

THE EFFECTIVENESS OF PROBLEM-BASED LEARNING IN THE ACCOUNTING COURSE

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ABSTRACT

This study aims to examine the effects of PBL pedagogy applied to the intermediate accounting course of students' learning effectiveness—academic performance. Unlike the previous studies, the study adopts the experimental approach with the pre-test post-test design and an open-ended qualitative questionnaire, the results support using PBL in teaching accounting courses to improve students' learning outcomes as well as the better students in beginning accounting experienced learning growth significantly higher than the average student. Moreover, in the after-class survey conducted for the experimental group on students' feelings and perception regarding PBL, we found that more than half of the students regardless of learning effectiveness gave positive responses. On their perception of PBL, students concur that PBL teaching will enhance their reading enjoyment of financial accounting texts and help improve their lifelong independent learning skills. Besides adding the empirical literature on PBL application to accounting education, this study mainly contributes to placing a greater emphasis on subjective norms and acceptance of students and to offering specific suggestions that can be of important to future researchers.

Keywords: Problem-based Learning, Learning Outcomes, Accounting Course

1. INTRODUCTION

In Taiwan's accounting education today, the prevalent teaching pedagogy is still the traditional method whereby teachers deliver textbook content directly to students through straightforward lectures. Students who come out of these accounting courses develop a narrow view that accounting learning is primarily rules-based. They learn by memorizing knowledge transmitted by their teacher, their energies focused mainly on the "how" rather than the "why". This has been criticized as mechanical learning through rote memorization (Keating & Jablonsky, 1990; Saudagaran, 1996). Therefore, traditional accounting education and training often result in graduates only knowing about the accounting profession per se, but lacking analysis, judgment, communication, problem-solving and other important skills (Porter & McKibbin 1988).

In an accounting conference titled “IFRS : Impact and Implication to Taiwan Accounting Education”, Taiwan accounting industry practitioners Chou & Juan (2009) summarized professors’ and CPAs’ remarks as follows: “Taiwan’s current accounting education fails to comply with IFRS, as IFRS focuses on the concepts of inference and judgment, rather than technical memorization and practice. Student graduates face a great gap between theory and industry practice. While the latter could be quickly picked up and reinforced in the workplace, the former is built on foundation inconsistent with industry expectations to begin with. Thus the need for students entering the workplace to re-learn everything. Schools ought to train students to identify problems, to search information, to make decisions, to develop documentation capabilities, rather than computing ability which is the current focus.” Also, the 2011 “IFRS Accounting Education Conference” organized by Taipei University’s Accounting Department and John Wiley concluded that the core concept in the transformation from US GAAP to IFRS is the move from rule-based to principle-based. In the past, there was a clear boundary between accounting handling and what accounting deemed as important, but the future will rely on transaction analysis and professional judgment, thus schools must abandon the traditional teaching mode that focuses on calculation. Instead, first priority should be on training students to think, analyze and develop interactive capabilities. (Huang, 2007).

Twenty years ago, U.S. professional accounting organizations put forward a series of research reports for evaluating accounting education. The American Accounting Association (AAA), for instance, recommended in the Bedford Report that students of accounting education should be encouraged to become active and independent learners rather than passive recipients of information (AAA 1986). The Accounting Education Change Commission (AECC) pointed out that students should be prepared for lifelong learning. It also stressed the importance of “learning by doing” and “group learning” (AECC 1990, 309). Following AECC’s report, American Institute of Certified Public Accountants (AICPA), in the Core Competency Framework for Entry into the Accounting Profession (The 1999 Core Framework) highlighted the need for a shift of accounting curriculum design from content-based to competency-based. It was clearly pointed out that curriculum design should be guided by a problem-based learning (PBL) approach. Milne & McConnell (2001), along with Johnstone & Biggs (1998), had similar views. They advocated the incorporation of PBL into accounting education.

Moreover, in November 2010, the Canadian Institute of Chartered Accountants (CICA) and the University of Toronto called for a change in accounting education from framework-based teaching to framework-based learning, one that is student-centered,

thinking what the student is doing and asking when is the appropriate time to introduce problems or case studies into the learning process. Such questions can be answered through PBL implementation (Wells, 2011).

Taiwan Education Ministry's "Report of Midterm Development Project on Business and Management Education" (Ministry of Education, 2010) pointed out that "Problem-solving oriented liberal course of study is based on real-world problems. The emphasis of student-centered education model is on thrusting students into complex, meaningful problem scenarios which need to be tackled through team work. This kind of learning will help them acquire problem-solving and self-motivated learning skills."

