



A META-ANALYSIS ON THE EFFECTS OF PROBLEM-BASED LEARNING IN ACCOUNTING LEARNING

Novitasari^{1*}, Nurika Restuningdiah², Helianti Utami³

^{1,2,3}State University of Malang, Indonesia

Corresponden Author:

Email: novita1705@gmail.com¹

Abstract

This research focuses on the effect of Problem-Based Learning in accounting learning for students of SMK (Vocational High School), SMA (Senior High School), and University. In addition, this research also aims to analyze the magnitude of the effect and correlation of Problem-Based Learning on accounting learning based on education, the type of research, and the dependent variable. This research analyzed 24 research articles based on the magnitude of effect. There was 1 article with a small impact, nine articles with a medium result, and 14 articles with a significant impact.

Keywords: Meta-analysis, PBL, Accounting learning

INTRODUCTION

Accounting education is one of the science fields whose learning discusses ways to solve problems where is learning to use scientific methods or think systematically, logically, orderly, and thoroughly. The conventional accounting learning system starts from the high school level in general and vocational schools to universities, which are more likely to focus on accounting practices in journals and financial reporting rather than analyzing. So that it makes the ability to think critically and analyze problems, as well as to communicate, becomes less. Ideally, the learning process should train students to think, explore and interact (Huang, Wang, and Lan, 2011). Albrecht and Sack (2000), in a monograph entitled Accounting Education: "Charting the Course Through a Perilous Future," stated that now it is time, in accounting education, to move from dependence on lecture methods and to move towards a teaching approach that conveys the knowledge, skills, and abilities that critical (Albrecht & Sack, 2000; 64).

Students must be active in learning activities to realize a critical, creative, honest, and communicative attitude. Students can also have the energy to develop themselves form their own. Educators will act as mentors and observe how the development of their students (Sardiman, 2001:94). To realize this, the teacher needs to provide a learning model that makes students more active in learning. Problem-Based Learning (PBL) as a learning model is one of the innovative learning models that can help students play an active role in the learning process. PBL is an instructional approach that has been successfully used for more than 30 years and continues to gain acceptance in various disciplines. This model focuses on instructional and curricular learners applying knowledge and skills to develop viable solutions to problems (Walker & Hallinger, n.d.). That way, students can play an active role in learning.

Strobel (2009) found that PBL is beneficial in long-term knowledge retention, skill development in terms of clinical performance, and student and teacher satisfaction. In addition, Milne & McConnell

(2001) noticed the need for PBL in accounting education. In line with Milene, Albrecht, and Sack (2000), who argue that accounting graduates should have more excellent skills, PBL appears to be a suitable model for achieving this goal. Still, little attention has been given to PBL in the accounting literature. Problem-based learning models have been widely applied to high school students, including vocational high school students with a major in accounting. One of the researches by Stanley and Stephen (2012), "*Problem-based learning: Does accounting education need it?*" discusses the effectiveness of PBL in the field of accounting through "learning by doing," which can produce changes to bring better learning outcomes for accounting graduates.

However, other results found by Suryanti (2016) show that there is no difference in learning outcomes between students who are taught the Problem-Based Learning (PBL) and Drill Models in Intermediate Financial Accounting. In addition, reports on systematic reviews and meta-analyses on the effectiveness of PBL used in higher education programs (Newman n.d., 2003) stated that the existing overview of the field does not provide high-quality evidence to give a solid answer for the question of the effectiveness of PBL. In line with Suryati (2020), the use of PBL in the accounting education literature is still considered to be lacking. For this reason, researchers feel the need for a deeper review related to the application of the PBL learning model in the study of accounting. In this case, the researcher uses the meta-analysis method further to examine the effectiveness of PBL in accounting learning.

