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Comparative Study of Problem Solving Ability in Mathematics Among +2 Students of Government and Private Senior Secondary Schools

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INTRODUCION

Solving problem is a complex cognitive skill that characterizes one of the most intelligent human activities . From childhood onwards, we actively solve problems present to us by the world we acquire information about the world and organize this information into structure of knowledge about objects, events, people and ourselves that are stored in our memories. These structures of knowledge comprise bodies of understanding, mental models, convictions and beliefs that influence how we relate our experiences together and how we solve the problems that confronts us in everyday life, in school, in our jobs and at play. Good problem solving skills come naturally; they are consciously learnt and nurtured. Problem solving has been defined as efforts which include thinking, reasoning, judgment, and strategies (Johnson, 1972). As the world becomes characterized by more complex activities and society becomes more technological, problem solving becomes increasingly more important. Because daily activities demand problem solving skills, educators have been given the task of trying to improve problem solving abilities of students.

The term 'problem' may have different meanings depending on one's perspective. In daily life, problem is explained as any situation for which a solution is needed, and for which a direct way of solution is not known (poly, 1962). For mathematical perspective, problem is defined as something to be found on shown and the way to find or show it is not immediately obvious by the current knowledge or information available (Grouws, 1996). To a teacher of mathematics, problem is an engaging question for which students have no readily available set of mathematical steps to solve, but have the necessary factual and procedural knowledge to do so (Schoenfeld, 1989). A mathematics problem can be a routine or a non – routine one. Routine problem is the one which is practical in nature, containing at least one of the four arithmetic operations or ratio (Alun, 2001), whereas non-routine problem is the one mostly concerned with developing students' mathematical reasoning, and fostering the understanding that mathematics is a creative subject matter (Pola, 1966).

It is also important to differentiate between a mathematics problem and an exercise. An exercise is "designed to check whether a student can correctly use a recently introduced term or symbol of the mathematical vocabulary" (Polya, 1953, p.126). Therefore, the student can do the exercise if he or she understands the introduced idea. However, a problem cannot be solved basically by "the mere application of existing knowledge" (Frensch & Funke, 1995 , p.5). Also, while doing exercises, students are expected to come up with a correct answer which is usually agreed upon beforehand. However, while solving problems, there might be no solution to the problem, or on the contrary, there can be more than one correct solution to the same problem (Lester, 980). While solving a problem, the critical point is not reaching to a solution but trying to "figure out a way to work it" (Henderson & Pingry, 1953,p. 248). Moreover, doing exercises demands no invention or challenge (Polya, 1953) whereas solving problems poses curiosity and enthusiasm together with a challenge to students' intelligent.

A major goal of education is to help students learn in ways that enable them to use what they have learned to solve problems in new situations. In short, problem solving is fundamental to education because educators are interested in improving students' ability to solve problems. Problem solving theory and practice suggest that thinking is more important in solving problems than knowledge and that it is possible to teach thinking in situations where little or no knowledge of the problem is needed . Such an assumption has led problem solving advocates to champion cotentless heuristics as the primary element of problem solving while relegating the secondary status .Yet if one analyzes the meaning of problem solving, the knowledge base and the transfer of that knowledge are the most essential elements in solving problems. "Most people spend more time and energy going around problems than in trying to solve them," says Henry Ford.

OBJECTIVES OF THE STUDY

1. To study the problem solving ability among +2 students of Ludhiana district.

2. To compare the problem solving ability government and private +2 students.
3. To compare the problem solving ability of unrelated category among government and private +2 students.
4. To compare the problem solving ability of related category among government and private +2 students.
5. To compare the problem solving ability among male and female +2 students.
6. To compare the problem solving ability of unrelated category among male and female +2 students.
7. To compare the problem solving ability of related category among male and female +2 students.
8. To compare the problem solving ability among government male and female +2 students.
9. To compare the problem solving ability of unrelated category among government male and government female +2 students.
10. To compare the problem solving ability of related category among government male and government female +2 students.
11. To compare the problem solving ability among private male and private female +2 students.
12. To compare the problem solving ability of unrelated category among private male and private female +2 students.
13. To compare the problem solving ability of related category among private male and private female +2 students.
14. To compare the problem solving ability among government male and private male +2 students.
15. To compare the problem solving ability of unrelated category among government male and private male +2 students.
16. To compare the problem solving ability related category among government male and private male +2 students.
17. To compare the problem solving ability among government female and private female +2 students.
18. To compare the problem solving ability of unrelated category among government female and private female +2 students.
19. To compare the problem solving ability of related category among government female and private female +2 students.

