process, and not only with the techniques of the internal operation within one system. When a student follows this structure then mathematics makes sense to him and he enjoys the intellectual thrill of mathematics. The real power of mathematics lies in its structure an abstractness instead of its computational part.

REFERENCE

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