The Effect of Problem-Based Learning with an Analytical Rubric on the Development of Students' Critical Thinking Skills

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This study aims to examine the effectiveness of problem-based learning (PBL) model with an assessment rubric on the students' critical thinking development in learning financial accounting. This quasi-experimental study conducted at a university in Riau, Sumatra, Indonesia involved 41 second-year students. They were divided into two groups: 22 students in the experimental group, 19 students in the control group. Pre-test and post-test were used to examine the effectiveness level. The data analysis techniques included descriptive statistical test and Mann-Whitney Test. The results showed that the mean scores of the pre-test and post-test in the experimental group were 47 and 60 respectively. The mean scores of the pre-test and post-test in the control group were 54 and 50 respectively. Moreover, the Mann-Whitney Test results showed that the value of Sig. (2-tailed)> alpha, that was 0.114> 0.05, indicating that Ho was accepted, and Ha was rejected. It indicates that albeit not significantly, the use of assessment rubric in the PBL model could increase the students' learning outcomes in the experimental group as compared with the students in the control group using PBL model only. It could improve the students' critical thinking skills. The limitations of the study and implications to future inquiries are also presented.

Keywords: problem-based learning, assessment rubric, critical thinking, financial accounting, quasi-experimental study

INTRODUCTION

Financial Accounting is one of the core subjects of the Accounting Department which plays an important role in assessing the quality of graduates of the study program. In this subject requires students to have and develop problem solving skills (Jones & Wright, 2011). Before taking the subject of financial accounting, students are required to take the prerequisite courses of the basics of financial accounting.

Basic knowledge of financial accounting equips learners in the ability to record financial transactions and good analysis for liquidity and business profitability (Umar & Aliyu,

2014). Therefore, students are required to have and develop problem solving skills to learn financial accounting in the long-term. It was observed that there was a decrease in student achievement in accounting. Similarly, the results of research conducted by Drennan and Rohde (2010) where there has been no memorable results for accounting at higher levels of education. Including student achievement at Ahmadu Bello university, India has decreased student achievement in financial accounting.

One of the factors causing the low students' achievement is the low students' critical thinking level in analyzing the materials. Cascini and Rich (2007) stated that success in accounting that needs to be developed is critical thinking ability. Therefore, it is requirement how to develop this capability in the classroom, using the various strategies and methods of learning. According to Burnett (2003), it is found that practitioners rank for critical thinking skills occupying one of four important skills an accountant must have.

The concern on the lack of students' critical thinking to activate the learning process was also evident in the present study. This issue was based on classroom observations from year to year in which the students' learning achievement was not satisfactory yet as found by Drennan and Rohde (2010). It was caused by the fact that the students do not have the ability to analyze the materials, in relation to the critical thinking skills needed to realize a successful learning process.

Problem-based learning (PBL) is, therefore, determined as the mediating method to elevate the students' learning outcomes. It is believed to be able to enhance the students' critical thinking skills through the given case studies. Problem Based Learning according to Duch, Gron, and Allen (2001) is that the core and learning objectives are linked to problems and can challenge students to develop higher levels of thinking such as analysis, synthesis, dan evaluation. PBL focuses on student competencies consisting of *(1) core knowledge, (2) cognitive skills (analysis, integration, evaluation, critical thinking), and (3) action skills (conflict management, time management, resource allocation power, and organizing and negotiating skills)* (Burch, 2001). Based on the characteristics of Financial Accounting subject, among others (1) requires students who have and can develop problem solving skills (Jones & Wright, 2011), (2) the content of the material requires a higher cognitive level, and (3) requires greater ability in processing prior knowledge (Carrington 2012). Based on these characteristics, the application of PBL has a match in order to boost student critical thinking.

However, the doubt at the effectiveness of PBL in accounting course remains in the surface. Heagy and Lehmann (2005) found that there was no significant difference between PBL and traditional learning in the basic courses. Furthermore, it is shown that PBL is not suitable for basic knowledge but giving students satisfaction in learning. It is also supported by the research of Johnstone and Biggs (1998) that provides for accounting educators in the application of PBL should (1) PBL be implemented only after the knowledge of accounting basics is lectured, (2) should the problem-solving strategy be taught explicitly; (3) innovative approach to teaching problem solving skills (which focuses on small groups and based on student center) (4) for those who apply the PBL has mastered the learning materials and techniques that will be delivered.

