REVIEWS IN THEPROBLEM SOLVING

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Abstract

Problem solving is considered one of the thinking processes, which is utilized by the individuals upon facing a problem or a challenging situation. The purpose of the problem solving is to find solutions to the problem or the challenge. Facing problems and challenges is considered frequent, dynamic events that the individual face during his/her development and interactions. The necessity for problem solving become of tremendous importance when the individual faces a problem that can have a great impact on his/her life. Problem solving is also initiated when a previous solution to the problem fails or short of resolving the issue completely, This article present the definition ofProblem Solving, Problem solving stages, development of problem solving conduct and Problem solving strategies

Keywords: Problem Solving,Problem solving stages,Problem solving strategies

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Introduction

The knowledge is versatile and thus, it is important to teach the students the different methods for problem solving. Problem solving is an essential skill on the academic and personal level. Problem solving can increase the knowledge of the student and can lead him/her to be independent. Moreover, problem solving can assist the individuals in taking well-calculated decisions, which can manifest the control of the individual over arising problems and challenges. Problem solving puts the student in a real-life situation that aims to balance his/her knowledge.

1. Definition of Problem Solving

Problem solving is of a great importance; both on the individual and social levels. Problem solving can improve the ability of an individual to adapt to the changing situations, and provide him/her with tools to conquer the problem or challenges. On the other hand, problem solving is important on the social level because it can drive the advancement and development of the society with regards to social and technical aspects.

Problem solving skills depend on using a logical, systematic way of thinking. The stages for resolving the problem are: (1) understanding the problem, (2) collecting pertaining information, (3) envisioning of the plausible solution, (4) balancing and assessing the potential solutions, (4) executing the solutions, (5) assessing the solution effectiveness in resolving the problem (Dawood&Hamdi, 2004).

The problem can be defined as: "The potential to improve". Therefore most of the gifted and talented student individuals seek problems instead of their avoidance (Harris, 2002). This is because gifted and talented student individuals have the basic knowledge that can identify the deficiencies and potential for improvement.

Ormond (1995) views the problem as a situation that requires treatment or preparation to suit a certain use or application. Problem solving requires the connection between basic knowledge and the elements of the problem in order to establish an outcome, which can range from simple to complex according to the type of the problem and its complexity.

Many people thing that problem solving is equivalent getting rid of these problems in such a way that the problem existence is eliminated. Of course such view is not reasonable. Many of the problems cannot be eliminated, for example, the complete removal of dust and disease is not realistic. Problem solving signifies the processes that can help diminish and/or cope with the problem. Problem solving can also be viewed as the attempt to score in a situation, where the achieving such goal is not possible (Haris, 2002).

On the other hand, Krulik and Rudnick (1980) defined problem solving as a thinking process that the individual employs based on his/her acquired previous knowledge and skills in order to respond to arising, unfamiliar situation. The response aims at formulating a method that attempts to resolve the ambiguity and confusion of the problem. Lee (1999) views the problem as a new, dynamic situation that requires treatment, preparation, taking a decision, or formatting of a plan.

Problem solving is important because problems constantly arise in the individual life, and in many cases the situation demands that the individual take fast decisions, which can have great impact on the individual's life (Abo-Asa;ad, 2008).

Problem solving can be applied to the learning process of the students. In such case, the problem solving skills allow the student to reform his/her role in the educational process. This is due to the fact that problem solving can assist students to become proactive. Problem solving skills can also teach the student to organize his/her experiences to establish a better learning. Generally, problem solving have a great impact on the education of the individual (Ma'aly, 2003).

There are several methods for problem solving, and they vary significantly. Some of the problem solving methods are: trial and error, discovery, following systematic processes, data correction, and extrapolation (Jarwan, 2010).

2. Problem solving stages

The problem solving consists of six stages.

2.1 First stage: Sensing of problem and overall direction

In this stage the individual realizes the problem and seeks to resolve it in a systematic and logical pattern. In this stage, the individual becomes aware of the inhibitory factors that prevent him/her from reaching the resolution or desired outcome.

2.2 Second stage: Outlining the problem and data collection

The individual states the problem by using finite, simple, accurate words, which results in creating the general outline of the problem. Ma'aly (2003) identified three elements that can influence outlining the problem:

1.   Personal factors: Constituters unique, personal aptitudes, self-perception, emotion, and morals.

2.   Environmental factors: describes the impact of the environment and surrounding on the problem's complexity and its tracts. This, for example, can include the interconnection and relation of the problem to other individuals and their influence on the problem.

3.   Factors related to the problem itself: such as the nature of the problem and its volume.

Outlining the problem requires the individual to define the primary and secondary elements of the problem. At this stage, the individual should concentrate on the primary elements of the problem while excluding the elements that is not directly linked to the problem.

In outlining the problem, it is important that the individual collects data pertaining to the problem, mainly, and in the initial phase, by asking him/herself questions: Why is this issue a problem? How does it influence me? What are the consequences if the problem persists? How do I feel about the problem? What incentives do I have to change the situation? Do I have any anxiety from the intended changes? How confident I am on my ability to execute the necessary changes?

