INNOVATIVE METHODS IN TEACHING MATHEMATICS IN HIGHER EDUCATION INSTITUTIONS AND GENERAL SECONDARY EDUCATION

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Mathematics is the study of topics such as quantity (numbers), structure, space, and change. There is a range of views among mathematicians and philosophers as to the exact scope and definition of mathematics. Mathematics can, broadly speaking, be subdivided into the study of quantity, structure, space, and change (i.e. arithmetic, algebra, geometry, and analysis). Mathematics, being an important subject and occupying a central position since the ancient period till date, has not been of interest to many students. The reason is mainly because there is aspiration but it is hard to achieve. Being highly abstract, it is concerned with ideas, which are interrelated, and with the manipulation of symbols Teaching of mathematics is not only concerned with the computational knowhow of the subject but is also concerned with the selection of the mathematical content and communication leading to its understanding and application of Mathematics. Mathematics has a role to play in many different fields: innovations in medicine, digital encryption, communication technology, modelling real life phenomena, predicting disasters, organization of enterprises, business and transport to name a few. In primary grades, many children demonstrate vivid interest in science and mathematics, but their attitudes decline in the middle grades. Interest levels vary by topic and by gender, but the general pattern is quite similar for mathematics and most of the sciences, and the decline occurs in most countries that have attained a certain level of wealth. The lack of interest in science and mathematics has been on the educational and political agenda for a long time for various reasons, such as the need for a scientifically literate public; the need for employees with a STEM (Science, Technology, Engineering and Mathematics) background; and the need of science itself to gain public. Many educational innovations, including context-based teaching, inquiry-based teaching, and ICT usage, have been proposed, both in science and mathematics education, to foster positive attitudes, but there is little systematic evidence about which educational approaches are effective to promote interest, attitude, and motivation. Mathematics is an important subject, but few understand what the discipline is about. For many, mathematics is a collection of rules to be mastered, arithmetic computations, mysterious algebraic equations, and geometric proofs. If most people were asked to recall how they were taught mathematics they would most likely recall engaging in rote memorization of mathematical concepts as the teacher demonstrated the procedures to solve certain problems on the board. Following the lesson the teacher would give a “drill and kill” homework assignment over the same concepts that were covered in class. The next day would consist of the same procedures but over a different concept. This method of mathematics instruction would continue on day after day. Over the past several years, however, debate has taken place over how to effectively teach math and whether the traditional method is as effective as it once was. Traditional methods of math instruction do not allow for much questioning, investigating or individual development of understanding. There are number of problems in geometry instruction at secondary school in India. For example, the approach that is used to teach geometry topics is very theoretical, and many abstract concepts and formulas are introduced without paying much attention on aspects such as logic, reasoning, and understanding. The topics that are taught seem very far from pupil‟s daily life. Therefore most pupils think that geometry is very difficult to learn. Pupils are passive throughout the lesson; „chalk and talk‟ is preferred teaching style; emphasis on factual

knowledge; questions require only single words, often provided in chorus; lack of learning questioning; only correct answers are accepted and acted upon; whole-class activities of writing/there is no hands work is carried out.

In view of the foregoing aims of teaching mathematics I realize that more focus should be laid in class room to the higher level of objectives underlying the mathematics subject, like critical thinking, analytical thinking, logical reasoning, decision-making, problem-solving. Such objectives are difficult to be achieved only through verbal and mechanical methods that are usually used in the class of mathematics. As one of the verbal methods of instruction give all importance to speech and texts, to the book and to the teacher who used to be simply satisfied with giving the mathematical rules to pupils and having them memorize it, e.g. The rule of signs and formulas in algebra, students memorize this and remember it! Another verbal method involves explanation. Teachers who use this method assume that the mental structure of the child is same as the adult‟s. This method leads to series of explanations and students at the initial steps of logical explanations trying to understand and grasp but slowly the gap is created between the explanations transmitted by teacher and received by students which lead to the poor understanding on part of students and they develop a fear of the subject - Math phobia. The Education Commission (1964-66) points out that “In the teaching of Mathematics emphasis should be more on the understanding of basic principles than on the mechanical teaching of mathematical computations”. Over the past decades many teaching approaches have been proposed to foster positive attitudes toward science and mathematics. Although each approach has its own unique features, which could be characterized on many dimensions, a few broad categories tend to be distinguished in research as well as in public debate. To categorize the studies we encountered the following types of interventions in our study.

Many curriculum reforms have focused on the use of contexts and applications of science and mathematics. Although the intensity and the role of context use vary across implementations, one aim of all context-based curricula is that students will experience the relevance and applicability of the science content in society and in their personal life worlds Many studies on context-based interventions report gains in students' attitudes to science and technology, with learning gains similar to those of conventional approaches. Typically, teachers use links to contexts to motivate students and support the learning of mathematics content, rather than to develop the ability to explore real-world contexts through the use of mathematics An important pillar in constructivist pedagogy is contextualising learning using an authentic environment and realworld examples. A majority of students have difficulties in connecting mathematics to real world applications and this could be a reason for failure in mathematics. Making Mathematics relevant via real world examples.

Students today find it difficult to understand what it is they need to know and many times why they need to know it. A common question asked in a mathematics classroom is “why do I need to know this?” or “When will I ever use this?” Answering this “need to know” question has been coined the term inquiry. Inquiry goes much deeper than asking simple questions such as, “is it going to rain today?” Inquiry is a process of learning that is driven by questioning, thoughtful investigating, making sense of information and developing new understandings. Writing is a powerful tool that not only helps to improve students‟ writing abilities, but also helps students clarify and extend their knowledge in the area of mathematics. A common mistake that some mathematics teachers make when assessing student performance is believing that if a student can “do” a problem, then the student “understands” math. Most mathematics

students (and some teachers) seem to interpret the students‟ role as essentially acquiring (i.e., memorizing) facts and algorithms that can be immediately applied to the solution of given exercises; few students expect mathematics to be meaningful and fewer still see mathematics as a creative undertaking. Consequently, students are too often content with externally manipulating symbols and doing routine problems, without ever reaching a deep and personal understanding of the material. Inquiry based mathematics incorporates writing in mathematics which highlights this misconception and provides a natural teaching opportunity for developing students‟ mathematical reasoning skills.

References:

1. Ms. Harpreet Kaur Sandhu, Mr. Avi Grover - INNOVATION IN MATHEMATICS EDUCATION.
2. Steffe, L. P. & Thompson, P. W. (2015). Interaction or inter subjectivity? A reply to Lerman. Journal for Research in Mathematics Education, 31(2), 191–209.
3. Potocka, K. (2010). An entirely-online developmental mathematics course: creation and outcomes. Primus, 20(6), 498–516.
4. Hekimoglu, S. &Kittrell, E. (2010). Challenging students‟ beliefs about mathematics: the use of documentary to alter perceptions of efficacy. Primus, 20(4), 299–331.