Compared to traditional teacher-led instruction mode, PBL places more emphasis on students' active learning. Through teamwork, students collectively gather, interpret, and analyze data to seek answers and to construct their own meaningful knowledge systems. Besides knowledge-oriented teaching, PBL emphasizes competency-oriented teaching, hoping to enhance students' independent-learning ability, teamwork, and integration of knowledge, problem-solving skills, critical thinking and lifelong learning capacity. So PBL emphasizes situational teaching (contextual learning), through lesson plans designed to expose students to actual problem situations, and help them learn how to integrate knowledge into analyzing and solving problems.

Given that accounting students' learning effectiveness is enhanced by teaching those good problem-solving and communication skills, the extent to which teaching method affects learning effectiveness becomes an issue worth investigating. In this paper, we attempt to examine how the PBL method affects students' learning effectiveness by applying the method to a second-year college accounting course. The better students in basic accounting tend to experience learning growth that is significantly higher than the average student.

Extant literature on the application of PBL to accounting education is rare and most of them adopt a questionnaire-based methodology (Stanley & Marsden 2012; Breton 1999). Unlike previous studies, this study utilizes the experimental approach with pre-test and post-test design and an open-ended qualitative questionnaire to explore the effects of PBL on students' learning effectiveness. Results show that applying PBL to accounting course can significantly improve students' learning outcomes. This work's two major contributions are: (1) it adds to the empirical literature on PBL application to accounting education by setting an example that uses tests scores and objective questionnaire measures to assess both learning outcomes (2) this paper

places a greater emphasis on subjective norms and acceptance of students and offers specific suggestions that can be of importance to future researchers.

This remainder of this paper is organized as follows: Section Two reviews literature regarding learning effectiveness and PBL application to accounting education, and it formulates the hypotheses of this research. Section Three describes the methodology, including research design, sample, and pedagogies. Section Four presents the results, and discussion follows in Section Five. Finally, conclusions, limitations, and suggestions are proposed in Section Six.

2. LITERATURE REVIEW

2.1 PBL Problem-based Learning (PBL)

Problem-based learning (PBL) originated from a concept of small group learning for business education that was introduced during the 1920s. McMaster University in Canada modified this tutorial process in the 70s through research and development into a “student-centered” pedagogy in which students learn “from problems”, “within small groups”, and through “discussions” (Barrows 1996; Kwan & Lee 2009). PBL is concerned with students’ competencies in three primary aspects: (1) core knowledge, (2) cognitive skills (e.g., analysis, integration, evaluation, and critical thinking), and (3) action skills (e.g., conflict handling, time management, resource allocation, organization and negotiation skills) (Burch 2001). It has been speculated that PBL can help develop students’ judgment, creativity, critical thinking, and information integrating abilities (Chen & Sun, 2006). All aforementioned abilities should be requirements for becoming an accounting specialist.

PBL can be viewed as a teaching philosophy that advocates student-centered and teacher-facilitated learning. According to constructivism, learners through interaction with the environment use the experiences they have gained to construct new knowledge (Yang 2012). In a PBL context, the instructor should develop students’ problem consciousness, guide and support their learning, and avoid giving immediate answers; students should show their self-management and knowledge-seeking spirit and learn through group collaboration. As each learner has different life experiences and prior knowledge, learners within the same group are enabled to contemplate issues from different perspectives. Through sharing of knowledge and opinions, learners can collectively construct a meaningful knowledge system (Wang 2012; Dods 1997; Hmelo & Evenson, 2000; Schmidt & Moust 1995; Trop & Sage 2002).

One major strategy used in the PBL process is collaborative learning (Evensen &

Hmelo 2000), which refers to the use of small groups through which students work together to accomplish shared goals and maximize their academic achievements (Johnson et al. 1994).

PBL is also a model based on the principles of situated learning, which suggest teachers should offer learning curriculums designed from students' perspective and allow students to know, use, and organize various resources in daily life through guided participation. Ultimately, students can develop the ability to solve complicated problems that they might encounter in daily life. According to Lave & Wenger (1991), knowledge gained from learning in a community of practice is more meaningful and of practical value to learners, and learners have more profound understanding of the culture of the community they acquired the knowledge from when they actively use the knowledge as a tool.

