



Humanities and Educational
Sciences Journal

ISSN: 2617-5908 (print)



مجلة العلوم التربوية
والدراسات الإنسانية

ISSN: 2709-0302 (online)

The Effect of Using Problem Based Learning on Developing the Critical Thinking Ability among Secondary Stage Students(*)

Dr. Manal Majed Abu Minshar

Assistant professor

Hebron University –Palestine

manalm@hebron.edu

تاريخ قبوله للنشر 26/9/2022

<http://hesj.org/ojs/index.php/hesj/index>

(*) تاريخ تسليم البحث 25/8/2022

(*) موقع المجلة:



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Dr. Manal Majed Abu Minshar

Assistant professor

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Abstract

Problem-based learning (PBL) is a new strategy which aimed at connecting students' experiences with life and stimulating students thinking to solve new problems and achieve new knowledge. So that, this study aimed at investigating the effect of adopting problem-based learning on developing the critical thinking among secondary stage students who were chosen randomly. The researcher used semi-experimental research design with an experimental and control group and pre-and post -test which was applied on a sample of 61 students. At the end of the study, it was determined that the problem solving learning strategy had a positive effect on students' critical thinking ability. The differences came in favor of the problem-based learning strategy group. So that, it is recommended that the problem-based learning strategy should be adopted, and the curriculum content and the teaching activities should be organized according to the problem-based learning. Furthermore, There is a need to conduct further studies on other new methods such as, inquiry -based teaching and project- based teaching.

Keywords: Problem-based learning, Critical thinking ability.

أثر استراتيجية التدريس التي تتبنى التعلم القائم على حل المشكلات في تحسين التفكير النقدي لدى طلاب المرحلة الثانوية

د/ منال ماجد أبو منشار

استاذ مساعد

جامعة الخليل- فلسطين

المستخلص

التعلم القائم على حل المشكلات (PBL) هو طريقة تدريس حديثة تهدف إلى ربط تجارب الطلاب بالحياة وتحفيز الطلاب على التفكير لحل المشكلات الجديدة وتحقيق معرفة جديدة. لذلك هدفت هذه الدراسة إلى تقصي أثر استراتيجية التدريس التي تتبنى التعلم القائم على حل المشكلات في تحسين التفكير النقدي لدى طلاب المرحلة الثانوية. استخدمت الباحثة المنهج شبه التجريبي من خلال مجموعة تجريبية وضابطة وامتحان قبلي وبعدي طبق على (61) طالبا. بينت النتائج أن هناك فروق ذات دلالة إحصائية بين الطريقة التقليدية واستراتيجية التعلم المبني على حل المشكلات. جاءت الاختلافات لصالح المجموعة التجريبية التي استخدمت استراتيجية التعلم القائم على حل المشكلات. لذلك، يوصى بضرورة اعتماد استراتيجية التعلم القائم على حل المشكلات، وتنظيم محتوى المنهج وأنشطة التدريس وفقاً للتعلم القائم على هذه الاستراتيجية. علاوة على ذلك، هناك حاجة لإجراء مزيد من الدراسات حول الأساليب الجديدة الأخرى مثل التدريس القائم على البحث والتدريس القائم على المشاريع.

الكلمات المفتاحية: التعلم القائم على حل المشكلات، مهارات التفكير النقدي.



Introduction:

Modern teaching methods not only educate but also inspire and generate curiosity. This has resulted in the need to modify the traditional style of teaching in such a manner that the new teaching methods are demonstrative, explanatory and practical. These new teaching techniques involve a style of teaching that focuses on cognitive, critical and creative thinking and the development of new patterns of learning. In modern education methods, the student is central to curriculum designing. In addition, modern education methods, such as critical thinking requires educators to focus on their cognitive skills to make different subjects more useful for students' lives.

Accordingly, the skills that should be taught to students, are aimed at solving problems in society. These skills should be mastered including critical thinking skills, the ability to communicate effectively, and problem-solving through negotiation and cooperation skills (Kembara, Rozak, & Hadian, 2019).

Problem Based Learning (PBL) has been presented into education in many professional fields. (PBL) started to become a feature of educational programs during the 1960s. Since then there has been steady growth in the number of programs and institutions that have adopted (PBL) around the world. Problem-based learning (PBL) conceptualizes learning as an active, social, and an embedded process (Capon & Kuhn, 2004; Hmelo-Silver, 2004).



(PBL) helps students to take a dynamic role in their education, and offers intellectual growth for them (Yeo, 2008). Definitely, (PBL) makes students responsible for their own learning, and allows them to explore more than one right answer for the same issue (Karantzas et al., 2013).

Students who involve in (PBL) activities were more likely to be more motivated and perform better than other students (McLeod, 2010). (PBL) learning promotes a better understanding of courses' concepts and improves the problem-solving skills of the students as well as their communication, presentation and teamwork skills. Researches have shown that students find (PBL) to be a very “motivating and effective means for learning” (McLoone, Lawlor & Meehan, 2016; Forcael et al., 2015).

Study Question:

Is there a significant difference in the critical thinking skills of students who were taught by using problem solving strategies and those who were not?

Method:

Research design:

The selected sample is (61) students. The students are secondary stage students in the academic year 2021-2022. Those (61) students formed two classes (A and B) one of which was randomly chosen to be the experimental group, the other forming the control group.