In relation to the effectiveness of PBL in enhancing students' critical thinking, a preliminary study was conducted. The results showed that there was no difference in learning outcomes between the application of the PBL method and the drill in small groups. The ability in analyzing the problem was still less satisfactory because they are accustomed to doing the exercises with the full guidance of the lecturer. Several contributing factors comprise: (1) group discussion did not run smoothly because almost all group member confused how to start solving questions in form of case study, (2) group discussion ran less smoothly due to lack the willingness of students to be persistent in finding out, (3) there are still students who only relied on other friends, (4) most students lacked reasoning skills, (5) students performed less enthusiasm in finding solutions from the given cases. Under the circumstances, this study aims to investigate the effectiveness of problem-based learning model with the proper use of assessment rubrics to the students' critical thinking skills development. Rubrics are considered helpful to mediate the students' learning process. The assessment rubrics can motivate them in learning the materials while being able to improve their academic achievement. The rubrics help them focus on the process of performing the tasks, producing higher-quality results, getting better grades and lowering the level of anxiety (stress) to the tasks given (Heidi & Du, 2005).

Previous studies have reported that the use of rubrics could increase the students' learning outcomes (Howell, 2011; Uddin, 2014). Some others have revealed that the use of rubrics as one of the tools in learning assessment can enhance the students' critical thinking skills, problem-solving skills, and self-assessment in the learning environment (Shafer, et al., 2001; Green & Bowser, 2006; Sadler & Good, 2006). Cascini and Rich (2007) also employed a simulation practice method with an assessment rubric in an accounting class about cash flow. The study was intended to develop the students' critical thinking. The findings demonstrated that there seemed no significant effect on the students' analytical skills to solve complex problems and to draw on a conclusion. Howell (2011) conducted an quasi-experimental study to explore the impact of grading rubrics on the students' academic achievement about youth naughtiness. The findings showed that the use of rubrics gave a positive impact on the students' performances. However, the information related to the effect of using grading rubrics on the students' critical thinking skills in an accounting class is still scant.

It is, therefore, worth-taking to understand whether the use of assessment rubrics can be a guide and facilitate the students in the process of analyzing the problems in the form of case study. This study aims to address two questions, "To what extent can the implementation of problem-based learning with assessment rubrics increase the students' critical thinking? To what extent is it effective to enhance financial accounting students' critical thinking skills?"

Literature Review

Problem-based Learning and Critical Thinking

Problem-based learning originally came from the concept of learning in a small group that was devoted for business education and became known around the 1920s.

University McMaster in Canada modified the syntax of learning in the 1970s through research and development into a "student center" approach where students learn from "problems" in small groups and through "discussions" (Barrow 1996; Kwan & Lee 2009). PBL focuses on student competencies consisting of (1) core knowledge, (2) cognitive skills (analisys, integration, evaluation, critical thinking), and (3) action skills (conflict management, time management, resource allocation, and organizational and negotiating skill) (Burch, 2011). Thus, it can be assumed that the application of PBL can develop the ability in decision making, creativity, critical thinking, and ability to integrate information.

In the context of PBL, the instructor should be aware of the students' problems, guiding and supporting their learning, avoiding haste in giving answers, students should have their self-management and the spirit of seeking knowledge and learning through group collaboration. Each learner has different experiences and knowledge, with group learning allowing to reflect on issues from different perspectives. Through sharing knowledge and opinions, the learning builds a meaningful knowledge system (Huang & Wang, 2012; Schmidt & Moust, 1995). The main strategy used in PBL is collaborative learning refers to the use of small groups through student cooperation to improve academic achievement (Johnson & Johnson, 1994)

PBL is a model based on learning situations where teachers should design the learning curriculum based on student perspectives and based on what is known, used, and organize sources in their day-to-day lives through guided participation. Ultimately students can develop the ability to solve complex problems they face in everyday life.

Based on Lave and Wenger (1991) and Duch et al. (2001), PBL views that core and learning objectives are linked to problems and can challenge students to develop higher levels of thinking. Critical thinking is one of the manifestations of higher-order thinking skills (HOTS). Basically, critical thinking is conceptualized as the ability to not only understand the learned knowledge but also transform the knowledge. The transformation of knowledge requires three stages: analysis, synthesis, and evaluation (Ives & Obenchain, 2006). Hence, the indicators of having a good command of critical thinking are the presence of analytical, synthesizing, and evaluative activities for the students in the classroom. The importance of possessing critical thinking skills is also articulated in the World Economic Forum (2016) as one of the orientation of education 4.0 era.