HYPOTHESES

H_1. There is significant difference in the mean score of problem solving ability of government and private +2 students.
H_1(a). There is significant difference in the mean score of problem solving ability of unrelated category of government and private +2 students.
H_1(b). There is significant difference in the mean score of problem solving ability of related category of government and private +2 students.
H_2. There is significant difference in the mean score of problem solving ability of male and female +2 students.
H_2(a).There is significant difference in the mean score of problem solving ability of unrelated category of male and female +2 students.
H_2(b). There is significant difference in the mean score of problem solving ability of related category of male and female +2 students.
H_3. There is significant difference in the mean score of problem solving ability of government male and government female +2 students.
H_3(a). There is significant difference in the mean score of problem solving ability of unrelated category of government male and government female +2 students.
H_3(b). There is significant difference in the mean score of problem solving ability of related category of government male and government female +2 students.
H_4. There is significant difference in the mean score of problem solving ability of private male and private female +2 students.
H_4(a). There is significant difference in the mean score of problem solving ability of unrelated category of private male and private female +2 students.
H_4(b). There is significant difference in the mean score of problem solving ability of related category of private male and private female +2 students.
H_5. There is significant difference in the mean score of problem solving ability of government male and private male +2 students.
H_5(a). There is significant difference in the mean score of problem solving ability of unrelated category of government male and private male +2 students.
H_5(b). There is significant difference in the mean score of problem solving ability of related category of government male and private male +2 students.
H_6. There is significant difference in the mean score of problem solving ability of government female and private female +2 students.
H_6(a). There is significant difference in the mean score of problem solving ability of unrelated category of government female and private female +2 students.
H_6(b). There is significant difference in the mean score of problem solving ability of related category of government female and private female +2 students.

Tool Used

The following tool is used for the study:
Set in Problem Solving by Anagram Solution.

STATISTICAL TECHNIQUES:

1. Mean, standard deviation and SE_D of scores of problem solving ability of +2 students in calculated.
2. 't' ratio is calculated to know whether there is mean difference of problem solving ability in government and private +2 students.
3. Data is represented diagrammatically.

PROBLEM

A problem (or problematic situation) is defined as any life situation or task (present or anticipated) that demands a response for adaptive functioning but no effective response is immediately apparent or available functioning but no effective response is immediately apparent or available to the person or people confronted with the situation because of the presence of one or more obstacles . The demands in a problematic situation may originate in the environment (e.g., objective task demands) or within the person (e.g. a personal goal, need, or commitment). The obstacles might include novelty, ambiguity, unpredictability, conflicting stimulus demands, performance skill deficits, or lack of resources. A particular problem might be a single time-limited event (e.g., missing a train to work, an acute illness), a series of similar or related events (e.g., repeated unreasonable demands from a boss, repeated violations of curfew by an adolescent), or a chronic, ongoing situation (eg., continuous pain, boredom, or feelings of loneliness). An interpersonal problem is a special kind of real-life problem in which the obstacle is a conflict in the behavioural demands or expectations of two or more people in a relationship (Jacobson &a Margolin, 1979). In this context, interpersonal problem solving may be described as a cognitive interpersonal process aimed at identifying or discovering a resolution to the conflict that is acceptable or satisfactory to all parties involved. Hence, according to this view, interpersonal problem solving is a "win-win" approach to resolving conflicts or disputes rather than a "win-lose" approach.