Research Procedure:

The research was conducted on a similar characteristics groups. One of them was the experimental group (problem solving strategy group) and a control group, and both of which were chosen randomly. In the experimental group the problem solving strategy was combined with teaching whereas in the control group, only traditional teaching was applied. The independent variable in this research was the problem solving strategy, and The dependent variable was students' critical thinking.

Written Critical thinking Examination:

In this research, the critical thinking examination was used to determine the students' ability to think in a critical way. The examination was conducted at the beginning and the end of the study for both groups. The critical thinking examination was prepared in accordance with the school subjects' curriculum.

Experimental Process:

The experimental process took place in the fall semester for both the experimental and control groups on arranged days and times (two times a week). Before the experimental Process started, initial results were collected. in the second week, teaching by using problem solving strategy took place in the experimental group class. The teaching objectives were covered immediately for both groups. In the experimental group Problem Solving Strategy were used to teach students. The strategy was developed by Heller, Keith and Anderson (1992) as follows: understanding the problem,



analysis of the problem, planning, application of the plan, controlling and self-evaluation.

Data Analysis Techniques:

The analysis of the data was done by using SPSS using mean (M), standard deviation (SD), t-test and correlation analysis. Also, the reliability coefficient is calculated according to the Cronbach alpha equation to ensure the stability of the factor.

Findings:

In order to observe the effects of problem solving strategy on students' critical thinking, students critical thinking in both the experimental and control groups were measured before and after the experimental process took place. Also, mean and standard deviation of pre- and post-test results of the experimental and control groups were calculated. In order to determine whether there was a significant difference between the averages of the groups, the t-test was conducted and the results of the analysis are given in Table 1.

Table 1: Mean, standard deviation and t-test results of the strategy and control groups according to critical thinking pre- and post-test

Measurement	Groups	n	M	SD	df	t-value	p-value
Pre-test	Ex-G	31	12.37	6.50	59	1.04	0.93
	C-G	30	10.82	6.36			
Post-test	Ex-G	31	42.11	10.14	59	6.40	0.00
	C-G	30	30.58	10.39			

In Table 1, it can be seen that the mean of the experimental group ($M=12.37$) is slightly higher than that of the control group ($M=10.82$). According to the results of the t-test. It can be seen that the pre-test t-value is smaller than the post-test t-value. For this reason, the difference in the means of the groups is statistically irrelevant. These results indicate that the critical thinking ability of the students in both groups before they started in the experimental study was very similar. It is also seen that the mean of the experimental group ($M=42.11$) was higher than that of the control group ($M=30.58$). According to the results of the analysis, because the post-test t-value is higher than the pre-test t-value, Therefore, the results can be seen to be in favor of the experimental group. This results show that Problem based learning strategy affected the students' critical thinking ability in the experimental group. The students in the Problem based learning classes have the highest average value of critical thinking skills compared to students who are learning through traditional method in the control group. This result comes in In accordance with (Dakabesi & luoise, 2019; Nadeak & Naibaho, 2020; Ostby, 2022) which showed the effectiveness of problem-based learning in developing critical thinking skills, Also, Adelana & Adewale & Ogunsola study (2021) confirmed that the use of problem-based learning as a teaching strategy contributes to developing students' performance, As well as, the study of Paristiowati & Bulan& Cahyana (2019), which revealed the positive effect of Problem based learning on students' achievement. In addition, Maulidiya & Nurlaelah (2019),



investigates the impact of problem based learning on the students' critical thinking ability. The study remarked an improvement in students' critical thinking by using problem based learning strategy and improvement in teachers' ability in handling the learning in an active way. Essentially, the problem-based learning strategy differs from "traditional" approaches in that the students are stimulated to use self-directed learning skills placing emphasis on a person's abilities to look for and adapt relevant information to analyze. The problem based learning approach has been widely adopted in diverse fields and educational contexts to promote critical thinking and problem-solving in authentic learning situations (Barrett, 2010).

The learning context is provided by actual questions and problems in everyday practices that play a role in learning practices (Al-Yamani & Askar, 2010). Jonassen & Hung (2012) added that Problem Based learning prepares students to face the problems of actual life, and it enhances students' achievement by challenging students to solve problems and encouraging them to practice higher thinking skills. Wee (2004) mentioned that critical thinking ability is possibly developed by Problem based learning, through the process of problem solving and mainly by brainstorming sessions.

The problem based model request students to build knowledge individually and also make students dynamic in the classroom and also outside the classroom in searching for problems' solutions (Rini & Diana, 2020).



Conclusion:

In light of the findings of the research, it has been determined that the problem solving strategy has had positive effects on students critical thinking. This result shows stability with the results of a number of studies that have examined the effects of problem solving strategies on students critical ability. It can be assumed that applying of problem solving is more effective in helping students improve their critical thinking ability than traditional way of teaching. Taking into account these results, the researcher recommended to adopt the problem -based learning in line with having qualified teachers to prepare educational activities using problem based learning. Moreover, there is a recommendation about conducting extra studies to identify the impact of using the problem based learning on the degree of students' efficiency and conducting more studies about the effect of problem based learning on students achievement, comprehension, decision-making ability, and creative thinking skills.



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