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REVIEWING THE TEACHING STRATEGIES OF PROBLEM SOLVING IN MATHEMATICS ACHIEVEMENT

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ABSTRACT

Collaborative learning, research, and creativity and innovation are the most basic needs of the education community to train correctly. Thus, it is our duty to change our vision to traditional methods according to the new approach. No sane person dares to deny the reality that the efficiency and adequacy of teacher is the full-view mirror of adequacy and efficiency of education. Teacher is the key element and has the central role in offering quality and effectiveness to the education system. Therefore, teachers should take steps seriously in their scientific and professional promotion and exploring the mysteries of educational success. Therefore, teachers have to start the change from the classroom and communicate their successful experiences with others in order to set the scene for change in the total collection (from the change in the attitudes to the change in the functions). Generally, the project lesson is the primary form of the teachers' professional development in Japan.

Because Collaborative learning, research, and creativity and innovation are the most basic needs of the education community to train correctly and teacher is the key and central element in this topic, we found a gap between knowledge and practice in the context of problem solving and decided to resolve this challenge gap by providing new methods of teaching in collaboration with team members. It is hoped that this research could take an even small step in studying the objectives of the training program, method of presenting the material content, and removing the challenges.

Keywords: problem solving, math, collaborative learning

INTRODUCTION

The problem of academic achievement in mathematics is one of the most common problems in the educational system of the country which can be seen at all levels of

education. Karim zade (2000) states that many students have trouble in math; the problem is to the extent that some of the students admit that they are afraid of this lesson and resort to non-mathematical fields in order to escape from. Weakness in math and escaping from it is not always due to lack of talent or its difficulty. Factors such as the students' attitudes about math, the perceptions of parents from mathematics, perceptions of friends from mathematics, history of failure, and many others can affect progress in mathematics. The complexity of thinking and learning in the people on the one hand and the natural difficulty of concepts, skills, and reasoning in math, the failure of some teachers, not clearly defined educational goals, and other factors such as interest and motivate of the learners on the other hand, can result in the failure of many students in achieving good results in mathematics and in effect their aversion and lack of interest from this lesson. (Bassey, 2006)

Diagnostic test of math problem for third grade elementary school: This test is prepared for evaluating and comparing the performance of students with problem in the calculation in the third grade of elementary school, Mashhad and includes the sub-scales of geometric shapes, sizes diagnosis, one-to-one correspondence, counting, audio-visual continuity, place value, four basic operations, problem solving, and diagnosing the categories and numbers. Face validity 1, according to experts reflect the diagnostic purpose in mathematical problems. Regarding discriminant validity, since the test maintained separation between the two abnormal and normal groups in all sub-scales, it has a high reliability. The reliability coefficient of 1 was obtained as 96/0 in the method of the test (Malekpur, 1373).In the present study, Cronbach's alpha coefficient gave us the internal consist encyreliability estimate of 81/0.

Diagnostic test of inability in learning math of Malekpur (1373) for fourth grade elementary school: This was prepared to like the previous test and with the same objectives, but for the fourth grade in Mashhad (Malekpur, 1373). Its validity was calculated using discriminant validity; since the test maintained separation between the two abnormal and normal groups in all sub-scales, it has a high reliability. The reliability was obtained as 86/0 using the paralleltest method (Malekpur, 1373).The reliability of pilot test was 72/0 using Cronbach's alpha.

Problem solving skill

If we ask the math teachers about the main problem of students in mathematics, surely, they will say they are unable to resolve the problem. We saw the same issue in Timss

study. As the performance of the students is low in most problems of the written exam performance of students is low, we, in fact, can say that students do not have problem solving abilities or skills.

One reason for this failure is the lack of planning for teaching the problem solving skills to the student. In other words, teachers have not taught them how to solve the problem Whenever students encounter a problem and are unable to solve it, the teachers only tell them the response or solution of the problem and as a result the students' questioning, curious, and amazed look will remain with the question that:How could our teacher solve the problem? How did the solution come to his or her mind? Why we could not discover the problem?

In many cases, teachers who have tried to teach their students problem solving in some way, they have gone wrong and gave improper teachings. For example, they have their students: numbers in the problem are very important. Draw a line under them. Do not forget to use them. This false teaching has caused the students not to clearly recognize the information of the problem. When the following problem was raised for the students in third grade, they involved the number 747 in the problem operation and wrote the addition, subtraction, phrases with the number:

"A Boeing 747 with 237 passengers landed the airport and 130 passengers got off. Now how many passengers does the aircraft have?"