In PBL, "problem" is the starting point for student learning, hence one of its major features. Duch (2001)'s view is that course content and objective ought to be linked to a "problem", for the latter can challenge students to develop higher-level thinking skills such as analysis, synthesis and evaluation. A good PBL "problem" can be divided into three levels: the first which is at the knowledge or comprehension cognitive level, is the typical end-of-chapter problem found in traditional textbooks; the second level adds a storytelling aspect to the traditional end-of-chapter problem; in the third level, the problem posed requires analysis, synthesis, or evaluation.

To summarize, compared to traditional teaching where the teacher unilaterally instills knowledge, PBL places major emphasis on the student, with teacher playing a catalytic role in cognitive coaching, guiding and training students to actively explore knowledge, to acquire the know-how's of effective lifelong learning, to gain collaborative problem-solving social skills. As a driving force for reforms in teaching concepts and teachers' self-renewal, PBL is a promising tool for transforming a teacher's career life. (Yang, 2012).

2.2 Teaching Models of PBL

PBL must take into consideration teaching skills, familiarity with the PBL model, teaching design, feasibility, as well as investment time and other factors. Teachers should tailor and modify PBL teaching mode in accordance with their needs in order to achieve different educational goals (Barrows, 1985, 1986, 1996). So far, a number of schools that implement PBL cater to traditional teaching advantages by developing a hybrid PBL model with traditional teaching methods mixed in to suit their needs (such as the New Pathway curriculum designed by Harvard Medical School)

(Armstrong, 1991; Barrows, 1996). Duch (2001) arrived at four PBL teaching models: the medical school model, the floating facilitator model, the peer tutor model, and the large class model.

In addition, Stanley & Marsden (2012) developed a PBL model called FRIDE (see Figure 1), a five-step problem-solving method that is easy to remember and implement, and thus especially suitable for students new to PBL.

Figure 1 FIRDE Problem Solving Methodology.

| Step | Action |
|----------|---|
| Facts | Define the problem, gather Facts and ask relevant probing questions |
| Ideas | Generate Ideas and consider alternatives |
| Research | Research each issue pertaining to the problem |
| Decide | Collaborate, share ideas and make a Decision |
| Execute | Communicate the decision to the client and/or Execute the chosen option |

The key point of PBL teaching lies not in knowledge transmittal, but in developing students' ability to learn independently and tackle problem-solving this way. How to learn is more important than what to learn. In the problem driven process, complemented by the "FIRDE" strategy, students learn to listen, to respect their peers' ideas, and through shared discussions, also interact with fellow team members. It helps them develop better communication and problem-solving skills, and also raises their learning effectiveness.

Hong (2001, 2004) summarized PBL's four modes of operation based on process order sequence : (1) student self-study → small panel discussions → discussions with teacher → small panel reconvene → class discussions by group; (2) student self-study → small panel discussions → discussions with teacher → student self-study →small panel reconvene → class discussions by group; (3) small panel discussions →student self-study → small panel discussions →discussions with teacher→ class discussions by group; (4) small panel discussions → discussions with teacher →student self-study →small panel reconvene → class discussions by group. Which of the four to adopt is contingent on student ability and depth of the problem (Hong, 2001 & 2004)? What is special about PBL is it can appropriately combine various teaching methods and strategies (Boud & Feletti, 1991).

2.3 PBL and Learning Outcomes

PBL's functionality can be confirmed through curriculum evaluation and research results compiled from institutions that have implemented PBL. Aside from aiding in student learning, PBL also contributes to teachers' professional development, so that teachers are given the opportunity to be involved in team teaching, in designing teaching materials, and in self-reflection and assessment. (Fisher, 1991; Harris et al., 1997).

Johnstone & Biggs (1998) outlined four recommendations for accounting educators who are considering implementing PBL: (1) that PBL be implemented only after basic technical accounting knowledge has been acquired; (2) that appropriate problem-solving strategies be explicitly taught; (3) that innovative approaches for teaching problem-solving skills be encouraged (small group and student-centered learning emphasized); and (4) that faculty members teaching PBL classes possess technical knowledge expertise of the subject area.

Mikne & McConnel (2001) adopted PBL as accounting education mechanism, using a case study approach as incentive for students to acquire new knowledge, so as to grant them the freedom to learn and develop on their own, and in so doing promote their independent learning ability.

Breton (1999) offered support for the hypothesis that in an accounting education context, PBL methods produce better academic results than traditional lectures. He also provided evidence suggesting that PBL students were cognizant of having acquired knowledge and ability which they expect will turn out to be even more useful in the long-term.

