Determining the effect of the implementation of problem solving teaching on self-efficacy and learning mathematics in male students of the High School (grade seven) Najaf Abad City

Vahid Mokhtari
MA Curriculum Planning, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

Zohreh Saadatmand
Assistant professor, Department of Curriculum Planning, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran
Corresponding author*

Abstract

This study aimed to investigate the effect of the implementation of the teaching and learning of mathematics problem solving, self-efficacy male students in the junior high school (seventh) was conducted. The population of high school students in Najaf Abad in 2015-2016 The sample size was determined by random cluster sampling methods for data collection of self-Scherrer, researcher training and problem-solving skills to the test in eight sessions (2 hours) for a month were used for quasi-experimental pre-test and post-test experimental and control groups. For data analysis, multivariate analysis of covariance was used to test Gvlygvrf Levin Smirnov test results showed Dadajray teaching problem solving The efficacy of male students in the junior high school (at p <0/05) Ast.vhmchnyn effective implementation of the teaching methods of problem solving learning male students in the junior high school (at p <0/05) effective

Keywords: problem solving, self – efficacy, problem, learning.
Introduction

The main objective of this study was to determine the impact of the implementation of problem solving teaching on self-efficacy and learning mathematics in male students of the Junior High School from Najaf Abad City. Teaching mathematics is a branch of science and human knowledge, which has been of great interest to scientific circles in recent years. Rapid scientific progress and its impact on different aspects of human life have clarified the necessity of familiarity with the rudiments of math even for those who are involved in the simplest jobs. This knowledge, as a human communication system, helps people to have precise understanding of information, models and arguments. What is known as learning difficulties in mathematics, starts from primary school and continues to higher education courses. People with disabilities in learning mathematics are those who, despite having normal intelligence and ability to enjoy physical and mental health and having proper social and economic environment, compared to their peers, have a major difficulty in mathematics and they have little progress in this lesson. (Zamani, 2010).

Students are afraid of mathematics and even, it changes to hatred of this lesson; therefore, they don’t have much progress in their final exam. In such circumstances, the task of the educational system is to train individuals who have the ability to unravel the mysteries of the society and to think scientifically, not to train people who accumulate information and knowledge that will be quickly outdated. We also need to train teachers who use active learning methods in their teaching.

One of these suitable methods which matches achievements in Science and Technology and complex societies, is problem solving teaching. (Taherzadeh, 2010)

When you are trying to solve a problem, you employ a variety of strategies, including reading the problem, finding important information or justifying the phrases. Puglia who is considered as the father of mathematics consider problem solving as finding ways to overcome difficulties, to overcome the obstacle and reaching the goal that is not easily achievable. Math problem solving is considered a complex cognitive activity that gaining success in which, in addition to the acquisition of the principles, concepts and skills, depends on the person’s understanding of known and unknown knowledge, the way to use their knowledge and the compensation of lack of knowledge. (Shuenfeld, 2009).

Most teachers do not understand the role of the students and their activities in the process of learning. Teachers themselves design the problem, collect issues related to the design and content, organize them, find solutions and resolve them. While for meaningful learning, the students must confront the questions personally, put their mind to act and solve the problems.
fact, learners have the main role and teachers should only act as the guide and the facilitators. According to Rousseau, if the student makes a mistake, do not correct the deviation, wait and let him/her find out the solution and correct the mistake. Rousseau suggested that students should be involved in the teaching and others’ contribution should not provide everything for the students in a way that the students make no effort to find the answers. One reason for this inability is lack of plan for teaching problem solving skills to the students. In other words, teachers do not teach them how to solve the problem. (Fallah, 2010).

Attitudes toward mathematics increase concentration and also the ability to solve mathematical problems. These two variables (concentration and teaching behavior of the teachers) increase students' ability to solve math problems, on the other hand, four variables including teacher’s teaching behavior, motivation to achieve self-esteem, self-efficacy and problem solving result in attitude formation toward mathematics among the students. (Saif, 2010).

Self-efficacy is an important factor in the development of human competence. Performing Tasks by different people with the same skills in different situations weakly, moderately or strongly, or by a person in different contexts depends upon changes in their self-efficacy beliefs. For this reason, a sense of self efficacy will enable people to use the skills in dealing with the obstacles and do extraordinary things. Effective function requires skills and the belief in the ability to do the required tasks. Management of constantly changing, ambiguous, unpredictable and stressful situations requires multiple skills. Self-efficacy deals with judgments about how a person can approach future conditions appropriately by applying required methods and skills. (Abdullahi, 2010).