A problem exists when a problem solver has a goal but does not know how to accomplish it. Specifically, a problem occurs when a situation is in a given state, a problem solver wants the situation to be in a goal state, and the problem solver is not aware of an obvious way to transform the situation from the given state to the goal state. Problem can be defined broadly as situations in which we experience uncertainty or difficulty in achieving what we want to achieve. Problem arise when an obstacle prevents us reaching an objective.

Objective: Something we have decided we need to achieve.
Obstacle: Anything that prevents us achieving an object.
Object + obstacle = Problem

Definitions: According to **Webster's Dictionary (1979), "**In mathematics, anything required to be done, or requiring the doing of something. A question ------that is perplexing or difficult."

Kantowski(1980) stated that "A problem is a situation for which the individual who confronts i has no algorithm that will guarantee a solution. That person's relevant knowledge must be put together in a new way to solve the problem."

Grouws,(1996) says, problem is a situation where something is to be found or shown and the way to find or show it is not immediately obvious.

Stanic and Kilpatrick(1989) wrote: Problems have occupied a central place in the school mathematics curriculum but problem solving has no.(page-1)

SOLUTION

A solution is a situation-specific coping response or response pattern (cognitive or behavioural) that is the product or outcome of the problem solving process when it is applied to a specific problematic situation. An effective solution is one that achieves the problem-solving goal (i.e., changing the situation for the better or reducing the emotional distress that it produces), while at the same time maximizing other positive consequences and minimizing negative consequences. The relevant consequences include both personal and social outcomes, long-term as well as short-term. With specific reference to an interpersonal problem, an effective solution is one that resolves the conflict or dispute by providing an outcome that is acceptable or satisfactory to all parties involved. This outcome may involve a consensus, compromise, or negotiated agreement that accommodates the interests and well- being of all concerned parties.

PROBLEM SOLVING ABILITY

Problem – Solving (P-S) is a principal component of mathematics education from the time of its emergency as a self – sufficient science until today Problem solving is a process and skill that you develop overtime to be used when needing to solve immediate problems in order to achieve a goal.

Definitions

Carpenter (1988) emphasized that learning " a collection of problem solving procedures."

Lester (1985) stated this way: The primary purpose of mathematical problem –solving instruction is not to equip students with a collection of skills and processes, but rather to enable them to think for themselves. The value of skills and process instruction should be judged by the extent to which the skills and processes actually enhance flexible, independent thinking.

Lajoie (1992) defines mathematical problem solving as: "modelling the problem and formulating and verifying hypotheses by collecting and interpreting data, using pattern analysis, graphing, or computers and calculators."

Dowshen (1980) conducted a critical analysis of the research on problem solving in secondary school mathematics between the years of 1925- 1975. Out of twelve conclusions, one stated the following. "Characteristics of an effective problem solver can be identified. An effective problem solver: tends to use a wide range of heuristic strategies; seems to be follow some plan of attack when solving a problem and exhibits trial and error ability; has good arithmetic reasonableness and is to estimate an answer; and usually obtains an understanding of a problem before trying to solve it." National Council for Teachers of **Mathematics, (2000)** Problem solving is engaging in a task for which the solution method is not known in advance.

Cockcroft (1982) also attempted to characterized problem solving: The ability to solve problem is at the heart of mathematics. Mathematics is only useful to the extent to which it can be applied to a particular 1& situation and it is the ability to apply mathematics to a variety of situations to which we give the name problem solving.(page-249) Krulik and Rudnick (1980) also define problem solving as the means by which an individual uses previously acquired knowledge, skills, and understanding to satisfy the demands of an unfamiliar situation. The student must synthesize what he or she has learned, and apply it to a new and different situation.(p. 4) Ormrod, (1999) explains when learning in one situation facilitates learning or performance in another situation."

PROBLEM –SOLVING STYLES

Rational problem solving is a constructive problem-solving style that is defined as the rational, deliberate, and systematic application of effective problem-solving skills. As noted earlier, this model identifies four major problem-solving skills: (a) problem definition and formulation, (b) generation of alternative solutions, (c) decision making, and (d) solution implementation and verification. In problem definition and formulation, the problem solver tries to clarify and understand the problem by gathering as many specific and concrete facts about the problem as possible, identifying demands and obstacles, and setting realistic problem-solving goals (e.g., changing the situation for the better, accepting the situation, and minimizing emotional distress).