Giguere (2006) implemented PBL in a course in cost accounting in 2000, and found PBL students' learning outcomes significantly better than those of conventional cost accounting students (rated through semester grade point average scores). Breton (1999) in his 1996 accounting theory class at Université du Québec à Montréal, divided 49 students into a control group and an experimental group. Using questionnaires to carry out statistical analysis that compared traditional teaching methods and PBL, results suggested PBL yielded than better learning outcomes than traditional teaching. Moreover, students who have gone through PBL were conscious of gaining ability for lifelong learning. From 2006 onwards, Stanley & Marsden (2012) at the Queensland University of Technology (QUT) adopted a new Accountancy Capstone unit. 481 out of a total of 562 students over seven semesters filled out questionnaires. Based on quantitative and qualitative data collected from these questionnaires, it was found that

students perceived PBL to be generally effective, especially in terms of developing such skills as questioning, teamwork, and problem solving.

However, Lehmann (2005), in a case discussion of foundation courses in accounting information systems, carried out PBL investigation on both graduates as well as students still enrolled in school. He found that for basic subject courses, learning results showed no significant difference between traditional or PBL teaching pedagogy. He further pointed out that PBL will not adversely affect access to basic knowledge, but will abet student learning satisfaction.

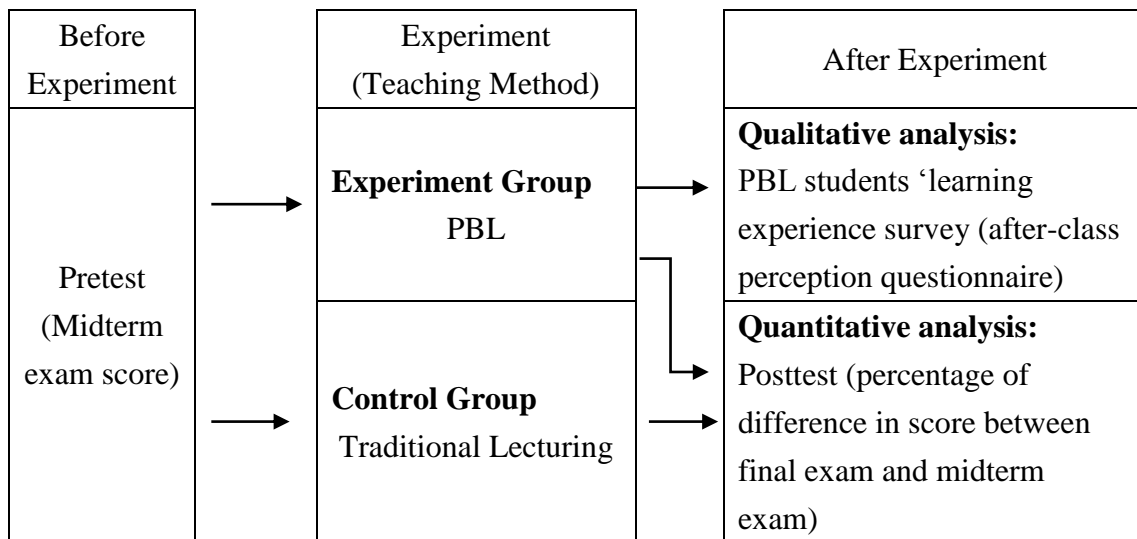
Given that PBL has gained wider and wider application, and that it offers a glimpse of the interaction among the three dimensions - curriculum, teaching, and learning, we found in reviewing extant PBL literature that empirical research on the application of PBL to accounting education, especially PBL effectiveness, is very limited. If PBL can be implemented, collaborative learning strategy can guide students in gathering information for meaningful situational learning. In the learning process, students will learn to listen and respect others' opinions and also develop communication and problem solving skills. Meanwhile, through guided participation, students learn to organize a variety of learning resources and acquire the ability to face complex issues that they may have to deal with in the future. As such, PBL is situational learning put to practice. Students are trained to establish professional knowledge in accordance with the conceptual framework of accounting, and, based on the lessons learned, acquire more in-depth accounting expertise. Therefore, assessing the effectiveness of implementing PBL in accounting education is a subject worth studying. Based on the above discussions, we propose the following hypothesis:

H₁: PBL can significantly improve the learning outcomes of accounting students.