Furthermore, to examine the development of the students' critical thinking skills, the implementation of problem-based learning is crucial. Since critical thinking is used to mediate the transition from knowledge telling to knowledge transformation (Ahmad et al., 2018), the classroom activities need to be carefully designed. According to the revised Bloom's Taxonomy proposed by Anderson and Krathwohl (2001), the activities should activate question-posing, reasoning, and argumentation skills of the students. This is in line with the core of problem-based learning, which enables those three skills to solve the given cases or problems.

Based on the characteristics of Financial Accounting subject, among others (1) requires students who have and can develop problem solving skills (Jones & Wright, 2011), (2)

the content of the material requires a higher cognitive level, and (3) requires greater ability in processing prior knowledge (Carrington 2012). Based on these characteristics, the application of Problem-Based Learning (PBL) has a match in order to boost student critical thinking. The application of PBL underscores the importance of problem solving skills (Birgili, 2015), which represent the critical thinking skills of the students. In the process of PBL, the students collaborate to solve the given problems through reflection on their experiences and systematic analysis to reach a conclusion.

Narmaditya, Wulandar, and Sakarji (2018) and Yuan, Kunaviktukul, and Williams (2014) assert that the students' critical thinking skills can be stimulated and developed by using the problem-based learning. The problem-based learning emphasizes the process of explaining the problem systematically and reaching a conclusion based on several steps driven by their critical thinking skills.

Furthermore, the implementation of problem-based learning as a means of elevating the critical thinking skills of higher education students is based on the argument that there are some factors contributing to the development of critical thinking skills. The factors are age, gender, academic achievement, and educational background, according to Masek and Yamin (2011). Yew and Goh (2016) add that problem-based learning has a considerable tendency to influence the students' critical thinking skills. It is because the learning approach gives an impact on the students' long-term knowledge.

The PBL should consider the teacher's ability, familiar with the PBL model, done as well as possible. Teachers should adapt by modifying the PBL teaching model as needed to the different objectives to be achieved (Barrows, 1996). Duch et al. (2001) divides 4 PBL models i.e. medical school model, model of expanding facilitator, peer tutor model, and large class model. Stanley and Marsden (2012) developed the PBL model known as FIRDE. There are 5 stages of problem solving model easy to remember and implement. The five stages can be seen in table 01 below.

Table 1
Methodology problem solving by FIRDE method

Number	Stages	Action
1.	Facts	Defining problems, getting facts and answering relevant questions
2.	Ideas	Generalizing ideas and considering alternatives
3.	Research	Research for existing problems
4.	Decide	Collaborating, sharing ideas and making decisions
5.	Execute	Communicating the selected decision or option

Source: Stanley and Marsden (2012)

In FIRDE strategy, students learn to listen, appreciate their friends' ideas, and through ideas in discussion as well as interactions with fellow team members. It helps them in developing communication skills and problem solving and improves their learning effectiveness.

Johnstone and Biggs (1998) suggests there are four suggestions for accounting educators in the application of PBL : (1) PBL is implemented only after the knowledge of accounting basics is obtained, (2) should the problem-solving strategy be taught

explicitly; (3) encouraging innovative approaches to teaching problem solving skills (which focus on small groups and based on student center) (4) for those who apply the PBL should already master the materials and learning techniques that will be delivered. Heagy and Lehmann (2005) found that there was no significant difference between PBL and traditional learning in the basic courses. Furthermore it is shown that PBL is not suitable for basic knowledge but giving students satisfaction in learning.

Assessment Rubric

A rubric is a document that articulates expectations for a task with a list of criteria, or what matters, and describes the quality level from excellent to not good (Andrade and Du, 2005, p. 1). The assessment rubric is a descriptive schema, used as a benchmark in analyzing the product as well as the business process and the achievement of the student. This rubric is used for achievement of quality, and can be used to evaluate various subjects or activities. Thus the rubric can reveal "how students learn, what students should learn, how student learning is assessed, and how assessment are generated" (Glenn, 2005, p. 1). To this end, seven steps of designing the scoring rubric are recommended to be done as referred to Zainul (2001).

Step 1.
Review the Instructional Objectives (ICT) targeted by the task. It is necessary to equate your scoring guidelines with ICT and the implementation of learning.

Step 2.
Identifies the observable specific attributes (indicators) you want to see (or ones you do not want to see), which students will show in their products, processes and performance. It is necessary to itemize the characteristics, skills, or behavior that you are looking for, as well as common mistakes that you do not want to see.

Step 3
Discuss the characteristics that accompany each attribute. Identify ways to describe: performance above average, average, and below average for each attribute that can be observed in step 2.