In the generation of alternative solutions, the person focuses on the problem-solving goals and tries to identify as many potential solutions as possible, including both conventional and original solutions. In decision making, the problem solver anticipates the consequences of the different solutions, judges and compares them, and then chooses the "best" or potentially most effective solution. In the final step, solution implementation and verification, the person carefully monitors and evaluates the outcome of the chosen solution after attempting to implement it in the real-life problematic situation (for a more detailed description of these skills, the reader is referred to D'Zurilla & Goldfried, 1971; D'Zurilla & Nezu, 1999; D'Zurrila et al.,2002).

Impulsivity-carelessness style is a dysfunctional problem-solving pattern characterized by active attempts are narrow, impulsive, careless, hurried, and incomplete. A person with this problem-solving style typically considers only a few solution alternatives, often impulsively going with the first idea that comes to mind. In addition, he or she scans alternative solutions and consequences quickly, carelessly, and unsystematically, and monitors solution outcomes carelessly and inadequately.

Avoidance style is another dysfunctional problem-solving pattern char. Characterized by procrastination, passivity or inaction, and dependency. The avoidant problem solver prefers to avoid problems rather than confronting them head on, puts off problem solving for as long as possible, waits for problems to resolve themselves, and attempts to shift the responsibility for solving his or her problems to other people.

THEORIES OF PROBLEM SOLVING

Many current views of problem solving, such as described in Holyoak and Morrison's Cambridge Handbook of Thinking and Reasoning (2005) or Marsha Love's 2002 review of research on problem solving, have their roots in Gestalt theory or information processing theory.

Gestalt Theory: The Gestalt theory of problem solving, described by Duncker (1945) and Wertheiner(1959), holds that problem solving occurs with a flash of insight. Mayer (1995) noted that insight occurs when a problem solver moves from a state of not knowing how to solve a problem to knowing how to solve a problem. During insight, problem solvers devise a way of representing the problem that enables solution. Gestalt psychologists offered several ways of conceptualizing what happens during insight: insight involves building a schema in which all the parts fit together, insight involves suddenly reorganizing the visual information so it fits together to solve the problem, insight involves restating a problem's givens or problem goal in a new way that makes the problem easier to solve, insight involves removing mental blocks , and insight involves finding a problem analog (i.e., a similar problem that the problem solver already knows how to solve). Gestalt theory informs educational programs aimed at teaching students how to represent problems.

Information Processing Theory

The information processing theory of problem solving, as described by Newell and Simon (1972), is based on a human computer metaphor in which problem solving involves carrying out a series of mental computations on mental representation. The key components in the theory are as follows: the idea that a problem can be represented as a problem space- a representation of the initial state, goal state, and all possible intervening states – and search heuristics- a strategy for moving through the problem space from one state of the problem to the next. The problem begins in the given state , the problem solver applies an operator that generates a new state, and so on until the goal state is reached. For example, a common search heuristics is means –ends analysis, in which the problem solver seeks to apply an operator that will satisfy the problem –solver's current goal; if there is a constraint that blocks the application of the operator than a goal is set to remove the constraint , and so on. Information processing theory informs educational programs aimed at teaching strategies for solving problems.

Teaching of Problem Solving

In the previous section, instructional methods where examined that are intended to promote problem-solving transfer .However, a more direct approach is to teach people the knowledge and skills they need to be better problem solvers. Mayer(2008) identified four issues that are involved in designing are problem solving course.

What to teach. Should problem solving courses attempt to teach problem solving as a single, monolithic skill (e.g., a mental muscle that needs to be strengthened) or as a collection of smaller, component skills? Although conventional wisdom is that problem solving involves a single skill, research in cognitive science suggest that problem solving abilities is a collection of small component skills.