3. RESEARCH METHOD

This research to investigate PBL student learning effectiveness is quasi-experimental in design. Using a PBL-based course for accounting students offered by a private Taiwan university, and prompted by the research objectives as well as by results published in relevant literature, the experimental framework design is as shown in Figure 2 below:

Figure 2 : Experimental Framework Design



3.1 Students Tested

Two second-year accounting classes were selected from a private university in northern Taiwan. The 55 students comprising Class A, the experimental group, received lessons based on traditional teaching methods. The 60 students comprising Class B, the control group, were given PBL-based lessons. i.e., lecture and review. The experimental period spanned 18 weeks during the first semesters of 2011 and 2012. Students in both groups had to spend four hours per week on the course.

3.2 Experimental Design

We adopted the pre-test and post-test design with a control group. The independent variable is PBL-based lesson and traditional teaching method. The dependent variable is learning effect. (Percent change in students' pre-test and post-test scores). For the first eight weeks of the experiment, the two groups of students took the same Intermediate Accounting course based on the same teaching method and following the same schedule. To test consistency of teaching method, content, progress, and students' accounting knowledge between the two groups, we gave students of both groups a midterm exam on the ninth week. This exam was collaboratively designed by the two participating teachers. Based on the exam results, we could evaluate if there was significant difference between the groups in their mastery of Intermediate Accounting.

Later, the two groups received the same lessons taught using different teaching methods. On the 18th week (the final week of the semester), both groups of students

had to take the same final exam designed by an independent third party (an accounting teacher). This way, we could evaluate the difference in their learning outcomes. During the period of experimental instruction from the 10th to the 17th week, students in Class A (control group) learned the same lessons taught using the traditional teaching methods with the small-group collaborative learning strategy. Students in Class B (experimental group) learned Intermediate Accounting lessons taught using the PBL approach.

Intermediate Accounting is a required course for all accounting students in this department. Taking Lohman & Finkelstein's (2000) suggestion of six to nine persons being the optimal size for each learning group, we divided Class A into eight groups, each consisting of six or eight students. Although learning group size is a concern in PBL, Duch (2001) argued that PBL is also suited for larger learning groups. Besides, the participating university had a uniform syllabus for each required course, so we did not completely design the experimental lessons based on situational problems. Instead, from the essay questions and cases for each unit in this course, we induced three major themes and designed four problems for each theme.

In PBL, the instructor served as discussion facilitator for all students. The sequence of problems to discuss, classroom activities such as reporting, resource-sharing, question-and-answer, was all arranged by the instructor. The PBL students had to take two sessions of the course per week, each lasting 110 minutes with a 10-minute break. During the experimental eight weeks, we adopted *mutatis mutandis* Stanley & Marsden (2012) FIRDE procedures and Hong (2001, 2004)'s operational model which involved three kinds of teaching activities: lecturing, group discussion, and class discussion. For this research, the three activities were arranged in the following order: lecturing → self-learning → first session of before-class discussion → discussion with the teacher → second session of before-class discussion → class report → group inquiry. The details involved in each step are compiled in Table 1.

3.3 Variables

Dependent Variables: Learning outcome is measured by student Percentage change grades in the mid-term and final examinations (Percentage change in students' pre-test and post-test scores).

Independent Variable: Teaching method was represented by a dummy variable which identified the experimental group as 1 and the control group as 0. Its effect on learning outcomes was expected to be positive (i.e., increases in learning outcomes greater for experimental group than for control group)

Table 1 the Process of PBL Applied to Intermediate Accounting

| Stanley & Marsden (2012) | Hong (2001, 2004) | Activity | Explanation |
|----------------------------|---|---|--|
| Facts | | Lecture | The teacher explains the key concepts in the theme with a focus on the definition of assets, conditions for asset recognition, and asset valuation in the IFRS framework. |
| Facts Ideas Research | student self-study | Self-directed learning | Each student group should collect and read data related to the topic assigned by the teacher. The teacher will provide students channels to access and gather reference data, including books of Intermediate Accounting, IFRS international standards, monthly journals of accounting studies, and IFRS websites established by the Big Four. |
| Research | small panel discussions | First session of before-class discussion | Members in each group should meet once a week to discuss what they have collected and their preliminary answer to the discussion topic. |
| Research | Discussion with the teacher | Discussion with the teacher | The teacher should discuss with the next reporting group one week in advance to help them identify and solve problems, and organize their answers into materials that conform to the learning objective and content. |
| Research | student self-study small panel reconvene | Second session of before-class discussion | Members in each group should discuss again what they have learned from an earlier discussion with the teacher. The goal of this discussion session is to make sure that all members have sufficient understanding of the learning theme and prepare the materials to report in class. |
| Decide Execute | class discussions by group; | Class report | Each group has to present a report at the scheduled time and date. The group leader will serve as the moderator, and each member has to report their part on the stage. Their report should cover the problem their group is responsible for, the concepts or knowledge they have previously learned, new concepts or knowledge they learn this time, solution to the problem, difficulties encountered, and findings. |
| | | Group inquiry | During class report, non-reporting groups have to propose questions about the topic or the content of the report. The reporting group has to answer each question. The teacher will provide supplementary information if their answer is inadequate. |