The perceived self-efficacy is not a scale which measures the skills of a person in a field, rather it is a person’s beliefs in his/her ability to perform well under different conditions and by having a set of skills. In other words, there is a difference between what skills the person has and the fact that what actions he/she will perform under different conditions by having these skills. That is, a person may, despite having the necessary skills to perform an action, and despite having the knowledge to perform the operation, perform unsuccessfully due to weak self-efficacy. (Ganji, 2011).

Pioneer education system tries to prepare today students to confront small and large challenges in the future. Teachers and coaches in this system know that their traditional role as providers of textbooks’ explanation and the questioners of the lessons have finished and the future generation expects them to be designers of life skills such as problem solving, critical thinking, increased sociability, and so on. They should guide the students toward creative and productive work
environments so that they can find their way in ups and downs of the future life. (Taherzadeh, 2010).

The main objective of this study is to determine the impact of the implementation of problem solving teaching on self-efficacy and learning mathematics in male students of the Junior High School from Najaf Abad City and it tries to test the influence of problem solving method.

The meaning of self efficacy

Personal self efficacy is a sense of competence, efficiency and the ability to cope with life. Bandura defined self-efficacy as the amount of our understanding of the degree of control over our lives. Self-efficacy is considered as the ability of a person in having a particular behavior or doing things successfully. Bandura (1992) defined perceived self-efficacy as the belief in one's capabilities to organize and to carry out the practical and required paths in the management of future conditions, how people think, feel and motivate their actions and put them into practice. Eden and zuk, (1996) defined self-efficacy as the estimates of a person of his/her ability to influence the necessary actions to achieve the stated conditions. Beliefs related to efficacy are seeking motivation, well-being and personal success of every person. If people believe that what they should do is beyond their capabilities, there will be little motivation, but if they realize that what they do bring about good results, they will do it. (Kurbanglu et al., 2011)

The meaning of learning

Learning forms the basis of human behavior, learning leads to change, the changes that are relatively stable, relatively permanent changes in potential behavior; learning is the result of experience. Changes that are the result of the growth of emotional factors and motivation are not learning because they are quickly destroyed. Potential behavior is a behavior that creates an ability in the learner and changes which are the result of the learning in learners are changes in abilities, not apparent changes in the behavior of the individuals. The experience in this definition means the effect of external and internal stimuli in learners. Learning is broader and more dynamic process of learning and gaining the facts. As a living being, human has innate ability to learn. Learning is not doing some actions at certain times and occasions in our lives. Man is born as a learner. (AghaHosseini, 2010).

According to Morse and Murray (2005), in addition to individual aspect, learning has a social dimension as well. Social learning is achieved through social interaction which is sometimes called the hidden curriculum of schools. In schools, students participate in learning as a member of the group. This type of learning is mutual and active and it is more than the sum of individual learning within a group. (AghaHosseini, 2010).
Ganji and Amyryan (2011), in a study entitled the influence of teaching problem solving on educational achievement of first-grade male students in Isfahan (Songhor) reached the conclusion that the academic achievement of the students who received training in problem-solving skills was more than the ones who did not receive training in problem-solving skills.

Ahmadi (2014) studied the influence of teaching problem solving on the social self efficacy in female high school students of Sari City. From the results, it can be concluded that teaching problem solving skills is a useful and efficient intervention in increasing social self efficacy in the students.

Admaee (2007), in a research examined the effect of cooperative learning and problem-solving teaching on high school students’ academic achievement and found that the students under collaborative learning and problem-solving outperformed their counterparts, moreover, the effectiveness of teaching strategies regarding gender variable also showed special sensitivity and led to significant results.

Anvarkhan (2010) studied the influence of problem solving on the achievement in mathematics and concluded that problem solving skills increased the students’ ability in solving the mathematical problems.

Materials and methods

The study method is quasi-experimental. The study population consisted of all the male high school students of Najafabad City (grade seven) a total of 1292 students in 2014-2015. In this study, first, through random cluster sampling, some areas were selected from Najaf Abad city. Then, the schools of the districts were studied and those which were close to each other, as much as possible, in terms of educational, social and economic status were selected. Two schools were selected among them and in each school one class was selected randomly, then, one of them was considered as experimental group and the other one was chosen as control group. It is noteworthy that groups consisted of two groups of 15 students (a sum of 30 students).