Collection of data also necessitate that the individual seeks to investigate available resources that can help understand, analyze, and resolve the problem. The resources can be in the form of book, consultations with friends, teachers, or family (Dawood&Hamdy, 2004).

2.3Third stage: Construction of hypothesis and solutions

The construction of hypothesis and solutions is generally based on logical premises or evidence in the problem, which can be obvious or concealed within the problem. The construction of hypothesis and solutions is also linked to the personal experiences of the individual. The construction of hypothesis and solutions is strongly influenced by the basic knowledge of the individual, which can be retrieved and employed to assist in formulating as many as possible of plausible, potential solutions (Dawood&Hamdy, 2004). The role of the teacher in promoting this stage includes:

1.   Training students to think in all aspects and possible solution to the problem.

2.   Providing students with extra resources that can assist them in generating alternative solutions.

3.   Discussing the potential alternatives and reforming and improving them.

4.   Encouraging students on generating alternatives without evaluating them.

On the other hand, Dawood and Hamdy (2004) view the student's role in construction of hypothesis and solutions as means to train the students on differentiating and appropriating different hypothesis and solutions, and it includes:

1.   Searching for multiple, alternative solutions by utilizing available resources such as books and experiences of others.

2.   Choosing of one suitable solution from the different possible solutions, and the student should explain the reasoning for his/her selection of this particular solution.

3.   The student should execute and evaluate the selected solution.

2.4 Fourth stage: Balancing alternatives and making decisions

In this stage, the individual compares the different potential alternatives of the solution, and selects only one solution. The individual should be able to discuss and debate the reasoning for his/her selection of this particular solution. The individual should restate the solution to provide strong, accurate depiction of the solution, and most importantly to formulate the solution with an embedded rubric, for later evaluation.

It may be difficult to formulate alternative solutions to the problem, and instead, a new out of the ordinary solution is needed. To achieve such new solution, creative thinking strategies should be engaged. One of the most applicable creative thinking strategies for the formulation of a new solution is brainstorming. Brainstorming can be applied on the individual or group level. Brainstorming enhances the thinking process and abilities, and can help in solving scientific and general life problems. The main goals of brainstorming are: (a) generation of creative solutions to a problem, (b) creating contradictions and challenges to opponents, (c) identifying other problems and creation of new projects. Brainstorming has multiple stages: Identification of the problem, generation of ideas, finding a solution. According to Dawood and Hamdy (2004), brainstorming employs two basic strategies:

1.   Postponing evaluation of ideas: In this strategy, the participants are encouraged to present all their ideas during the brainstorming session without any judgment or evaluation of the presented ideas.   The idea here is to create an atmosphere that encourages individuals' participation and involvement without imposing any kind of prejudice. In such setting, every participant's idea is valued, and hence individuals become highly engaged and responsive.

2.   Increasing quantity can lead to better quality: This stems from the associative school concept "quantity leads to quality". This rule organizes the ideas which are generated during a brainstorming session in a pyramid. The common ideas are generated in high numbers and constitutes the base of pyramid, while innovative ideas are the least in number and is represented by the pyramid apex.

2.5 Fifth stage: Establishing execution strategies

In this stage, a plan for executing the selected solution is prepared. The plan should integrate all decisions and points that were agreed on. Moreover, the plan should include detailed, technical description of the different tasks, assignments of the tasks, time frame for the execution of the solution, and procedures for the assessment of the progress (Dawood and Hamdy, 2004).

2.6 Sixth stage: Assessment and Reevaluation

Assessment should be conducted in every stage of the problem solving. Of course, challenges can occur in the sensing of problem, data collection, construction of the solutions, making

decision, or execution. Once a challenge is identified at any stage, the problem solving should be reevaluated. Assessment is concerned with identifying concerns, and finding strategies to avoid such challenges within s short time frame.

The assessment is based on the findings of experimental application or validity of the presented solution. However, it is possible to generalize the result on comparable cases, which have similar variables. Generalization is also possible for cases with similar relations between the variables (Ma'aly, 2008; Abo-Asad, 2003).

Guilford ( ) presented a simplified model for problem solving, which is based on the theory of structure of intellect (SI). Guilford named his model "the structure of intellect problem solving model". This model includes the creative thinking at the stage of generation of ideas, and the stage of finding solutions from the individual's base of knowledge. Guilford also considers the creative thinking as the driving force for evaluation, and depends on eliminating the alternatives to come up with an original idea or a new solution (Jarwan, 2005).

3. Problem solving strategies

Al-Kanany (2005) complies the strategies as follows:

1. Standard problem solving strategy: This includes the employment of all of the problem solving stages but within the standard, ordinary thinking style.

2. Creative problem solving strategy: This strategy requires a high level of sensitivity in identifying the problem, and making inferences and relations in an unordinary fashion. It also includes the application of non-classical methods to achieve outstanding, creative results.

4. Development of problem solving conduct

Al-Atoom (1999) mentioned several elements that can enable the individual to bypass the problem. These elements are:

1. Estimating the size of the problem: It is very beneficial to know the size and components of the problem before attempting to find solutions. Knowing the size of the problem can give insights on the breadth of the problem and its implication. Consequently, the individual

is more efficient in identifying the needed resources and tools. This, of course, prevent any sort of surprise elements that can impede the quest for solutions, and instead, can direct the individual to seek the right conditions and resources.