Control Variables: For these variables, some researchers include such factors as gender (Aly & Islam 2003), whether or not one is an accounting student, whether or not one graduated from a general high school as opposed to vocational high, and whether or not one passed the accounting exam during one's second-year at the university. The control variable settings used in this research are below:

1. Gender (Female is 1, Male is 0)
2. Accounting Major (Accounting is 1, Other is 0)
3. High school (General high school is 1, other is 0)
4. Passing accounting exam (Passed is 1, fail is 0)
5. Part time job experience, ranging from very experience (1) to no experience (5)

3.4 PBL Students' Perceptions

To further explore the effects of PBL on accounting students, six months later we administered a post-experiment survey to students in the experimental group and obtained 52 valid responses. The survey consisted of two sections: the first evaluated students' perceptions about the PBL course using declarative statements; the second used open-ended questions to collect their comments and suggestions regarding PBL implementation in the Intermediate Accounting course.

(1) After-class Perceptions Evaluation with Statements

This consisted of 28 statements, all designed to be evaluated on a scale from 1 to 7 (1 for strongly disagree and 7 for strongly agree). These statements were intended to measure the participants' after-class perceptions in two constructs: (1) learning outcomes, and (2) PBL operation. The first construct contained 7 statements. Each respondent can get a score ranging from a low of 7 to a high of 49. The expected score was 28. The second construct had 15 statements with possible score range 15-105 and expected score 60. It should be noted that all statements appearing in the PBL operation construct were phrased in the negative so that we can examine whether PBL implementation had any adverse impact on the students' learning. If phrased in the affirmative, results obtained could serve as reference for anyone interested in improving PBL application in accounting education.

To avoid a response bias that could result from the ordering of the questions, we randomly distributed the positions of affirmatively stated and negatively stated statements from the two constructs. The Cronbach's alpha coefficients for the two constructs were 0.704 and 0.797 respectively. All these values are greater than 0.70, suggesting good reliability of the questionnaire.

(2) Open-ended Questionnaire

This consisted of three questions. We performed content analysis on the students' responses to discover certain key phrases in their answers to each question.

Question 1: What is the main factor that makes PBL suitable for application to the Intermediate Accounting course? What is the main factor that makes it unsuitable? Key phrases for "suitable" are: "self-directed learning", "gaining more professional knowledge", "independent thinking", and "peer interaction". Key phrases for "unsuitable" are: "PBL not applicable to this course", "poor learning outcomes", "inappropriate implementation method", and "evaluations are irrelevant to the course".

Question 2: What are the main strength and main weakness of the PBL course you took last semester? Key phrases for "strength" are: "self-learning", "independent thinking", "gaining more professional knowledge", and "peer interaction". Keywords for "weakness" are "learning outcomes", "implementation method", "evaluations are irrelevant to the course", and "PBL not applicable to this course".

Question 3: How can the PBL course you took last semester be further improved? Key phrases for "improvement" are: "teacher should provide more supplementary information", "reporting method should be adjusted", "reporting content should be adjusted", and "implement PBL in other courses".

4. RESULTS

4.1 Descriptive Statistics

This study aims to investigate the impact of PBL on teaching outcomes. Two sections totaling 133 sophomore accounting students at the university were chosen as subjects for this experiment. As shown in Table 2 below, valid samples gathered at semester beginning and semester end each number 55 and 60 respectively, making up a total effective sample of 115. Of these, 112 are accounting and 3 are non-accounting undergraduates; 109 graduated from general high schools and six from vocational highs; finally, sophomores' number 103 and no sophomores' number 12.