Step 4a.
For a holistic section, write down a complete narrative description for excellent and very bad results, by inserting each attribute into the decryption. Describe the highest and lowest performance levels by combining descriptions for all attributes.

Step 4b.
For the analytic rubric, write a complete narrative description for excellent and very bad performance for each attribute individually. Describe the highest and lowest performance levels by using descriptors for each attribute separately.

Step 5a.
For the holistic section, complete the rubric by outlining other tactics on a continuum that range from excellent to bad performance of attributes collectively. Write a description for all levels between performance.

Step 5b.
For the analytic rubric, complete the rubric by outlining other levels of continuity ranging from excellent to bad for each attribute. Write descriptions for all intermediate levels of performance separately for each attribute.

Step 6
Collect samples from student work that represent samples of each level. This will be useful as a "benchmark" (threshold limit = minimum limit) and help you in scoring in the future.

Step 7
Revised rubric as needed. Prepare the effectiveness of the rubric, fix it before it is used at a later time. Sections are shared in the experiment class, with shareholder equity material. Socialization of how to use the rubric will be done twice after mid semester meeting.

Learning Outcomes

Learning is "a mental or psychic activity that takes place in an active interaction with the environment that results in changes in knowledge-comprehension, skill, and attitudinal value" (Winkel, 1999, p. 53). The ideal learning outcomes encompass all the psychological aspects that change as a result of experience and student learning process.

Gagne (1971) instills the terms of learning outcomes with learning capabilities consisting of (1) verbal information, (2) intellectual skills, (3) cognitive strategies, (4) motoric skills and (5) attitudes. Five types of learning outcomes according to Gagne above can be classified that verbal information, intellectual skills and cognitive stratgei included in the cognitive area, attitudes included in affective areas and motor skills.

The forms of learning according to psychic function consists of learning dynamic or konatif, affective learning, cognitive learning (remembering-thinking), and learning sensomotorik (observing, moving, skilled). In this case will discuss the form of cognitive learning.

Characteristic of cognitive learning is learning to obtain and use forms of representation that represent objects that can be faced objects, people or events. Such objects can be presented through symbols, criticism, or the idea that everything that is involved mental. The greater the ability of the language to express these ideas the higher the ability to express cognitive abilities efficiently and effectively (Winkel 1999, p. 65). Masek and Yamin (2011) asserted that cognitive learning is learning through a process approach by using "reasoning", "insight". Here students are invited to think inductively or deductively so that seek a logical and rational relationship.

The most important factor influencing learning is what the learner already knows, based on assumptions (Lodewijks, 1981) as follows.

a. Previous knowledge is a very important variable in educational psychology.
b. The level (content and organization) of the student's prior knowledge should be

measurable for optimal learning achievement.
c. Optimal learning situation if appropriate with prior knowledge level.

METHOD

This study was designed as a quasi-experimental research with non-randomized control group with pre-test and post-test. It was chosen because this study aimed to explore the effectiveness of using assessment rubrics on the students' critical thinking development. Figure 1 below depicts the details.

$$O_1 \longrightarrow X_1 \longrightarrow O_2$$
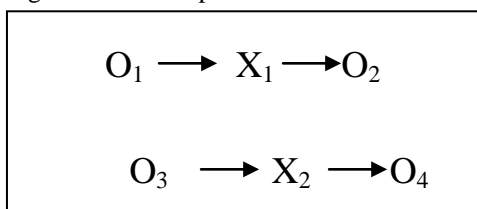
$$O_3 \longrightarrow X_2 \longrightarrow O_4$$

Figure 1
Study design explanation:
O1: Pre test in the experimental class
O2: Post test in the experimental class
X1: Treatment of PBL model with assessment rubric in experiment class
X2: Implementation of PBL method without assessment rubric in control class
O3: Pre test in the control class
O4: Post test in control class

This study was conducted in a university in Riau, Indonesia. The participants consisted of 41 accounting students. They were then divided into two classes in which 19 students were in the control class and 22 students were in the experimental class. They were enrolling in intermediate financial accounting II course. Moreover, the pre-test results showed that they have obtained the basics to financial accounting. Afterward, the students in the experimental class were divided again into five groups (two groups got five students). The group division was based on the students' proficiency level: high, medium, and low, which was obtained from their mid-term exam results.

