Developing Research Morals through Investigation of the Effectiveness of Teaching by the Problem-Solving Method and Evaluation Based on the Research Indexes

Seyyed Abolghasem Mehri-nejad (Ph. D.)[1]

Hasan Pasha-Sharifi (Ph. D.)[2]

Abstract

Educating the graduates with cognitive potentials and emotional tendencies for research and innovation has been the ideal for all the education systems throughout the world. It has been also considered a necessity and a national will for our country (Iran). There is no doubt that this important goal should become a reality by the most fundamental element of education i.e.The Teacher.

The aim of the present research is investigating the effectiveness of teaching by the problem solving method. It is also to evaluate establishment and raising of research moral among the school students based on the research indexes. A pilot project took place consisting of two test groups and one control group. We selected a total of 68 students from two schools in Tehran (Iran). The students

1 - Faculty member of Al-Zahra University
2 - Faculty member of Islamic Free University

were from three classes in fourth grade. The education year was of 2005-2006.

The three independent variables were randomly applied on the mentioned population in the science and geography courses. These variables were: a) teaching by problem solving method along with the evaluation based on research indexes, b) teaching by problem solving method without the evaluation based on research indexes, and c) teaching based on traditional method.

Research moral, as the dependent variable, was evaluated on the three indexes of A) attitude toward research, B) the pupils' performance in the examinations containing the questions about researching issues, and C) research oriented class activities. The obtained results showed that teaching by problem solving with/without the evaluation based on research indexes is more efficient than teaching by the traditional method. This was with the probability of 0.99. We found, there was no significant difference between the teaching with the evaluation based on research indexes and teaching without the evaluation based on research indexes. This similarity was in terms of their efficiency in raising research moral among the research population.

Keywords: Research moral, Teaching by problem solving method, Evaluation based on research indexes, Teaching by traditional method, Exams with researching features, Researching oriented class activities, Attitude toward research.

Research Background and Problem

From the time official education became common in societies, the nourishment of high cognitive abilities such as perception, reasoning, thought, creativity, problem-solving, and judgment have been emphasized (Buergstrome N., 1991). Through-out the recent decades, education systems in different countries have shown numerous efforts to upgrade high cognition abilities, especially

creativity, problem-solving, and critical thinking. As Parens[1] and Branly[2] indicate, during only 18 months, about 1250 books were published on topics of problem-solving, creativity, and critical-thinking. Therefore, fundamental modification and change to the main educational elements, meaning the content that is thought, teaching method, evaluation method, mental-social environment, and the education place's physical environment is of high importance (Elvin[3] & Chamdes[4], 1997). From among these elements, the teacher's method of teaching has been, without doubt, the architect of the student's cognitive structure. The teacher's evaluation method, at the meantime, gives direction to the student's mental energy and is the leader of his motivations and educational activities. Thus, the experts' and the researchers' main worry for the education system during the past several decades has been modifications and innovations in the teachers' teaching method.

The emphasis on use of problem-solving for betterment of the creative and searching cognitive structure can be traced back to philosophical thoughts by William James and John Dewey. Based on this method of thinking, individuals such as M. Montessoru, M. Kilatrick, L.P. Hachean, J. Piajet, J. Bruner, and J. Schwab made further modifications to the study programs, teaching methods, and evaluations.

The transformation process of innovative methods in teaching have endorsed the effectiveness of the problem-solving method in the teaching-learning process for the flourishing of the high cognitive strength. This resulted in a set of teaching models through problem-solving method, such as Wallas'es model, Bieler[5] &Dycheko & Kraforde's model, the model by Ford & Stein[6], and the explorative model by Joseph J. Schwab (!996). The main emphasis by Schwab's curriculum plan is on familiarizing the students with methods of research and exploration that sciences

---

1- Parens, M.
2- Branly, L.
3- Elvin, N.
4- Chamdes, G.
5- Bieler, R. F.
6- Stein, M.

were based on and were eventually transformed (Schwab, 1966 – narated by Neller, 1997).

Regarding the element of conducting the exploitative curriculum plan, which is teaching through problem-solving, and its evaluation, which is the most important element of curriculum, no policy systems and functional appearance for the effectiveness of the project has been conducted and monitored.

Now that the weakness in research interests, abilities, and outcomes have become visible and criticized in the students and the intellects across the country, is it possible to give the teachers the significant role for the outcomes in the transformation of these interests and abilities and the flourishing of this national need and consider their teaching method and evaluation the critical role?