How to teach. Should problem- solving courses focus on the product of problem solving (i.e., getting the right answer) or the process of problem solving(i.e., figuring out how to solve the problem)? While it makes sense that students need practice in getting the right answer (i.e., the product of problem solving), research in cognitive science suggests that students benefit from training in describing and evaluation the methods used to solve problems (i.e., the problem solving). For example, one technique that emphasizes the process of problem solving is modelling, in which teachers and students demonstrate their problem solving methods.

Where to teach. Should problem solving be taught as a general, stand alone course or within specific domains (such as problem solving in history, in science, in mathematics, ETC.)? Although conventional wisdom is that students should be taught general skills in stand-alone courses, there is sufficient cognitive science research to propose that it would be effective to teach problem solving within the context of specific subject domains.

When to teach. Should problem solving be taught before or after students have mastered corresponding lower-levels? Although it seems to make sense that higher-order thinking skills should be taught only after lower-level skills have been mastered, there is sufficient cognitive science research to propose that it would be effective to teach higher-order skills before lower-level skills are mastered.

In this section, three classic problem-solving courses are described that meet these four criteria and that been subjected to rigorous research study: the Productive Thinking Program developed by Covington, Crutchfield, and Davies(1966), Instrumental Enrichment developed by Feuerstein(1980), and Odyssey described by Nickerson (1994). The Productive Thinking Program consisted of 15 cartoon-like booklets intended to teach thinking skills to elementary school children. Each booklet presented a detective-type story- such a story about a bank robbery- and students learned how to generate

hypotheses-such as who might have done it- and evaluate hypotheses using information in the booklet. Child characters in the booklet modeled problem-solving methods, and adult characters offered commentary and hints. Overall, Mansfield, Busse, and Krepelka(1978) reported that students who learned with the Productive Thinking Program showed greater improvements in their ability to solve similar detective-type problems as compared to students who had not received the training.

In Instrumental Enrichment, students who had been identified as mentally retarded based on a traditional intelligent test were given concentrated classroom instruction in how to solve traditional intelligence test items. In a typical lesson, the teacher introduces the class to an intelligence test item; then, the class breaks down into small groups to devise ways to solve the problem; next, each group reports on is solution method to the whole class; and finally, a teacher-led discussion ensues in which students focus on describing effective methods for solving the problem. Evaluation studies reported by Feuerstein(1980) show that students who received this training on a regular basis over several years showed greater gains in non-verbal intelligence than did non-trained students.

Finally, in Odysseyy, middle-school students received training in how to solve intelligence test problems, using a procedure somewhat like Instrumental Enrichment, and with similar results. Perkins and Grotzer reported that the training "enhanced the magnitude of students 'intelligent behaviour [on] authentic tasks at least in the short term" (2000, p.496). Overall, each of these courses met the criteria for what to teach (i.e., a collection of small component skills), how to teach (i.e., using modelling to focus on the process of process solving), where to teach (i.e., teaching specific skills), and when to teach (i.e., teaching before all lower-level skills were mastered). Although none of these programs is currently popular, courses based on these four criteria are likely to be successful.

CLASSIFYING TYPES OF PROBLEM SOLVERS

In the literature one finds references to "good" and "poor", "expert" and "novice", "successful" and "unsuccessful" problem solvers among many other categories. Comparing the behaviours between successful and unsuccessful problem solvers, Dodson(1972) found that good problem solvers were superior with respect to:

a) Overall mathematics achievement,
b) Verbal and general reasoning ability,
c) Spatial ability,
d) Positive attitudes,
e) Resistance to distraction,
f) Level of field independence, and
g) Divergent thinking.

Krutetskii(1976) found that a major difference between good and poor problem solvers lay in their perception of the important elements of the problems they were attempting to solve. Good problem solvers typically lad certain abilities that poorer problem solvers lacked:

a) The ability to distinguish relevant from irrelevant information,
b) The ability to see quickly and accurately the mathematical structure of a problem,
c) The ability to generalize across a wide range of similar problems, and
d) The ability to remember a problem's formal structure for a long time.