Conducting research using a meta-analysis of the PBL learning model is deemed appropriate because it is needed to answer questions about the differences in previous study results that discuss the effectiveness of PBL in accounting learning. In addition, a systematic review conducted on PBL can provide concrete evidence or firm answers to questions about the effectiveness of PBL in the study of accounting education. According to Newman n.d. (2003), in most literature, the general overview of the field does not provide strong evidence for the effectiveness of PBL. The reason researchers use the PBL learning model is that it is suitable for the need to develop critical thinking skills, soft skills, learning outcomes, and learning achievements. Also, PBL is an approach that represents development and provides significant changes in educational practice. A meta-analysis study is also carried out to examine the consistency or inconsistency in the cross-assessment of previous research results that have been statistically processed. This study is being carried out due to increased research replications or verifications, which has increased the number of variations in research results (Borg: 1983).

Using the Problem-Based Learning model, how much research measures students' critical thinking skills, learning outcomes, learning achievement, learning motivation, and soft skills? There is no meta-analysis research related to Problem-Based Learning (PBL) in accounting learning. The application of the PBL learning model and its outcomes, particularly in accounting lessons, focus on this study.

METHOD

A. Meta-Analysis

This research uses a meta-analysis method, a statistical technique that is quantitative because it uses numbers and statistics for practical purposes. Meta-analysis is quantitative because it uses numerical calculations and statistics for functional purposes to compile and extract information from a large amount of data that is not possible with other methods (Glass et al., 1981). The research method used is descriptive research using the meta-analysis method. The analysis presents the results of scientific publications in a study conducted by several researchers in electronic journals nationally regarding the effect of Problem-Based Learning learning models on accounting learning. The meta-analysis aims to analyze several relevant research articles to determine the impact of the most effective model. Based on research taken that has been summarized, it needs to be tested and re-analyzed to find the most meaningful research results.

Meta-Analysis Phases

The phases in conducting a general meta-analysis, according to DeCoster (2009), are:

- a) Determine and study the research topics to be summarized,
- b) Find and collect some research with a predetermined topic and complete it. Search research literature can do manually or through internet sites.
- c) Perform effect size calculations using the meta-analysis formula and test hypotheses on the effect size
- d) Identify whether there is the heterogeneity of effect size.
- e) Conclude and interpret the results of meta-analysis research.

Research Procedure

The stages or procedures in this research include

- 1) Determine the problem or topic to be researched, including the effect of Problem-Based Learning on accounting learning.
- 2) Search and collect research reports in the form of national and international journals related to the problem or topic to be researched and determine the period of research findings used as source data, published in 2010-2020.
- 3) Reading research reports to see the suitability of the contents with predetermined problems, focusing research on the issues in the form of aspects of research methods, and categorizing each study or collecting as much information as possible in the research report.
- 4) Determine the effect size on each research report from each data obtained.
- 5) They are analyzing research reports published based on the study of methods and data analysis used to conclude the meta-analysis research taken.

Population and Research Sample

a. Population

The population of this research is all research regarding the effect of the Problem-Based Learning (PBL) model on accounting learning which consists of 84 research articles.

b. Sample

Screening of research sample criteria.

At this stage, the articles that have been downloaded are briefly reviewed to filter the quantitative research sample. At this stage, research articles that do not meet the requirements are excluded from the model. Following are the sample criteria:

1. Quantitative research articles and PTK.
2. The independent variables determine from the number of sufficient researches to carry out a meta-analysis.
3. Completeness of other research data includes the number of samples and the number of observations presented.
4. The articles used are research articles that focus on learning accounting for SMA and SMK grades 10 to 12 and universities.

From the search results of articles published from 2010 to 2020, 24 reports met the meta-analysis criteria.

Data Analysis Technique

The basic unit of the meta-analysis research is the effect size, so calculations are used with the effect size analysis technique to answer the research problem formulation. Effect size is a value that reflects the magnitude of the treatment effect (more generally) the strength between two variables. This variable is a unit in the meta-analysis. Calculate the effect size for each study to assess the consistency of effects across studies and calculate the summary effect.

Data analysis was carried out on the preliminary study in this research by Microsoft Excel computer program statistical tools by SPSS. Next is the data analysis stage, which consists of:

1. First, determine the criteria for the articles to be analyzed and tested, then collect the study's overall results, then try the meta-analysis technique.
2. Statistical analysis in meta-analysis.
 - a) Determine the Effect Size (ES) and Standard Error (SE) values for Correlation: F, t, and r.

