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## **Problem Solving in Mathematics : A Skill of Cognitive Domain**

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### **Abstract**

*The mathematical problem refers to a situation that requires one to make decisions. The problem solving is the process of accepting a change and striving to resolve it. It is meaningful, developmental and sequential discovery of generalization, involves the thought process that results from the problem. It helps to develop mathematical knowledge and making the student more responsible for their own learning. The hierarchical cognitive domain skills such as information processing, knowledge, understanding, analysis, synthesis, application, problem solving and creativity will help the students to know the sequential mental processes involved in solving problems in mathematics and boost their confidence in learning mathematics. In problem solving, the role of teacher is also very significant to open the cognitive domain of students.*

**Key words :** Problem Solving Skills, Mathematics, Cognitive Domain.

### **1.0 Introduction :**

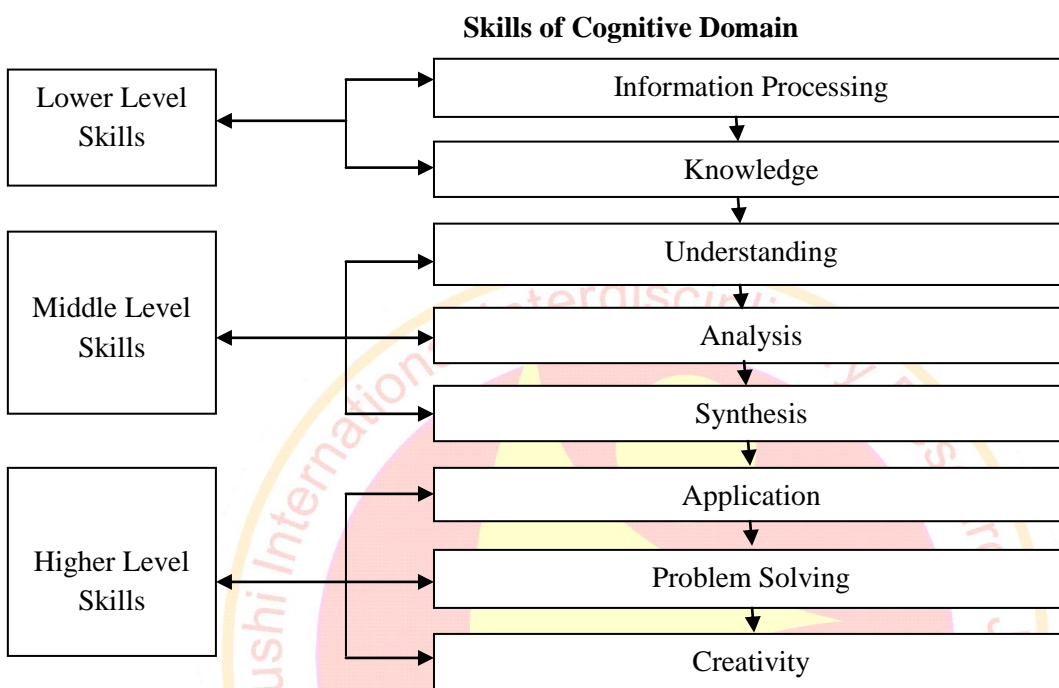
Problem is used in the sense that, "whenever there is a gap between where you are now and where you want to be and you don't know how to find a way to cross that gap." (Hayes, 1989). It is also a situation in which you are trying to reach some goal and find a means of getting there. It has the current situation (mind state) and the desired outcome (a goal state). There is a general agreement that mathematical problems refer to a situation that requires one to make decisions. The individual does not have an immediately clear or spontaneous solution to the problem at hand.

(Polya 1945, Newell, Sinnen 1932, Buns 1992).

Problem solving is a process by means of which an individual uses previously acquired knowledge, skills and understanding to satisfy the demands of an unfamiliar situation. It is also summarized as the process of accepting a challenge and striving to resolve it. It involves critical and creative thinking. Teachers role is important in developing problem solving abilities. Teachers provide just enough information to establish a background or intent of the problem and students clarifying, interpreting and attempting to construct one or more solution process. In this teacher accepts right or wrong answer in a non-evaluative way. They guide, coach, ask insightful questions and share the process of solving problem. The problem solving skill can be used to encourage students to make generalizations about rules and concepts, a process which is central to mathematics. It helps to develop mathematical knowledge and making the students more responsible for their own learning. The main objective of teaching mathematics is to train the students in the art of problem solving. In this situation the role of the teacher is very significant. One way it is challenge to the teacher to open the cognitive domain of students and carrying them to higher order mental abilities through sequential learning process.

## 2.0 Cognitive Order Learning :

The cognitive domain of human brain is said to be responsible for thinking, understanding, imagination and creativity. The cognitive domain skills include a hierarchy of skills involving information processing, knowledge, understanding, analysis, synthesis, application, problem solving and creativity. There is vertical connectivity amongst them. Using the cognitive order moving from information to problem solving will help the students to know the sequential mental processes involved in solving problems in mathematics.



The skills of cognitive domain are divided into lower level skills, middle level skills and higher level skills.

### 2.1 Lower Level Skills :

The lower level skills consist of information processing and knowledge. Information processing is convergence of latent information into manifest information (Shannon C.) and help to bring relevant prior learning. It will also help to get required knowledge to recall and recognize basic concepts, mathematical terms, ideas, procedures and theories of concerned problem.

### 2.2 Middle Level Skills :

The middle level skills consist of understanding, analysis and synthesis. The understanding of the concept helps to grasp the meaning of the material and interpret verbal material, charts and graphs. It also promotes to analyze the concepts in mathematics and it becomes easy to break down material into its components which will help to understand its organizational structure. Analysis helps to understand both the content and the structural form of the material. This analyzed material then synthesized by putting parts together to form a new whole. It also helps to build a new concept and solution by putting parts together.

### 2.3 Higher Level Skills :

The higher level skills consist of application, problem solving and creativity. At the application stage learned material is used in new situations. The application of rules, methods, concepts, principles,

laws, theories has to be done in known situations and the students can progressively move to unknown situations. The problem solving generates an appropriate model such as an equation or a diagram for solving a routine problem. It helps for finding methods to facilitate solution. Problem solving also helps to adopt one or more algorithms to find a solution to a multistep problems. This resulted into increase of creativity which generates new ideas.

After a full-fledged concept learning session using the cognitive order learning problem solving should be taken up where the students encouraged to work out the problems. Generally the problems of students stem from lack of understanding of the basic concepts. Therefore it is essential to keep doing 'concept recall' and 'concept clarification'.

### **3.0 Conclusion and Suggestion:**

The forgoing discussion reveals that the problem solving is very significant in teaching and learning mathematics. It helps to develop mathematical knowledge and making the students additive responsible for their own learning. The skills of cognitive domain consisting of lower, middle and higher level skills from information to problem solving will help the students to know the sequential mental process involved in solving problems in mathematics. It will also boost the confidence of students in learning mathematics. In problem solving the role of teacher is very significant to open the cognitive domain of students. It is suggested that teacher should accept challenge to open the cognitive domain of students and carry them to higher order mental abilities through sequential learning process.

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