Krutetskii also noted that good problem solvers tended to recall the structural characteristics of the problem and to forget its details, whereas poor problem solvers tended to recall specific details of the problem. Silver (1979) observed this same difference between good and poor problem solvers in their recall of problem structure, however , unlike Krutetskii , good problem solvers in Silver's study tended to have reasonably recall of contextual details of the problems. Silver indicated that the poor problem solver difficulties in recalling the structure of the problems could be attributed to their lack of ability in noticing the problem structure, rather than a general lack of memory, since poor problem solvers exhibited more accurate recall of problem details than did most good problem solvers.

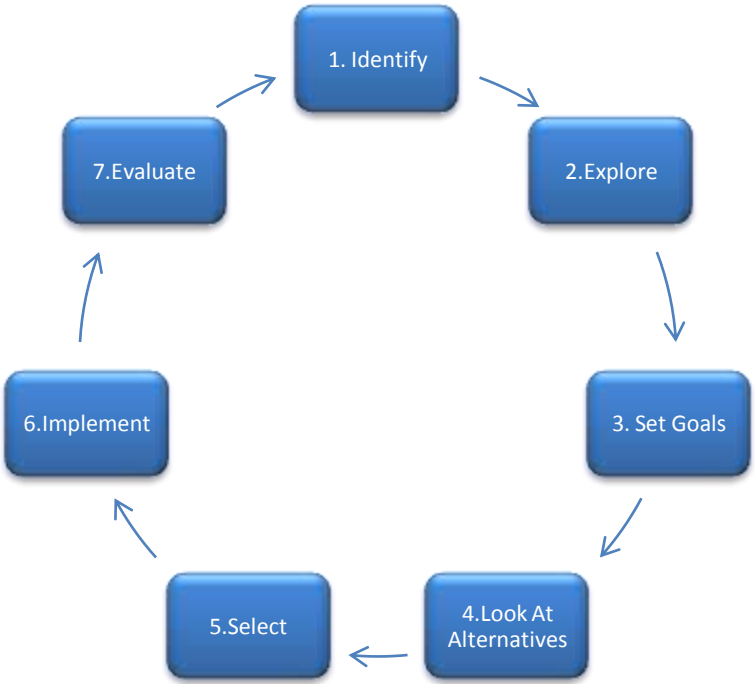
Schoenfeld's (1985, 1987) research suggested that good problem solvers can be distinguished from poor problem solvers in at least five important ways:

1. The knowledge of good problem solvers is well connected and composed of rich schemata while that of poor problem solvers is not
2. Good problem solvers tend to focus their attention on structural feature of problems while poor problem solvers focus on surface features.
3. Good problem solvers are more aware than poor problem solvers of their strengths and weaknesses as problem solvers.

4. Good problem solvers are better than poor problem solvers at monitoring and regulating their problem-solving efforts.
5. Good problem solvers tend to be more concerned than poor problem solvers about obtaining "elegant" solutions to problems.

PROCESS OF PROBLEM SOLVING

There is a variety of problem solving processes. But each process consists of a series of steps identifying the problem, searching for possible solutions, selecting the most optimal solution and implementing possible solutions. It is useful to view problem solving as a cycle because, sometimes, a problem needs several attempts to solve it or the problem changes. The diagram below shows a seven step problem solving steps.



1. Identifying the problem

The first step in problem solving process is sizing up the situation to identify the problem. That sounds simple enough, but sometimes managers might way be uncertain about what the problem is; they might just feel general anxiety or be confused about what is getting in the way of their objectives. If that is the case, they can ask themselves or their friends or professional experts.

2. Exploring the Problem

Having identified the problem manager analyze it to see what the root causes. Often people get caught up in symptoms or effects of a problem or issue and never get down to the real cause. They get mad at someone's attitude, anger, or actions, which are not the cause of the problem. The key here is to focus on analyzing the problem for the real cause without being affected by emotional issues. Seeing answer for questions such as the following will help explore the problem: identify the problem–Ask who.....? Who says that this is a problem? Who caused or is causing the problem? Whom does it or will it affect? Who has done something about the problem?