Formula:

$$F = t^2$$

$$T = \sqrt{F}$$

$$r = \frac{t}{\sqrt{t^2 + N - 2}}$$

$$z = ES = 0,5 \times \ln \frac{1+r}{1-r}$$

$$SE = \sqrt{\frac{1}{N-3}}$$

b) Determine the Effect Size (ES) and Standard Error (SE) values for the Experiment: Formula:

$$d = \frac{X_1 - X_2}{Sp} \text{ (Fraenkel, et al 2012)}$$

$$S = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 - 1) + (n_2 - 1)}$$

$$df = n_1 + n_2 - 2$$

$$SE = \sqrt{Vg}$$

c) Determine the effect size (ES) and Standard Error (SE) values for PTK:

Formula:

$$P = ES = \frac{1}{N}$$

$$SE = \sqrt{\frac{p(1-p)}{N}}$$

RESULTS AND DISCUSSION

A. Results

1. Overview of Study Selection

This research is entitled A Meta-Analysis on The Effects of Problem-Based Learning in Accounting Learning. This research uses a meta-analysis approach developed by Hunter et al. (1990) to reveal the effect of the learning model by analyzing 24 primary research articles that discuss problems related to applying the Problem-Based learning model in accounting learning. Based on the procedures described in the research method, the analysis is carried out by determining the criteria for the articles to be tested according to the meta-analysis criteria, collecting the complete research results, and grouping them according to the variables to be studied.

Data collection is done by visiting the website using the keyword Problem-based Learning in accounting learning.

2. The results of a meta-analysis on the effects of the PBL model on Accounting Learning.

Table 4.1. Meta-Analysis

No.	Author	Effect Size	Category	N Articles
1	Supreme	0.005	Small Effect	1
2	Hsu, et al. (2016)	0.227	Medium Effect	9
3	Winarsih, et al (2019)	0.245		
4	Yulita (2013)	0.299		
5	Gaspers (2015)	0.332		
6	Lindasari (2018)	0.363		
7	Ridwan (2020)	0.44		
8	Wardhani (2018)	0.44		
9	Pratiwi et al. (2014)	0.491		
10	Masru'ah et al. (2021)	0.492		
11	Ernawati (2011)	0.539	Big Effect	14
12	Fedi (2018)	0.549		
13	Ghofari et al. (2020)	0.564		
14	Israeli et al. (2016)	0.63		
15	Pages	0.65		

16	Rahayuningsih (2017)	0.76	
17	Herland et al. (2016)	0.823	
18	Titi (2020)	0.857	
19	Avivah & Eko (2019)	0.866	
20	Riza (2019)	0.947	
21	Palestine & Laily	0.952	
22	Baidillah	1	
23	Dadang (2018)	1.84	
24	Irina (2017)	2.45	
Average Effect size		0.698	Big Effect

3. Data Analysis of the Effect size Calculation on PBL Model for Accounting Learning Based on Education.

Table 4.2 Results of the Effect size Calculation on PBL Model for Accounting Learning Based on Education.

No.	Education Background	NA	ES
1	SMA	9	0.549
2	SMK	12	0.879
3	University	4	0.42
Big Effect			0.616

4. Data Analysis of the Effect size Calculation on PBL Model for Accounting Learning-Based Research Type.

Table 4.3 Results of the Effect size Calculation on PBL Model for Accounting Learning Based on Research Type.

No.	Types of research	NA	ES
1	Experiment	16	0.611
2	PAK	8	0.856

5. Data Analysis of the Effect size Calculation on PBL Model for Accounting Learning Based on Related Variables.

Table 4.4 Results of the Effect size Calculation on PBL Model for Accounting Learning Based on Related Variables.