2.	Outlining solutions: It is recommended to establish more than one solution to the problem. This can help the individual in selecting the best-fit solution, and additionally, provide alternative solutions in case the chosen solution fails.

3.	Recalling of information: The individual's ability to recall a good amount of information from his/her base knowledge or previous experiences can assist in assessing the problem and evaluating possibilities before the taking any decision about the problem. Some of the supportive procedures for recalling of information is the detailed documentation and/or tabulating of events and experiences. This enable the individual to compare between the current problem and previous experiences.

4.	Searching for key ideas for solutions: Finding key elements for the solution can direct the individual for better results, and can provide a road map for the construction of the solution. The key elements can also function as indicators for sensitive areas within the problem.

5.	Training on generating multiple solutions: This is crucial as sole solution for a problem may fail to work, and thus having multiple alternatives is important.

6.	Sensible motivation and realistic outcome: feeling over or under-motivated can decrease the success rate of the solution. The individual should maintain an appropriate objectivity and readiness to generate suitable, high-quality outcomes.

5. Previous studies on problem solving

In 1996, Ganem conducted a study titled: "Strategies for Problem Solving" on Three Groups of Students; Gifted and talented student, High Achievers, and Low Achievers. The students were tenth graders and from both genders. The total number of sample was 60, which was divided equally between the three groups. The study findings indicated that the most used problem solving strategies used by the gifted and talented students were the continuing activities, planning for solutions, and putting hypothesis, strategies that depend on self-activism, .making decisions, and evaluation of the solution. On the other hand, the high achievers strategies comprised of identifying the problem, and making relations and connections, and comparison between positive and negative outcomes. The low-student achievers approached the problems

negatively and they mostly applied repetitive reading. For all three groups, the type and nature of the problem had a direct effect on the employed problem solving strategies.

Al-Adel and Abd-Alwahab (2003) study aimed at investigated the relationship between problem solving and background knowledge of the individual within groups with variant mental abilities. The study assessed the gifted and talented student and average student abilities in problem solving based on their background knowledge. The sample of the study consisted of a total of 326 students from both genders (120 males and 116 females). The researchers used the High Intelligence test and Abilities of Creative Thinking test that was prepared by Abd-Algafar (1970). The researchers also used their own tests: Academic Achievement, Assessment of Problem Solving, and Background Knowledge Skills. The researchers tested the result of their study using various statistical methods. The results confirmed (a) the presence of a relationship between the problem solving abilities and the background knowledge (b) both of the problem solving abilities and background knowledge are personal mental process, (c) the advancement of gifted and talented students in problem solving, (d) the presence of significant differences in the relations between students' problem solving abilities and the conscious usage of review and evaluation, (e) the impact of personal factors on the scores of students in all the assessment used except for review and evaluation, (f) the presence of an effect of students' mental abilities on the students' scores in all the assessments., (g) the presence of statistically significant differences between genders in problem solving in favor of male students.

The study of Maleeha (2003) aimed to investigate the relationship between short and long-term memory and problem solving. The study sample consisted of 920 tenth grade students. The researcher used three assessments:

(a)   Short-term Memory Test: consisted of two lists; the first contains ten Arabic general words, while the second list contained 10 foreign names.

(b)   Long-term Memory Test: is a story about two competing soccer teams. The story includes ten unusual Arabic names to increase the level of difficulty in remembering them.

(c)   Problem Solving Ability Test: This test was prepared by the researcher and consists of eight problems with varying complexity levels from the tenth grade mathematics curriculum.

Statistical analysis of the study findings revealed that (a) there is no relationship between the average scores of the students in the Short-term Memory and the students' problem solving abilities, (b) The existence of a relationship between the Long-term Memory and the students' problem solving abilities, (c) A correlation between students' scores in the Problem Solving Ability Test and the overall scores in both of the short and long-term memory tests.

Zins (1993) performed a study that was tilted: "The Improvement of the Problem Solving Skills for the Individuals Requesting our Consultation". The researcher did a theoretical analysis of consultations and concluded that that consultation may assist the individuals in problem solving, but it is necessary that the individuals acquire new skills that can increase the effectiveness of the problem solving process. The researcher also concluded that direct training is of crucial importance to direct individual behavior and personal communications, all of which can increase the abilities of problem solving.

Cornwell (2001) studied the effect of revealing personal psychological intelligence testing on problem solving, especially personal problems. The logistic of the study was to deliver to the individual his strong and weak abilities. The researcher then presented problems to the individual, and suggest solutions and strategies for their resolution. The researcher will then ask the individual about his/her opinion in the offered solution and asks him/her to come up with other solutions. In this way the, the individual is promoted to apply his own resolution to the problem. After analysis of the findings, which included analysis of consultees work and responses, It was evident that the knowledge of personal strengths and weaknesses increased the awareness of the individuals and assisted them in seeking the suitable strategies for problem solving.

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