Sherer Self-Efficacy Questionnaire

This scale was made by Sherer and colleagues (1982) and includes 17 items and each one has five options. Numbering method of self-efficacy questionnaire is in a way that each item receives points from 1 to 5. Items number 1, 13, 8, 9, 3 and 15 receive increasing points from right to left and the rest of the items receive increasing points in a reverse order that is, from left to right. This scale has a maximum score of 87 and a minimum score of 17. This scale has been translated and validated by Barati (1996). Reliability of the scale was found in different investigations by
Barati (1997), 0/79 Abdi Nia (1998), 0/85 and in a research by Arabyan, et al (1383), 0/91. In a study by Vaghari (2000) Cronbach's alpha 0/85 was obtained for the analysis of the reliability of self efficacy. Najafi (2001) separated 30 examinees randomly and performed self efficacy test on them and obtained Cronbach's alpha 0/83%. It was also 0/83 through Spearman-Brown method. In a research by Ganji and Farahani (2009) reliability coefficient was obtained 0/81 for Cronbach's alpha.

**Self-made mathematical problem solving test**

Because of unavailability of math problem solving test, this test was used for collecting information about the students’ math problem solving functions. It was designed by the cooperation of some of the experienced high school math teachers and it consisted of 10 one-point questions.

**Findings**

The first hypothesis: the implementation of problem solving teaching method is influential in the self efficacy of the male high school students.

Table (1-1) the results of Lavigne test about the assumed equality of variances of the scores of research variables of two groups in the population

<table>
<thead>
<tr>
<th>F</th>
<th>The first degree of freedom</th>
<th>The second degree of freedom</th>
<th>Significance level P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/248</td>
<td>1</td>
<td>28</td>
<td>0/145</td>
</tr>
</tbody>
</table>

As it can be seen from the table, The null hypothesis is confirmed for the equality of the variances of the scores; with regard to the fact that the significant level is more than 0/05, it is revealed that the variance of Pre-test and post-test in relation to the implementation of the teaching methods of problem solving on the self-efficacy of mathematics in both experimental and control groups is equal.

Table (2-1) Kolmogorov-Smirnov test on the assumption of normal distribution of pre-test and post-test in relation to the implementation of the teaching methods of problem solving on mathematics’ self-efficacy
The assumption of normal distribution of scores of The pre-test and post-test in relation to the implementation of the teaching methods of problem solving on mathematics’ self-efficacy in both experimental and control groups was confirmed. Based on the fact that the amount of Kolmogorov – Smirnov is between ± 1/96 , with 95% certainty, it can be concluded that there is no significant difference between observed and expected frequencies; in other words, there is normal distribution of the population. Also, according to the Asymp.Sig. (2tailed) that is more than the level of significance (0/05) it can be concluded that population distribution is normal. R-squared values show the degree and severity of the effect size and here it is 0/203 for the experimental group and 0/744 for the control group.

Table (1-3) the results of the analysis of covariance on the average scores of post-test of experimental and control groups with controlled pre test

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares</th>
<th>Degree of freedom</th>
<th>Average of squares</th>
<th>F squares</th>
<th>P significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>group</td>
<td>1312/696</td>
<td>1</td>
<td>1312/696</td>
<td>81/231</td>
<td>0/001</td>
</tr>
</tbody>
</table>

Analysis of the hypothesis by using covariance test analysis with the controlled pre-test (F = 81/231 0/05), revealed that the hypothesis was confirmed, that is, the implementation of problem solving teaching methods influenced the self efficacy of the male students of the Junior High School (grade seven). Based on the impact factor (0/751) the difference between experimental
and control groups was in the scores of the impact of the implementation of the teaching methods of problem solving on the self efficacy of high school students of the experimental groups.

The second hypothesis: the implementation of problem-solving teaching method is influential in the learning of high school male students (grade seven).

Table (4-1) Lavigne test results regarding the assumption of equality of variance of scores of research variables of two groups in the population

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>The first degree of freedom</th>
<th>The second degree of freedom</th>
<th>P significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/376</td>
<td>1</td>
<td>28</td>
<td>0/251</td>
</tr>
</tbody>
</table>

As it can be seen from the table, the null hypothesis is confirmed for equality of variance of scores; given that the significant level is more than 0/05, it is revealed that the variance of the scores of pre-test and post-test, in relation to the implementation of the problem solving teaching method on the math learning is equal in both control and experimental groups.