No.	Research variable	JA	<i>Effect Size</i>
1	Learning outcomes	10	0.889
2	Critical Thinking	4	0.546
3	Learning achievement	6	0.675
4	Motivation to learn	4	0.668
5	Soft skills	3	0.357
Big Effect			0.627

6. Hypothesis test Hypothesis 1.

The effect size calculation on the entire research study found that the magnitude of the effect size is $0.698 < 0.5$, meaning that it is included in the significant effect. Based on these findings, it can be seen that there is a considerable effect from the application of the Problem-Based Learning model on accounting learning.

Hypothesis 2

Based on the meta-analysis calculation on the effect size of PBL in accounting learning based on education or research objects, it is known that the acquisition of the effect size is $0.616 < 0.5$. The findings are included in the category of significant effects, which means that applying the Problem-Based Learning model in accounting lessons based on education has a considerable impact.

Hypothesis 3

Based on the effect size results on the two types of research, they are included in the category of significant effects (< 0.5). Based on these findings, there is a substantial effect from applying the Problem-Based Learning model on accounting learning based on the type of research.

Hypothesis 4

Based on the effect size results, it is included in the significant effect category, that is (< 0.5), meaning that the Problem-Based Learning model has an effect on accounting learning based on the dependent variable studied from 24 research articles.

DISCUSSION

1. Problem-Based Learning Model Affects Accounting Learning

PBL has a significant effect on overall accounting learning. This study is evidenced by acquiring an effect size of 0.698, including the multiple effect category. The effect size results demonstrated that problem-solving methods could influence and change accounting learning. Accounting learning requires not only theoretical knowledge but also hands-on experience. According to the Problem-Based Learning model, which is based on the constructivism paradigm and focuses on the learning process, the use of PBL in accounting learning is very effective.

2. Problem-Based Learning Model Affects Accounting Learning Based on Education.

The meta-analysis calculation based on the type of education shows that the Problem-Based Learning model has a different effect on SMA, SMK, and Universities. For the effect size results, research articles conducted on high school students obtained a value of $0.549 < 0.5$, classified as a significant effect. Furthermore, for SMK students, the effect size of the PBL model on accounting learning is 0.879, as it is known that the learning system in SMK focuses on preparing students to face the world of work so that they are more practical. Therefore, students are required to be active during the learning process. According to Rusman (2011), applying the PBL model to SMK students in accounting lessons is very suitable and effective. Based on the acquisition of an effect size value of 0,879, which is classified as a significant effect—following the characteristics of PBL, the problems

raised in PBL are real-world problems. It is in line with the objectives of vocational learning, which prioritizes practical work skills directly following the material being studied.

The application of the Problem-Based Learning model affects accounting learning based on education or research objects, according to the meta-analysis results and the magnitude of the effect size for the impact of PBL in accounting learning

based on education, with an effect size acquisition of 0.616. Furthermore, for applying the PBL learning model to accounting learning carried out on accounting students at the university, the results showed an effect size of 0.42. These results are included in the moderate effect category. The use of the PBL learning model for accounting students at the university is still little done, as evidenced by the number of articles found in this study. Only four pieces examine at the university level.

3. Problem-Based Learning Model Affects Accounting Learning Based on Research Types

This research analyzes articles with two types of research: experimental research and classroom follow-up research. Based on the effect size calculation for empirical research, it is 0.611, with 16 articles. As for the follow-up research, the effect size class obtained is 0.856, with the number of articles studied as many as eight pieces belonging to the significant effect. The effect of the PBL model on accounting learning is more important or more effective in PTK. This result proves that PTK is in line with PBL characteristics, where PTK has carried out 1 to 3 cycles in the research process.