Identify the problem-Ask what?

What happened or will happen? What are the symptoms? What are the consequences for others? What circumstances surround the occurrence of the problem? What is not functioning as desired?

Identify the problem-Ask when?

Did it or will happen? Why did it happen? When did it first occur?

Identify the problem-Ask where?

Where is the problem occurring? Did it or will it have an impact? Where did it have an impact?

Identify the problem-Ask why?

Why is this, a problem? Did it or will it occur? Why did it occur? Why was nothing done to prevent the problem from occurring? Why did no one recognize and do something about the problem at the earliest? Why is a response needed now?

Identify the problem-Ask how?

How should the process be working? How are others dealing with this or similar problems? How do you know this is a problem; what supporting information do you have? Once the cause is found, plans can be made to fix it. Analyzing , implies gathering information.

3. Set goal

Having explored and analyzed the problem, managers should be able to write a goal statement that focuses on what is the successful end of process. Making and writing down a goal statement: Helps them to clarify the direction to take in solving the problem; and gives them something definite to focus on i.e., what will occur as a result of the solution? This whole process is about closing or fixing the gap between the problem and the goal. Writing down the problem ensures that they are not side-tracking from, but addressing the problem.

4. Look at alternatives

Now that the problem has been analyzed, the managers can begin to develop possible solutions. This is a creative as well as practical step where every possible solution is identified. They should identify the various alternative solutions available to them through such techniques as: analysis of past solutions, reading, thinking, asking questions, discussing, viewing the problem with fresh eyes, brainstorming, sleeping on it.

5. Select the best solution

Now these are a wide variety of possible solutions, it is time to select the best solution to fix the problem, given the circumstances, resources and other considerations. Here the managers are trying to figure out exactly what would work best, given the nature of the problem . There are always a number of things that can affect a solution , for instance, money, time, people, procedures, policies, rules and so on, all of these factors must be thought about. Managers should priorities the solutions by their effectiveness. This is a slow process of elimination. There may be some possible suggestions that are immediately eliminated. Eventually, managers should narrow down the choices to one best possible solution which will promise the best or optimal outcomes.

6. Implementation

Implementation is a crucial part of problem solving process. In order to implement the solution chosen, managers must have an action plan and communicate it to those directly and indirectly affected. Allen ("Problem solving and decision making") says that communication is most effective when it precedes actions and events. In this way, events conform to plansand events happen when, and in the way, they should happen. Managers should answer the vital questions before they are asked, like-What should be communicate? What is the reason for the decision? Whom will affect and how? What are the benefits expected for the individuals, the department, and the organization? What adjustment will be required in terms of how work will be done? What, specifically, is each individual's role in implementing the decisions? What results are expected from each individual? When does the action called for by the decision go into effect? Communicating answers to these questions can overcome any resistance that otherwise might be encountered.

7. Evaluation

This is the final step in the problem solving process. Managers should review the effectiveness of the solution against desired outcomes. Did the solution work? If not, why not? What went right, and what went wrong? What adjustments do they have to make to ensure that the solutions work better? This stage requires careful analysis that improves upon the best solutions.

SKILLS OF PROBLEM SOLVING

Problem solving requires two distinct types of mental skill, Analytical and Creative.

Analytical or logical thinking include such as ordering, comparing, contrasting, evaluating and selecting. It provides a logical frame work for problem solving and helps to select the best alternative from those available by narrowing down

the range of possibilities (a convergent process). Analytical thinking often predominates in solving closed problems, where the many possible causes have to be indentified and analyzed to find the real cause.
Creative thinking is a divergent process, using the imagination to create a large range of ideas for solution. It requires us to look beyond the obvious , creating ideas which may, at first, seem unrealistic or have no logical connection with the problem. There is large amount of creative thinking in solving open problem. The creative thinking skills can be divided into several key elements.

Fluency – producing many ideas.
Flexibility – producing a broad range of ideas
Originality – producing uncommon ideas.
Elaboration – developing ideas.