Or the students have been told that some words are very important in the problem. For example, if you saw the word "collection", it means addition; if you saw the word "difference", you need to subtract. That is why, in the following problem cited in Timss study, a group of fourth grade students participated in this study were wrong and instead of multiplying, added.

"In a movie theater, there are 15 rows of seats. In each row, there are19 seats. How many seats are there in the hall?" It is better that we do not use these teaching methods and lookfor a plan to train our students the problem solving.

Teaching problem solving

Is problem solving teachable? One reason for the lack of a plan to teach students problem solving is that, several years ago, math educators believed that problem solving is not teachable, but it is an art, feature, or ability that some people have and some do not. Therefore, no one tried to teach the students this skill. However, the number of those who conduct researches in this field are more. One of those who worked on the quality of problem-solving and training it was George Pulia. His work was published in the book "how to solve a

problem?" The defunct Dr. Ahmad Aram translated this book. He says in the introduction of his book:"I am a mathematician. I am not an expert in teaching mathematics, but I would like to know why can I solve a mathematical problem and others not? Why can some students solve a mathematical problem, but others can not?He followed the same questions and provided a model for thinking in problem solving and teaching the strategies. Pulia made two major points: 1. The four-stage model for thinking in problem solving, 2. Teaching the strategies. However, the second point is more important in the education.

Problem-solving strategies

Problem-solving strategies represent extremely complex cognitive and beyond cognitive skills that are at higher levels of information processing and represents one of the most intelligent man activities, compared to processes such as language learning and formation of concepts. These strategies are a series of operations through which attention, perception, memory, and other information processing processes are move in a coordinated way to reach the target. Therefore, problem solving is regarded as one of the most complex forms of human behavior, even for the tasks and problems which does not have a clear and defined structure.

One of the best ways to strengthen the research skills of students is using the teaching method of problem solving. Problem-solving strategies are the dominant patterns of thinking research in designing and collecting the curricula that can lead to interaction with the environment and nurture the development of his scientific judgment and the reconstruction of thought instead of accumulation of information in the mind. (Saliqe Dar, 2007) Kohler, who was the founder of a part of Gestalt psychology considered problem solving. He believed that the problem causes the person to lose his or her cognitive balance and the individual seeks to remove it; that is the problem sets him or her to work in order to solve the problem and retrieve the cognitive balance. He believes that the individuals first evaluate the problem and examine all its components and features in order achieve the answer in insight sparkles all at once. (Glover & Browning, 2003) Problem solving is the efforts on part of one's life and the education system should prepare students to deal with the future. Problem is the situation which the person can solve it with his or her skills and information. Problem solving can be defined as: Recognition and application of methods and skills that lead to the correct answer of

the learner or achieving the desired goal. (Seif, 2007)

Cassidy and Long(Cassidy & Lang, 2002) defines the problem solving style a cognitive and behavioral process through which we can identify and propose effective strategies to deal with the problematic success in everyday life. These researchers have raised a multidimensional model of problem-solving style, which includes the dimensions of frustration, control, confidence, creativity, avoidance, and approach (Cassidy, 2009).

Operational definition of problem solving strategies:

For problem-solving strategies, some principles, strategies, and plans have been proposed that this research has selected the problem solving model of George Pulia. The pattern or plan of George Pulia involves the following four steps. (Pulia, Translation by Aram, 1366)

A few points:

1. When we want to teach a strategy, we want our students to solve the given problems with the same strategy to become familiar with it completely. However, after teaching that strategy, they can solve the other problems with whatever strategies they want. In this way, a problem can be solved by different strategies in the classroom. If this happens, the teacher will be so delight and proud.

2. Strategy teaching means the provision of terms and conditions that students understand that the strategy intended to solve the problem is efficient.

3. There are many strategies. Teaching a number of them to the students is not appropriate, according to the conducted studies, because it will stop the students' thinking and creativity. Here, are a few strategies to assess:

a) Drawing strategy: The most natural strategy which comes to the student's mind is drawing. Many problems can be solved completely or their solution can be manifested by drawing the right figure. Most teachers do not accept this strategy (solution) from their students in solving the problems; therefore, this natural strategy is gradually set aside.