Furthermore, the framework of the entire research process is demonstrated by Figure 2 below. An assessment rubric was used as the instrument of this research to obtain the effectiveness of problem-based learning with this rubric. The rubric was used to formulate the expected task criteria in accordance with the learning objectives of the course. The analytical rubric is usually selected when the response type is sufficiently focused, The degree of feedback given to the student (and the lecturer) is very meaningful. Students receive feedback on each individual scoring criteria of their show, and this is not used in holistic rubrics. After that it is possible to create a "profile" of specific students' strengths and weaknesses.
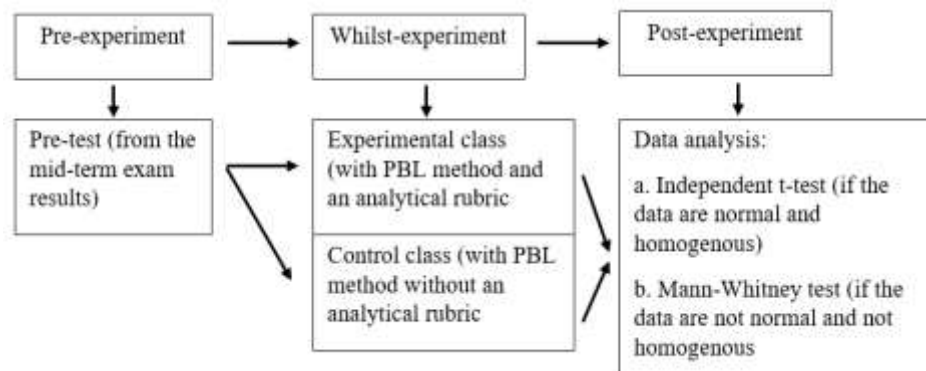
Figure 2
The research framework

To measure the students' critical thinking skills, the students were given some cases to be solved. The students were given an activity to analyze the influence of splitting stock. The students accomplished a particular case in group, as follows. A company named PT Osean sells a number of ovens to all restaurants in the area of Central Java Province. The company has 50.000 shares, and has announced the stock split. There are three plus two shares every time the stock is issued. The questions are:

1. How many shares are outstanding after the split?
2. If the common stock has the market price as much 180.000 rupiahs per share before the split, how much is the price of each share after the split, that will be close to the market price?

The students discussed the problem with their group mates. After reading some materials given by the lecturer in the forms of books and learning web sites, they attempted to solve the problem. They also discussed it with the lecturer twice a week. Then, they did a presentation of the discussion results.

The learning objective was to enable the students to apply the accounting knowledge regarding the equity of the shareholders. Table 2 depicts the sample of the rubrics. The indicators were as follows.

1. The students made the stock publishing journal.
2. The students made journal entries for cash dividends and stock dividends.
3. The students made journal entries for treasury stock transactions.
4. The students explained and exemplified the report of the shareholders' equity.
5. The students explained the influenced of splitting stock on the company's financial report.

Table 2
A sample of the rubrics in the analysis activity

Criteria	Good (Score=3)	Unsatisfactory (Score=1)
Criterion 1	Accurate in analyzing the additional number of shares after splitting the stock	Inaccurate in analyzing the additional number of shares after splitting the stock
Criterion 2	Accurate in analyzing the changing price per share after splitting the stock	Inaccurate in analyzing the changing price per share after splitting the stock
Criterion 3	Explain the calculation systematically	Do not explain the calculation systematically

The pre- and post-tests were utilized as the instruments of this research as well to obtain the students' improvement. Before administered, all question items were analyzed and validated first by experts. The test used in this study was in the form of case studies. The test required the students' analytical skills, which had a range of difficulties as part of the strategy of implementing the problem-based learning. The test was administered at the end of the semester.

Validity and reliability tests on the question items were conducted prior to the administration. There were seven essay questions in the test. The validity level of six question items was between the range of 0.65-0.88, while one question got 0.53. Hence, one question (No.7) was withdrawn. The reliability test results demonstrated 0.84 meaning that all question items were categorized as very high.

Furthermore, the question items were tested in terms of their difficulty level. The results showed that there were five questions categorized as medium, one question as easy, one question as difficult. Moreover, it is suggested that the questions are tested in terms of their discrimination level. The results showed that six questions were considered good and one question required revision.

FINDINGS

The Development of Students' Critical Thinking Skills Based on the Tests Scores

This sub-section delineates the occurrence of critical thinking in each activity of the FIRDE model and the learning outcomes of the students in control and experimental classes. Table 3 displays the occurrence of the students' critical thinking skills during the learning process. This research did not mainly focus on the details of the critical thinking skills. However, this research referred to the activities done by the students by using the indicators of problem-solving by using FIRDE method, as follows.