SIGNIFICANCE OF THE STUDY

Problem solving ability is important because all have to make decision. Everyone face problems everyday that need solving. Whether the issue is small or big; we all set goals for ourselves, face challenges, and strive to overcome them. It is important to realize that being a problem solver is not just an ability; it is a whole mind-set, one that drives people to bring out the best in themselves and to shape the world in a positive way.

Mathematics is "not something which is passively learned, but is something which people do" (Dilworth, 1966, p.91), and problem solving "lies at the heart of doing mathematics" (Lester, 1980, p.29) mainly because of the fact that it provides students with a meaningful and powerful means of developing their own understanding in mathematics (Toulk & Olkum, 2002). For nearly three decades, there have been attempts all around the world to make problem solving "the focus of school mathematics" (NCTM, 1980, p.1) rather than being an isolated part of the mathematics curriculum. It is stated that "problem solving instruction is most effective when students sense two things; that the teacher regards problem solving as an important activity, and that the teacher actively engages in solving problems as a regular part of mathematics instruction" (Lester, 1980, p.43). That is, what teachers believe is very critical to how we improve problem solving practices in our mathematics education.

RESULT AND CONCLUSION

The following conclusions have been derived from the present investigation. These are following:

1. There exists significant difference in the mean scores of problem solving ability of government and private +2students.
1a. There exists significant difference in the mean scores of problem solving ability of unrelated category of government and private +2students.
1b. There exists significant difference in the mean scores of problem solving ability of related category of government and private +2students.
2. There exists no significant difference in the mean scores of problem solving ability of male and female +2students.
2a. There exists no significant difference in the mean scores of problem solving ability of unrelated category of male and female +2students.
2b.There exists no significant difference in the mean scores of problem solving ability of related category of male and female +2students.
3. There exists no significant difference in the mean scores of problem solving ability of government male and government female +2students.
3a.There exists significant difference in the mean scores of problem solving ability of unrelated category of government male and government female +2students.
3b.There exists significant difference in the mean scores of problem solving ability of related category of government male and government female +2students.
4. There exists no significant difference in the mean scores of problem solving ability of private male and private female +2students.
4a.There exists no significant difference in the mean scores of problem solving ability of unrelated category of private male and private female +2students.
4b.There exists no significant difference in the mean scores of problem solving ability of related category of private male and private female +2students.
5. There exists significant difference in the mean scores of problem solving ability of government male and private male +2students.
5a. There exists significant difference in the mean scores of problem solving ability of unrelated category of government male and private male +2students.
5b. There exists significant difference in the mean scores of problem solving ability of related category of government male and private male +2students.

6. There exists significant difference in the mean scores of problem solving ability of government female and private female +2students.
6a. There exists significant difference in the mean scores of problem solving ability of unrelated category of government female and private female +2students.
6b. There exists significant difference in the mean scores of problem solving ability of related category of government female and private female +2students.

Suggestions for Further Research

Due to constraints of time and resources at the research, the present research has many limitations. Hence the results and conclusions bear the stamp of these limitations and must be seen and interpret in these contexts only. This leaves out the number of avenues unexplored. These are given below in the shape of suggestions for further research:

1. The present research problem can be studied for the other districts of Punjab.
2. It may be extended to other states of India and comparisons can be made.
3. It may be tried on a larger sample also.
4. It may be done on B.Ed. Trainees and Teachers as well.
5. It may be conducted on college students also.

EDUCATIONAL IMPLICATIONS

On the basis of results and conclusions the under mentioned implications can be drawn:

- The study enables the educators to provide the equal opportunities to male and female candidates as they have no significant difference in problem solving ability.
- The present study helps the teachers to evaluate the problem solving ability of students.
- By this study, teacher would find the obstacles in the way of problem solving.
- Teachers would incorporate and comprehended how to perform well defined procedures.
- Teacher would acquire more information about the individual difference among the students.
- Teachers can provide motivation and increase confidence to improve the problem solving performance and to remove confusions and frustration among student.

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