The following example shows how we use this strategy to resolve a problem.

"In a field, there are 20 chickens and cows. The number their feet are 56. How many chickens and cows are there on the farm?"This problem can be solved using the drawing strategy for the fourth grade elementary school students.

- First, we draw 20 circles instead of their heads. For each, we consider 2 lines (2 feet), so here we have 40 feet. The remaining 16 feet are drawn by adding every 2 feet.

b) Sub-problem strategy: Complex and multi-purpose problems usually consist of a few simple problems. Sometimes solving a problem or a chain of sub-problems can lead to solving a main problem. Identifying the sub-problems and solving themare an important strategy for solving the compound problems.

The following problem is solved using this strategy:

"Reza has collected 37 walnuts. The number of Ali's walnuts is17 more than the number of Reza's. How many walnuts do they have collected altogether? "

This problem actually consists of two small problems that solving these, we can find the answers.

1. How many walnuts does Ali have?

2. How many walnuts do Reza and Ali have altogether?

Then:

1. The number of Ali's walnuts: 37+14=54

2. The number of their (Reza and Ali) walnuts: 54+37=91

In this strategy, students must learn how to diagnose the sub-problems, write them separately, and then solve each of them.

c) Solving the simpler problem strategy: Sometimes the problem has complexities that can not be solved easily. But when we make it simple, its solution or solution method appears, or the problem is examined in the simpler mode, we can generalize it to a general case by modeling. Simplifying the numbers and data is part of this strategy.

In the following problem, the solution can be achieved by simplifying the numbers.

"In a factory, some tubes are produced in meters. One day, 244 tubes were produced. How many meters (tube) were produced, on this day? "

The simplified problem is as follows: A factory produces tubes in 3 meters long. If 200 tubes were produced, how many meters (tube) were produced? It means that we can achieve the solution (i.e., multiplying) by changing the numbers and simplifying them.

d) Removing the undesirable mode strategy: When using the data, assumptions, and information of the problems, the undesirable modes are removed one by one or in groups from all possible response modes, we are close to the answer. Removing the unfavorable modes means the exclusion of the modes that do not conform to the conditions and assumptions of the problem in order to achieve the optimum response to the problem. Note the following example:

A play with two players is performed in such a way that a person imagines a number between 1 and 100 in his or her mind. The next person has to reach the number in the mind of the first person by

asking him or her (Yes or no questions). For example, the question whether this is a two-digit number is not a good one because if the answer is yes, only 9 numbers (undesirable) will be deleted and 90 other numbers will remain.

The question whether the number is even, is appropriate because in any case, one of them will be removed. The best question to start is: Is this number among 1 to 50? Thus, half of the cases are removed. If the answer is yes, the next question is whether the number is among 1 to 25? Similarly, by dividing the numbers into two, the undesirable numbers are gradually removed to achieve the desired number.

CONCLUSION

Due to the fact that the main purpose of teaching mathematics is providing the ability for numerical calculations, correct use ofknowledge and skills, and growing a creative mind. It is better for the teachers to perform activities to achieve the main goal of education, using accurate scientific instruments. Therefore, it is appropriate and worthy to apply a combination of teaching methods after an introduction to the principles and implementation phases of the various teaching methods, diagnosing the situations, and considering the abilities and interests of students, depending on the type of course. In this study entitled as "How we can reduce the students' anxiety in solving the two-stage mathematical problems and make them interested in mathematics", we examined the obtained data from diverse scientific resources and methods such as: daily research notes, observing the activities of students, interviewing with their parents, administering paper and pencil exams, surveying the students, exchange of experience with managers and colleagues, and interviewing with the respected parents to learn more about the indifference state of students towards mathematics and anxiety in solving math problems.

In math class, using the problem-solving strategy, the students should understand the problems, state it simply, specify the knownandunknownof theproblem, and draw a figure for it. In this method, they know the desirable relations and use them in their every day life. The teacher is a guide here. In addition, the slower students, in this method, will have some troubles since their minds can not handle such programsand they can not understandthe concept of the problem. Therefore, in accordance with the supervisors, it is better to apply the second method in the classroom to solve these difficulties for the slowr learners.

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