To understand whether work-study experience or involvement with community organizations have any impact on subjects' interaction with other students, subjects were asked questions related to demographic variables in the questionnaire. As shown in Table 3, 31% of the subjects have absolutely no work-study experience and 69% have (of these, 36% have little experience, 30% have some experience, 3% have more

Table 2: Descriptive Statistics on Subjects' Background

| | Gender | | Department | | High School ^a | | Year ^b | |
|--------------------|--------|------|------------|-------|--------------------------|-------|----------------------|-------|
| | Female | Male | Acc'ting | Other | General | Other | 2 nd Year | Other |
| Experimental group | 44 | 11 | 52 | 3 | 54 | 1 | 47 | 8 |
| Control group | 45 | 15 | 60 | 0 | 55 | 5 | 56 | 4 |
| Subtotal | 89 | 26 | 112 | 3 | 109 | 6 | 103 | 12 |
| Total | 115 | | 115 | | 115 | | 115 | |

Note (a): High school: Graduates of general high as opposed to vocational high (Other)

Note (b): Year: 2nd Year refers to those taking course for the first time, Non-2nd year - those retaking course

experience, and only 1% have a lot of experience). As far as involvement with community organizations, 17% have absolutely no involvement and 83% have (of these, 26% have little involvement, 37% have some involvement, 15% have more involvement, and only 5% have a lot of involvement). The results indicated only a third of the subjects have practical work-study experience, but the proportion of students involved with community organizations is as high as 83%.

Table 3: Descriptive Statistics on Subject Demographics

| | Work-Study Experience | | | | | Involvement with Community Organizations | | | | |
|--------------------|-----------------------|-----|-----|----|----|--|-----|-----|-----|----|
| | 1* | 2* | 3* | 4* | 5* | 1* | 2* | 3* | 4* | 5* |
| Experimental group | 14 | 19 | 20 | 1 | 1 | 10 | 11 | 22 | 10 | 2 |
| Control group | 22 | 22 | 14 | 2 | 0 | 10 | 19 | 20 | 7 | 4 |
| Subtotal | 36 | 41 | 34 | 3 | 1 | 20 | 30 | 42 | 17 | 6 |
| Percentage | 31% | 36% | 30% | 3% | 1% | 17% | 26% | 37% | 15% | 5% |
| Total | 115 | | | | | 115 | | | | |

Note (*): 1-no experience, 2-little experience, 3-some experience, 4-more experienced, 5-very experienced

4.2 The Results of PBL and Learning Effectiveness

On PBL and their effectiveness, we applied the univariate t-test and analysis of regression to arrive at the results below:

4.2.1 Univariate *t*-test

Table 4 shows pre-test (mid-term exam) and post-test (final exam) scores of both experimental and control group. The mean pre-test scores for the two groups are 56.5 (S.D. =10.8) and 56.6 (S.D. =12.5) respectively. The difference in their pre-test scores is not significant ($t=-0.086$, $p=0.932$). After completing experimental instruction, the

two groups achieved mean post-test scores of 69.8 (S.D. =16.0) and 66.2 (S.D. =20.6) respectively. Differences in learning achievement as measured by percentage change yielded averages of 0.2582 (S.D. =0.2526) and 0.1610 (S.D. =0.2381) respectively for the experimental and the control group. The *t*-test result suggests the difference between the two groups is significant ($t=2.148$, $p=0.034$).

Table 4 - Descriptive Statistics for Univariate t-test

| | Student No. | Mean | S. D. | <i>t</i> -value | <i>p</i> -value ^b |
|-------------------------------------|-------------|---------------|---------------|-----------------|------------------------------|
| Pre-test scores | | | | | |
| Experimental group | 55 | 56.5 | 10.8 | -0.086 | .932 |
| Control group | 60 | 56.6 | 12.5 | | |
| Post-test scores | | | | | |
| Experimental group | 55 | 69.8 | 16.0 | 1.058 | .292 |
| Control group | 60 | 66.2 | 20.6 | | |
| Learning effectiveness ^a | | | | | |
| Experimental group | 60 | 0.2582 | 0.2526 | 2.148 | .034 |
| Control group | 55 | 0.1610 | 0.2381 | | |

Note (a): Percentage difference between final and midterm grades (i.e., final minus midterm, divided by midterm grade)

4.2.2 Regression Analysis of Learning Outcomes

Table 5 shows the Regression Analysis of Learning Outcomes. After control variables were factored in, research results indicated that PBL was significant to learning effectiveness (Significant 10% $t=1.781$, $p=0.078$). In other hand, post-test grades for students in the experimental group were better than those in the control group. This supports our H_1 hypothesis H_1 and provides proof that PBL-based lessons significantly improved accounting students' learning outcomes. Moreover, students who passed preliminary accounting exam received better post-test scores than those who failed. ($t=3.122$, $p=0.002$). This also indicates students who had better grasp of foundational accounting concepts receive better grades on the final exam.

