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Problem Solving Ability for Students at High School Level

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ABSTRACT *This paper focuses importance of problem solving ability for students at high school level. Problem solving has a special importance in the study of mathematics. A primary goal of mathematics teaching and learning is to develop the ability to solve a wide variety of complex mathematics problem. Stanic and Kilpatrick (1988) traced the role of problem solving in school mathematics and illustrated a rich history of the topic. To many mathematically literate people, mathematics is synonymous with solving problems – doing word problems, creating patterns, interpreting figures, developing geometric construction, proving theorem, etc. On the other hand, persons not enthralled with mathematics may describe any mathematics activity as problem solving. Problem solving ability is an attempt made to answer the question from three points of view: Principles and standards for school mathematics (Principles and standards, NCTM, 2000). Problem solving ability meets the needs of all learners.*

Introduction:

Problem solving has a particular consequence in the study of mathematics. A crucial purpose of mathematics teaching and learning is to build up the capability to solve a wide range of complex mathematics problems. Problem solving is an important component of mathematics education because it is the single vehicle which seems to be able to achieve at school level. Through problem-solving strategies, mathematics can be developed. Presenting a problem and developing the skills needed to solve that problem is more motivational than teaching the skills without a context. Such motivation gives problem solving special value as a vehicle for learning new concepts and skills or the reinforcement of skills already acquired (Stanic and Kilpatrick, 1989, NCTM, 1989). Approaching mathematics through problem solving can create a context which simulates real life and therefore justifies the mathematics rather than treating it as an end in itself. The National Council of Teachers of Mathematics (NCTM, 1980) recommended that problem solving be the focus of mathematics teaching because, they say, it encompasses skills and functions which are an important part of everyday life. Furthermore it can help people to adapt to changes and unexpected problems in their careers and other aspects of their lives.

Problem Solving Ability

Systematic theory on the mechanisms of human problem is a relatively recent advance in psychological science and knowledge of fundamental processes provides basis for understanding the development and acquisition of our abilities. Mathematical problem is a tool used as not only to help students develop their thinking ability but it also helps them to develop their basic skills of solving the problem especially a problem in daily life. The goal of teaching mathematics to be effective was that the students were able to solve its problems. As a matter of fact, the experience in solving the problems of the subject is very important to develop students thinking skills and help them gain more skills in solving the problem in daily life (Branca, 1980; Chapman, 1997).

Problem Solving as a Process

Garfola and Lester, 1985 have suggested that students are largely unaware of the process involved in problem solving and that addressing this issue within problem solving instruction may be important. We will discuss about the various areas of problem solving process is below.

1. **Domain Specific Knowledge**

To become a good problem solver in mathematics, one must develop a base of mathematics knowledge. How effective one is in organizing that knowledge also contributes to successful problem solving. Kantowski (1974) found that those students with a good knowledge base were most able to use the heuristics in geometry instruction.

Silver (1979) found that successful problem solver were more likely to categorize math problems on the basis of their underlying similarities in mathematical structure.

2. **Algorithms**

Algorithm is a procedure, applicable to a particular type of exercise, which, if followed correctly, is guaranteed to give you the answer to the exercise. Algorithms are important in mathematics and our instruction must develop them but the process of carrying out an algorithm, even a complicated one, is not problem solving. The process of creating algorithm, however and generalizing it to a specific set of applications can be incorporated into the curriculum by having students create their own algorithms.

3. **Heuristics**

Heuristics are kinds of information, available to students in making decisions during problem solving, that are aids to the generation of the solution, reasonable, in nature rather than prescriptive, seldom providing perfect guidance, and variable in results.

4. **Looking Back**

Looking back may be the most importance part of problem solving. It is the set of activities that provides the primary opportunity for students to learn from the problem.

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The phase was identified by Polya, (1973) with admonitions to examine the solution by such activities as checking the results, checking the argument, deriving the result differently, using the result, or the method, for some other problem, reinterpreting the problem, interpreting the result, or stating a new problem to solve.

Teaching and Learning in the problem solving process:
Teachers should:

- Encourage pupils to have can do' or can try' attitude. Pupils should expect to struggle, to be 'stuck', and not always to obtain the correct answer. They also need to realize that success can be the attempt at the problem and the learning experience gained. The discussion- and use – of success criteria prior to starting on the problem would assist many pupils to realize that finding a correct answer is not the only way to be successful.
- Create a supportive classroom where pupils are prepared to tackle the unfamiliar and not feel threatened when they get stuck-a classroom that allows and encourages peers support.
- Talk to the pupils about the processes so that they can build up a vocabulary and so that pupils are explicitly aware of the strategies involved.
- Allow pupils to follow their own ideas. Teachers should assist when appropriate without giving the answer away. Pupils need to be allowed to struggle with a problem to gain confidence in their own abilities.
- Provide space in the lessons for pupils to reflect on their own thinking by discussing with partner or by reporting back to group or glass and so deepen their understanding of the process involved.

Conclusion

It has been suggested in this paper that there are many ways to improving their problem solving ability. Neuroscientists have proven that our brain cannot find solutions if we focus only on the problem. This is because when we focus on the problem we are effectively feeding 'negativity' which in turn activates negative emotion in the brain. These emotions block potential solutions. Have on open mind try and entertain 'all possible solutions' - even if they seem ridiculous at first. It's important us keep on open mind to boost creative thinking, which can trigger potential solutions. View problem neutrally try not to view problem as 'scary' things if you think about it what is a problem? It's really just feedback on our current situation. Not only is it a vehicle for developing logical thinking, it can provide students with a context for learning mathematical knowledge, it can enhance transfer of skills to unfamiliar situations and it is an aesthetic form in itself. A problem-solving approach can provide a vehicle for students to construct their own ideas about mathematics and to take responsibility for their own learning. There is little doubt that the mathematics program can be enhanced by the establishment of an environment in which students are exposed to teaching via problem solving, as opposed to more traditional models of teaching about problem solving. The challenge for teachers, at all levels, is to develop the process of mathematical thinking alongside the knowledge and to seek opportunities to present even routine mathematics tasks in problem-solving contexts. We solve hundreds of small problems every day. It covers different types of problems, such as routine vs. non-routine life.

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