In Iran we face issues such as schools physical limits, the number of students in each class, the volume of the text books, the knowledge, the skill, the occupational identity, and the teachers' occupational motivation as well as that of the students. Considering all of this, is teaching and evaluation effective by problem-solving with origins of thoughts by James and Dewey, and the transformed and operational shape which Schwab offered? To answer these questions and clarify the issue, we require investigation by testing, the task which the current research was meant to do.

Research Questions

1. To what extent is problem-solving effective in the establishment of students' research mentality?

2. To what extent does the interaction between problem-solving method and evaluation based on research indicators nourishes the researching mentality in comparison with teaching through the problem-solving method?

3. To what extent does the interaction of teaching through problem-solving and evaluation based on research indicators nourishes the researching mentality in comparison with the traditional method?

Methodology

Research Project

In order to test the research questions, the semi-test design was selected which had two experimental groups and one control group.

$$R \quad O_1 \quad X \quad O_2$$
$$R \quad O_3 \quad X \quad O_4$$
$$R \quad O_5 \quad X \quad O_6$$

The Sample and The Sampling Method

The research sample in this research consisted of 68 students in grade four from two primary schools in Tehran. The first experimental group consisted of 26 grade four students of which, two students had an IQ that exceeded 120 and one whose IQ was less than 105 and were therefore not included in the statistical analysis.

Teaching by problem-solving method and its evaluation based on research-wise indicators was determined and conducted for the experimental group 1. Teaching by problem-solving method, which was conducted randomly for the second experimental group included 26 students in grade four; the evaluation scores for one of the students were not included in the statistical analysis as the student had an IQ level less than 105. The third group which was considered as the control group was consisted of 22 grade four students of Modarres complex; from this group one student's IQ score was over 120 and one was less than 105 and were therefore excluded from the data analysis.

Interference Conducting Method

In this research, three official teachers from the education system, who had a post-diploma certification for primary school

teaching conducted three teaching methods as the three independent variables or three experimental interferences. The three teaching methods include:

a. Teaching by the problem-solving method along with evaluation based on research-wise indicators

b. Teaching by the problem-solving method

c. Teaching by the traditional method

Research Tools and Their Conducting Method

In this research three types of evaluation tools were used:

a. The questionnaire for attitude toward researching

b. The check-list for research-wise activities

c. The written test having research-wise questions

Results

In this research three groups of data were collected: a. The data related to the questionnaire on attitude toward researching; b. the check-list of research-wise activities in two subjects of Science and Geography; c. The written test having the research-wise questions of the end of the term for two subjects of Science and Geography. These three types of data were gathered from the first and second experimental groups and the third one, the control group. The results of the analysis of the mentioned data in the framework of the three research questions will be offered as follows:

Question One: To what extent is teaching through problem-solving effective in developing the students' research mentality?

Investigating this question showed that teaching through problem-solving without evaluation based on research-wise indicators (2nd experimental group) has caused increase in four of

the five indicators in comparison with teaching in the traditional method. Only in one of the indicators on the test questions, having the research characteristics of Geography subject, the two groups had no significant difference from each other. This finding indicates that in comparison with the traditional teaching methods common in the Iranian schools, teaching through problem solving, even without change in the evaluation, can develop the researching mentality among students. In addition, this finding is similar to the findings by Wallas (1921), Schwab (1966), Bailer (1971), D. Chekow & Crawford (1974), Falavel (1976), Ford & Stein (1984), and Neler (1977).

Question Two: To what extent is research-wise mentality developed by the interaction between teaching through problem-solving and evaluation based on research-wise indicators, with teaching through problem-solving?