Table 3
The occurrence of the students' critical thinking skills

No	Stage	Activities
1.	Facts	Define the problem, gather facts, and answer the relevant questions regarding the problems
2.	Ideas	Generalize the ideas and consider the available alternatives
3.	Research	Research the existing problems
4.	Decide	Collaborate with others, share ideas, and make decisions
5.	Execute	Communicate the decision or the chosen option

Regarding the pre-test results in the experimental class, Figure 3 demonstrates that three students were in the first score interval (0-20); five students were in the second interval (21-40); eight students were in the third interval (41-60); five students were in the fourth interval (61-80), and only one student was in the highest interval (81-100). The mean of the pre-test score was 47. Half of the students' scores (50%) were below the mean, while the other half were above the mean. 20 and 25 were the most frequently occurred scores, which were identified in three students respectively. The only student in the highest interval obtained 90, while three students in the lowest interval got 20.
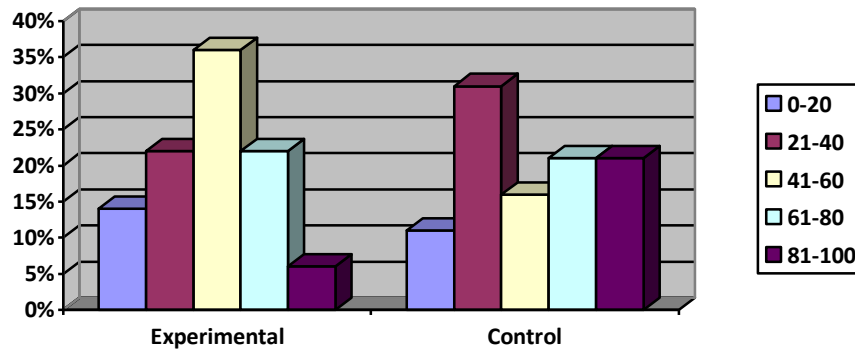

Figure 3
The comparison of distribution of students' pre-test scores in both groups

Meanwhile, the distribution of students' pre-test scores in the control class seems more promising than its counterpart. The mean score was 54. Specifically, eight students' scores (42%) were above the mean; one score (5%) was in the mean spot; and the rest of the scores (N=10 scores or 53%) was higher than the mean. The most frequently occurred score was 30 with three students. The highest score was 95, while the lowest score was 20 with two students.
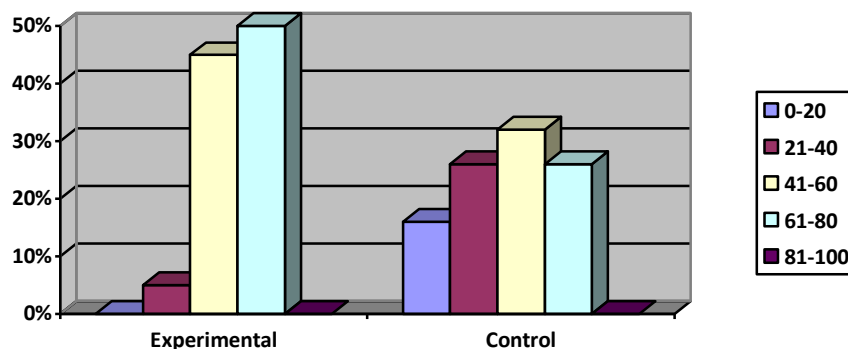
Figure 4
The comparison of distribution of students' post-test scores in both groups

Since there was a gap of the students' scores between the experimental and control classes, the researchers applied the problem-based learning with an analytical rubric in the former class. After all meetings were completely done, the post-test was administered to them. Figure 4 depicts the details. The results showed that the mean score of the experimental class increased from 47 to 60. Specifically, three students' scores (14%) were in the mean spot; eight scores (36%) were above the mean; and eleven scores (50% were below the mean. Although the number of scores in the below-the-mean area remained still, the most frequently occurred score was 65 with five students. The highest score was 75 with four students, while the lowest score was 25 with one student only.

On the other side, the control class exemplified a somewhat stagnant result. The mean score was 50. This means that the implementation of problem-based learning without using an assessment rubric seemed not influential on the development of students' critical thinking skills; from 54 in the pre-test to 50 in this test. Two students' scores (11%) were in the mean spot; nine scores (47%) were above the mean; and eight scores (42%) were below the mean. Interestingly, the most frequently occurred score was 75 with four students. The highest score was 80, while the lowest one was 20. The fact that the highest score in the experimental class was lower than that in the control class might be caused by the outlier students, whose performances fluctuated. The results generally reach to a conclusion that the implementation of problem-based learning with an assessment rubric partly influences the development of students' critical thinking skills.