4. Problem-Based Learning Model Affects Accounting Learning Based on Research Variables

Based on the research results on five dependent variables, the effect size for five learning outcomes variables, critical thinking, learning motivation, learning achievement, and soft skills, shows an effect of $0.627 > 0.5$, classified as a significant effect. These results show that the PBL model impacts accounting learning based on the dependent variable. Furthermore, the following is a description of the meta-analysis on the effect of the PBL model to improve learning outcomes, critical thinking, learning motivation, learning achievement, and soft skills of students in accounting learning.

a. Learning outcomes

The calculation of the effect size on the learning outcome variable shows a value of 0.889; this result proves that the effect given by the PBL model has succeeded in changing the learning outcomes of students. The effect size gain on learning outcomes in this research is a significant effect because it reaches > 0.5 . This result means that PBL effectively improves learning outcomes in accounting learning. The results of this research also confirm the findings of Stanley (2012) that PBL provides real benefits because it can enhance accounting learning outcomes.

b. Critical Thinking

The result of the calculation of the effect size on the critical thinking variable shows a value of 0.546; this result proves that the effect given by the PBL model has succeeded in increasing students' critical thinking. Based on these results, the PBL model improves students' necessary thinking skills, with an effect of 0.546, which is quite large. According to Abidin (2014), the characteristics of PBL are

that the problems used in PBL are contextual and authentic and can encourage the ability of students to think from multiple perspectives.

c. Motivation to learn

The result of the calculation of the effect size on the variable of learning motivation shows a value of 0.668; this result proves that the effect given by the PBL model has affected increasing students' learning motivation. According to Rusman (2012), PBL is a learning model that uses intelligence to confront real-world challenges and reasons that direct the learning process to design various problem-solving cognitions.

d. Learning achievement

Learning achievement is a measurement result that reflects mastery of a subject matter. Learning achievement helps help students assess the extent of their abilities. The PBL model is applied through learning activities, formulating problems, determining problems to processing problems, and evaluating students to compare learning achievements in grades with other students. The calculation of the effect size on the learning achievement variable shows a value of 0.675; this result proves that the effect given by the PBL model has succeeded in increasing student learning achievement in accounting learning.

e. Soft skills

The calculation result of the effect size on the soft skills variable shows a value of 0.357; this result proves that the effect given by the PBL model has succeeded in changing the soft skills of students in accounting learning. The form of soft skills is the ability of students to adapt, communicate, solve problems, and the spirit of leadership. According to Ibnu (2006), knowing someone's soft skills involves sharing, group discussions, and presentations. In this case, PBL is appropriate if it is applied to train and improve students' soft skills. According to David et al., the essence of PBL is group discussion based on problems to be solved, self-study, and developing attitude skills.

CONCLUSION

A. Conclusion

This research aims to analyze the effect of the Problem-Based Learning model application on Accounting Learning. This research examines the PBL model's impact on accounting learning based on categories, education, type of research, and research dependent variables. The analysis was carried out using a meta-analysis method by effect size measurements from 24 similar research studies.

The results of this research indicate that:

1. Problem-Based Learning Learning Model Effects on Accounting Learning.
2. Problem-Based Learning Learning Model Affects Accounting Learning based on education.
3. Problem-Based Learning Learning Model Affects Accounting Learning by Type of Research
4. Problem-Based Learning
5. Model Effects on Accounting Learning based on Bound Variables.

Research Implication

The theoretical significance of this research is that the Problem-Based Learning model has been proven to affect accounting learning. Those impacts can be seen from various aspects, such as improvement in learning outcomes, learning achievement, students' critical thinking, learning motivation, and soft skills. This research provides implications of the results according to the meta-analysis findings in 24 articles.

In addition, the findings in this research also confirm the relationship between PBL characteristics and the dependent variable studied in this research.

Moreover, for practical implications, this research provides results related to the effect of PBL on accounting learning based on education. The application of PBL to accounting learning in SMK students proved to be the most influential, with a percentage of 50%. Furthermore, based on the type of research, it is proven that the Classroom Action Research had the most impact with a percentage gain of 67%.

Finally, based on the dependent variable studied, it is proven that PBL can affect and improve student learning outcomes with a percentage gain of 42%.

Research Limitation

Meta-analysis is used to determine the magnitude of the effect of variables studied using statistical methods. In this research, there are several limitations, including:

1. There is 1 article with no impact or relation because the effect size is tiny.
2. This research only analyzes articles from national journals

Suggestion

The future researcher can research more broadly about the effect of PBL on accounting learning in international journals.

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