The comparison of these two groups has shown that the two groups have no difference in increased attitude toward research from each other, meaning that the students' attitude toward research is not under the influence of the type of evaluation along with teaching through problem-solving. This is while teaching by problem-solving method along with evaluation based on research indicators has been more effective for responding the test questions having the characteristics for Science and Geography lessons in comparison with only the problem solving method. Teaching through problem-solving only, has been more effective in increasing the research activities of Geography and Science, in comparison with teaching through problem solving that accompanies evaluation based on research indicators. This finding shows that due to the evaluation, the teacher expectation causes increase in cognitive research functions which are evaluated through the test questions that have the research characteristics. This finding is similar to thoughts by Ana Freud 1963, Klein 1958, Piaget 1970, Erickson, 1962, Exteen 1972, Myer 1965, and Falavel 1979. However, accompanying the evaluation method based on research indicators with teaching by problem-solving causes

reduction in research-wise activities in the classroom compared with teaching by problem-solving without the evaluation method. This finding shows that evaluation based on research indicators was conducted in such way that class activities were considered to have lesser importance than the exams. This part of the findings is not similar to the findings by the mentioned experts. It is possible that three elements have caused such result: a. The first experimental group teacher's worry about the end-of-the-term exams, which is often worried about by the teachers because of the necessity of answering the parents and the school principal. b. Lack of clear request and the teacher's method of final evaluation based on students' weekly research-wise activities. c. The competition put forward by the second group's teacher in order to document his more enhanced ability to teach by the problem-solving method, which made the class research activity check-list to look better. This is while his students performance in equal exams having the research indicators, which experts designed and used for marking, were weaker than the first group in a significant way.

All of this considered and putting-aside the given probabilities by the researcher, what is seen from the documentations is that when evaluation based on research indicators accompanies teaching by problem-solving, low class research-activity is resulted.

Question 3: To what extent does the interaction of teaching by problem-solving and evaluation based on research-wise indicators develop the research mentality compared with the traditional method?

The comparison of these two groups shows that teaching by problem-solving along with evaluation based on research-wise indicators causes improvement in all three research mentality indicators compared with teaching in the traditional method. This result is similar to the thoughts and findings by Wallas 1921, Schwab 1966, Bailer 1971, D . Jacko & Crawford 1974, Ford Wastein 1984, Neler 1997, Anna Freud 1963, Klein 1958, Piaget

1970, Erickson 1962, Myer 1965, Schpiths 1965, Axtein 1972, Falavel 1979, and Alkind1.

In general the findings in this research show that teaching by problem-solving, be it with or without evaluation based on research indicators, will develop the research mentality among students. This result was concluded even during a school term and in the framework of the Science and Geography text books and other education environment limits and limits related to the teachers. If this teaching method is utilized in several educational rounds or through all educational periods and the support of school text books, educational institutes environment, and the teachers' knowledge and skill is provided, without doubt the school learners will possess high level abilities and craves in research.

Applied Suggestions

The concluding results of this research suggest change from the traditional teaching method and what is common in the schools, toward the problem-solving method in order to develop innovative and researcher students. Without doubt, the actualization of teaching through problem-solving requires teaching to the teachers, improvements made to the class environment, modifications to the curriculum planning content as well as the evaluation in all levels and stages and even university entrance and occupation after graduation.

References

Shari'at-madaari, Ali (1373/1994). The Principles of Education, Tehran University Publications.

Shari'at-madaari, Ali (1373/1994). The Role of Education in Human Life, Article from the Research Quarterly Journal on Educational Issues, New Set, No. 3, Bahar Publications.

1- Alkind, N.

Buergstrome. (1991), Seven ways of Knowing: understanding multiple intellgences. Second Edition palatine: skylignt publishing through.

Dembo, M. H. (1994); Applying educational psychology, (5 th. Ed). New york: Longman.

Edwards, Ronald R, (1999). Problem solving through critical thinking.

Elvin & Chamdes. (1997), Evaluation of learning in science. In B. Bloom. J. Hastings, and Madaus (eds). Handbook for formative and summative Evaluation of student learning New York: Mc Graw Hill.

Esborn, H. (1995) Frames of mind: The theory of multiple intelligences. New York: Hurper and raw.

Flawell, J. H. (1979). Cognitive development. Englewood clifs, N. J.: Prentice- Hall.

Halpern. (1984). Educational psychology (3rd . Ed) Boston: Hough mifilin co.

Joyce & Others. (1992), Beyoned the purely cognitive: Bellefs systems, social cognitions & meta cognition and driving forces 4th intellectual performance cognitive science.

Kramol (1993), changing the curriculum, university of London press.

Neller. (1997), Curriculum planning A New Approach, Allyn and Bacon, inc. Newton Mass, U.S.A.

Schwab. (1996), organizing schools to encourage self- Direction in learners, UIE Hamburg. Pergamon press.

Walker, C. Eugene & Michael, C. Roberts (1997). Handbook of clinical child psychology (2rd ed). U.S. A.