The Significance of PBL with an Analytical Rubric on the Development of Students' Critical Thinking Skills

Before performing different test analysis between PBL model with rubric compared with PBL model without rubric implemented first test of prerequisite normality and homogeneity can be seen in following table.

Table 4
Normality test results of pre test and post test experimental class

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PRETEST_EKSPERIMEN	.155	22	.185	.901	22	.032
POSTTEST_EKSPERIMEN	.142	22	.200[*]	.947	22	.272

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

For the experimental class, Table 4 using the Kolmogorov-Smirnov test showed that the pretest normality test results reached Sig.value $0.032 < 0.05$, and the post-test results reached Sig value $0.272 > 0.05$. Thus, the pre-test of the experimental class is not normally distributed while the post-test is normally distributed.

Table 5
Normality test results of pre test and post test of control class

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
PRETEST_KONTROL	.167	19	.172	.913	19	.085
POSTTEST_KONTROL	.150	19	.200[*]	.909	19	.072

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

For the control class, Table 5 using the Kolmogorov-Smirnov test demonstrated that the pretest normality test results obtained the Sig value $0.085 > 0.05$ and post-test obtained the Sig value $0.072 > 0.05$. Thus, the pre-test and post-test results are normally distributed.

Table 6
Homogeneity test result of pre-test

		Levene Statistic	df1	df2	Sig.
PRE_TEST	Based on Mean	2.988	1	39	.092
	Based on Median	1.718	1	39	.198
	Based on Median and with adjusted df	1.718	1	35.067	.198
	Based on trimmed mean	2.910	1	39	.096

Table 6 showed that the mean of 0, 092 is greater than alpha (α) of 5% (0.05) with the sig value $0.092 > 0.05$. It can be concluded that the pre-test data between the control class and experimental class is homogeneous.

Table 7
Homogeneity test results of post test

		Levene Statistic	df1	df2	Sig.
POST_TEST	Based on Mean	8.990	1	39	.005
	Based on Median	8.402	1	39	.006
	Based on Median and with adjusted df	8.402	1	36.890	.006
	Based on trimmed mean	8.957	1	39	.005

Table 7 showed that the mean of 0, 005 smaller than alpha (α) of 5% (0.05) with the sig value 0, 005 <0.05. It can be concluded that the post-test data between the control class and the experimental class is not homogeneous.

Mann-Whitney Test Results

The normality test results of the pre-test in the experimental class are not normal, and homogenity test results of the post-test between control class and experimental class is not homogeneous. Therefore, to test the hypothesis Mann Whitney test was conducted.

Table 8
Mann-Whitney test results

Test Statistics[a]	
	POST_TEST
Mann-Whitney U	149.000
Wilcoxon W	339.000
Z	-1.580
Asymp. Sig. (2-tailed)	.114

a. Grouping Variable: MODEL

Table 8 above shows that the value of Sig. (2-tailed)> alpha, that is 0.114> 0.05 indicates that Ho is accepted, and Ha is rejected so it can be concluded that there is no difference between the Problem Based Learning model with the assessment rubric compared with the Problem Based Learning model without the assessment rubric for improving student learning outcomes in intermediate financial accounting 2. So it can be concluded that the PBL model by using rubrics is beneficial to improve the students' critical thinking skills, albeit not significantly in the intermediate financial accounting classroom.

DISCUSSION

The result of data analysis showed that the pre test result between the control group and the experimental group showed that the average score of the experimental class of 47 and the control class was 54 difference of 7 points higher the control class. Post test results between the control group and the experimental group showed that the average of the experimental class 60 and the control class was 50 difference of 10 points higher the

experimental class. From this data it can be seen that the average post result of the experiment class is higher than that of the control class, meaning that the use of rubric can improve learning result intermediate financial accounting 2 in experiment class albeit not significantly.

When the two classes applied the PBL model without using the rubric, the experimental class pre test result was 7 points lower than the control class, but after using the rubric the reverse result of the experiment class experimental study was 10 points higher than the control class. Thus the application of Problem based learning by using rubric shows that it can improve learning outcomes compared to PBL model without using rubric albeit only 10 points of increase. This shows that the number of students who experienced a decrease in the experimental class is lower than those in the control class. This can corroborate the evidence of the effect of using rubrics in improving the students' learning outcomes.

In the experimental class, the number of students who experienced a decrease was 6 (27%) students. Meanwhile, those experienced an increase are 16 (73%) students. In the control class, the number of students who experienced a decrease is 8 (42%) students. The number is students who experienced no increase or decrease is 1 (5%) student. The number of students who experienced an increase is 10 (53%) students.