Table (5-1) Kolmogorov-Smirnov test on the assumption of normal distribution of pre-test and post-test in relation to the influence of the implementation of the teaching methods of problem solving on learning mathematics.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Experimental group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Post test</td>
<td>Pre test</td>
</tr>
<tr>
<td>number</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>average</td>
<td>4/76</td>
<td>4/55</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1/01</td>
<td>0/714</td>
</tr>
<tr>
<td>Kolmogorov-Smirnov test</td>
<td>0/635</td>
<td>0/597</td>
</tr>
<tr>
<td>Significance level</td>
<td>0/815</td>
<td>0/868</td>
</tr>
</tbody>
</table>

The assumption of normal distribution of scores of the pre-test and post-test in relation to the influence of the implementation of the teaching methods of problem solving on learning mathematics in both experimental and control groups was confirmed. Based on the fact that the
amount of Kolmogorv – Smirnov is between ± 1/96 , with 95% certainty, it can be concluded that there was no significant difference between observed and expected frequencies; in other words, there was normal distribution of the population. Also, according to the Asymp .Sig. (2tailed) that is more than the level of significance (0/05) it can be concluded that population distribution is normal. R-squared values show the degree and severity of the effect size and here it is 0/209 for the experimental group and 0/162 for the control group.

Table (6-1) the results of the analysis of covariance on the average scores of post-test of the experimental and control groups with controlled pre test

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares</th>
<th>Degree of freedom</th>
<th>Average squares</th>
<th>F</th>
<th>P significance level</th>
<th>squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>group</td>
<td>1312/696</td>
<td>1</td>
<td>81/877</td>
<td>111/395</td>
<td>0/001</td>
<td>0/805</td>
</tr>
</tbody>
</table>

Analysis of the hypothesis by using covariance test analysis with the controlled pre-test (F = 81/231 0/05), revealed that the hypothesis was confirmed, that is, the implementation of problem solving teaching methods influenced the learning of the male students of the Junior High School (grade seven). Based on the impact factor (0/805) the difference between experimental and control groups was in the scores of the impact of the implementation of the teaching methods of problem solving on the learning of high school students of the experimental groups.

Conclusion
Implementing problem solving teaching methods is influential in self-efficacy of the high school male students (grade seven). The findings show that teaching problem-solving has a positive impact on the self-efficacy of the students. Evidence shows significant differences between the resulting changes and the increase in average scores of self efficacy variable among the members of the experimental group and control group in post test. The results of this study are consistent with the findings of MohammadiRad (2002), Jafari (2002), Moatari (2005), Masoudnia (2007), Zahrakar, et, al (2010), Nuri and colleagues (2012), Ahmadi (2014), Mohamad Narimani (2015), Warneck, et, al (2001), Burneshtalyn (2003), Bygam and power (2003), Velit, et al (2009). In explaining this alignment, it can be said that possible reasons for an increase in Self-efficacy is that capable people in solving the problems have the ability to detect bad and inefficient thoughts and to deactivate them. They can control their negative emotions and thoughts. These people do not see the problems as a result of inefficiency, incompetency, incapacity or disability. They are able to predict the outcomes of their solutions and conclusions. When people use the problem-solving skills very well, the sense of competence, dominance and self-efficacy are enhanced in them.
Implementing problem solving teaching methods is influential in self-efficacy of the high school male students (grade seven). The findings show that teaching problem-solving has a positive impact on the learning of the students. Evidence shows significant differences between the resulting changes and the increase in average scores of learning variable among the members of the experimental group and the control group in post test. The results of this study are consistent with the findings of Khazaee (2004), Falah (2007), Taherzadeh (2008), Baezat and falah (2014), Mylfenokampl (1991), Donald (1997), Muir (2004), Igburt, et, al (2006), Admaee, et al (2007), Rosales et al. (2008), Zhang (2009). In explaining this alignment, it can be said that believing the person’s thoughts is an important goal of education and creating problem solving abilities in the learners is a way of fertilizing the person’s thoughts. One of the most important factors in problem solving is belief in the students; therefore, having a correct understanding and evaluation of their beliefs is critical in educational and learning adjustments. Teaching learning guidelines helps the students to make better decisions regarding social and educational problems (in mathematics) and provide solutions, think more precisely and deeply and believe that they can solve problems. Teaching problem solving skills is a short-term, efficient and harmless strategy which aims at cognitive abilities of the students and meaningful learning in order to empower the students against daily problems and exam stress. Therefore, teachers can help the students in this way by choosing proper purposes.

Summary

Based on the research findings that there was significant relationship between variables of teaching problem solving, self efficacy and learning, the researcher believes that if we refine our attitudes toward text books and include math problem solving methods in classroom, under the guidance of the teacher, we can have more time and reach better goals. By decreasing the number of repetitions, we can save more time for solving more problems. Guidelines for solving problems are very useful for better and fast solutions. Teaching problem solving is the most fundamental method of confronting problems. The purpose is to identify influential resources and to increase general self efficacy through teaching skills and general method of confrontation without imposing dependency in dealing with difficulties. According to the researchers’ point of view, this method results in the person’s self efficacy.
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