Based on the data, the difference in the value is 15% higher in the control class than in the experimental class for the post test. The difference is only 2 students (8 students in the control class and 6 students in the experimental class) that experience a decrease. Thus the difficulty level of the post test is higher than the pre test. It means that using the rubric is quite helpful in improving the students' learning outcomes albeit not significantly.

From the results of mann whitney test analysis showed that there was no significant difference between using rubrics and not using rubrics in the experimental class compared to the control class. Therefore, when compared with the average difference in post test between the experimental and control classe is only 10 points higher than the experimental class. Thus the application of PBL by using rubrics can improve the students' learning outcomes albeit not significantly because there is no significant difference between the two groups.

There are several reasons why there is no significant difference between the two groups. First, during the PBL learning process, the students lack of the curiosity that can be seen from few students who are active in the discussion process before the presentation. Second, the group discussion process is less than the maximum because the material about equity shareholders, is new material obtained by the students so they might still feel confused. The discussion is not running maximally. Third, the enthusiasm to find out and creative power is also not considerably positive. This can be seen from the lack of initiatives to obtain materials from other sources.

From the implementation of the PBL with the rubric of assessment, although the introduction of the rubric that runs two weeks there is still confusion how to use the rubric as a guide to do the question, has seen enthusiastic students to solve the case

questions. That is compared to the control class that does not use the rubric, the enthusiasm or curiousity still low on the control class, they only rely on the explanation of the lecturer. However, in the experimental class has already seen that some groups began to curious to solve the problem through the rubric provided. From the results make the questions and answers from cases given the complexity of the work has begun to be seen if compared to a class that does not use a section. This means that weakness in previous research is quite effective by using rubric although not significantly increase the learning result when compared to the control class. The results of the present study corroborate the previous research conducted by Cascini and Rich (2007) with practice simulation method with assesment rubric where discussed subject is about cash flow statement in developing critical thinking of student at intermediate financial accounting. In his research there was no significant impact on complex problem-solving analysis and skills in making conclusions. This means that the use of rubrics does not considerably help improve the students' critical thinking in complex case matters for cash flow statement topics.

This can happen because intermediate financial accounting requires a high level of thinking that is the analytical skills needed in critical thinking. According to a survey conducted by Burnett (2003), it was found that practitioners rated for critical thinking skills occupied one of the four essential skills that must be possessed an accountant. Thus the case questions are a complex problem in intermediate financial accounting 2 including the topic of shareholder equity.

Therefore, in accordance with the results of research Cascini and Rich (2007), the use of rubrics in the problem-based learning model does not have a significant effect on the results of intermediate level financial accounting 2. This is evidenced from the test results mann whitney that there is no difference results significance between PBL model with rubric in experiment class and PBL model without assesment rubric in control class. This can also be seen from the increase of experimental class learning outcomes compared to the control class is only 10 points to the post test score.

In contrast to Giguere (2006) who implemented PBL in cost accounting, the findings show that the students' learning outcomes are significantly better than those in the conventional learning classes.

The research conducted by Uddin (2014) on the impact of the use of rubrics on student performance (achievement) showed that the use of rubrics in a writing class can significantly influence the students' performances and trigger positive attitudes from the students and teachers.

A limitation was found in the research as in the previous research that some students still look passive (lack of spirit). The number of active students is less than 50%, in providing a complex explanation to their friends. Some scholars (Huang & Wang, 2012; Schmidt & Moust, 1995) argue that students should have and apply self-management and the spirit of seeking knowledge and learning through group collaboration and with group learning allowing them to reflect on the problems of different perspectives. Through sharing knowledge and opinions, the learners can build a meaningful

knowledge system. It still takes time to change the student habits from being passive to being active. The reason for the existing limitation of the research is because the rubric used has not been through a rigorous validation from the linguists and scholars.

CONCLUSION AND RECOMMENDATIONS

Based on the results of research and analysis of data, it can be concluded that albeit no not significantly, difference between the use of assessment rubric in the PBL model with the assessment rubriccould increase the students' learning outcomes in the experimental group as compared with the students in the control group using PBL model only. in It could improving improve the students' critical thinking skills. It might be because the assesment rubric has not been through the validation of linguists and scholars.

It is recommended that further research does a rigorous validation for maximum results. Then it is advisable for the co-ordinator of the study program to include the course of critical thinking because when students are not accustomed to analyze a problem and do not know how to start doing the right problem solving then it is difficult to directly faced in complex cases.

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