5. DISCUSSION

The experimental design of this study administers both pre-test and post-test to the control group in order to objectively measure students' test grades. Regardless of whether univariate t-test or regression analysis was used, the results fully support using PBL in teaching accounting courses to improve students' learning outcomes. Due to changes in course structure and learning methods, we obviously sense concomitant effects in student learning. Determining whether any course of learning

achieves its desired goal and effectiveness is not easy with a simple assessment,

Table 5 Learning Outcome Differences

| Variable ^a | Change in Semester Score | | |
|--|--------------------------|-----------------|-----------------|
| | β -value | <i>t</i> -value | <i>p</i> -value |
| Group | 0.083 | 1.781 | 0.078 |
| Gender | 0.041 | 0.761 | 0.448 |
| Passed preliminary exam | 0.142 | 3.122 | 0.002 |
| Accounting dept | -0.028 | -0.191 | 0.849 |
| General high school | -0.013 | -0.127 | 0.899 |
| Work-study experience | -0.018 | -0.678 | 0.499 |
| Involvement with community organizations | -0.020 | -0.950 | 0.344 |
| <i>F</i> value (<i>p</i> value) | 2.601 (.016) | | |
| R-Square | .145 | | |

Note (a): Variables definition: Group (1 for experimental group, 0 for control group); Gender (1 for female, 0 for male); Passed preliminary exam (1 for passed, 0 for failed); Accounting dept. (1 for accounting department student, 0 for non-accounting student); General high school (1 for general high school, 0 for vocational high school); both Work-study experience and Involvement with community organization (scale of 1-5: higher rating indicate involvement or frequency)

but purely from the objective of improving students' test scores, the results do indeed prove that PBL promotes learning and learning attitude change. Although the implementation period in this study is not long, with foundation basics established at the onset, our findings are consistent with what Johnstone & Biggs (1998) mentioned, namely, students PBL should be implemented after students have already attained foundational accounting knowledge expertise. Because PBL curriculum model allows for student-led self-education, and students develop strong interest in their learning situation, teachers can at any time also participate in student learning discussions and accord students high recognition of their abilities, thereby not only increasing learners' self-confidence, but also enhancing team learning effectiveness and depth.

In addition, to respect students' subjective feelings towards PBL implementation and their degree of acceptance, we distributed qualitative after-class surveys to these experimental group students. The questionnaire is divided into two parts, the first part a perceptions evaluation with declarative statements and the second part an open-ended questionnaire. What follows are specific recommendations of Intermediate Accounting students regarding PBL implementation:

5.1 After-class Perceptions Evaluation with Statements

Table 6 shows the statistics of PBL students' after-class perceptions. The sum of all mean scores for the seven items related to learning outcomes is greater than the expected total score ($32.06 > 28.0$). The statistics indicate that the PBL students agreed that PBL could increase their reading of financial accounting books (67%), pleasure of learning (71%), and abilities of lifelong and independent learning (73%). These perceptions suggest that learning IFRS accounting standards can contribute to development of independent thinking and judgment as well as abilities of lifelong and independent learning.

Table 6 PBL Students' Perceptions about Learning Outcomes

| STATEMENTS | Total | Mean | S.D. | Percentage of agreement ^a |
|--|-------|-------|------|--------------------------------------|
| PBL helps my development of lifelong and independent learning abilities. | 257 | 4.94 | 0.85 | 73% |
| PBL allows me to have the pleasure of learning something outside professional knowledge. | 234 | 4.50 | 1.02 | 71% |
| PBL has increased the amount of time and effort I spend on reading financial accounting books. | 267 | 5.13 | 1.34 | 67% |
| PBL allows me to have more critical thinking and judgment about IFRS issues. | 261 | 5.02 | 1.00 | 54% |
| PBL increases my interest in accounting studies. | 216 | 4.15 | 0.83 | 48% |
| PBL reduces my stress from learning accounting. | 197 | 3.79 | 1.14 | 35% |
| Through group discussion in PBL, I get to know people who share my interests. | 235 | 4.52 | 1.06 | 21% |
| Total | 1,667 | 32.06 | | |

Note (a): Percentage of agreement: The ratio of all counts of responses for which 5 or more points are given (i.e., slightly agree, agree, and strongly agree) to the total counts of responses.

5.2 Findings from the Open-ended Questionnaire

Further survey was also conducted to elicit PBL students' responses on after-class perceptions of PBL, and most students gave positive responses in the open-ended questionnaire. The main PBL benefits include encouraging self-directed learning (36 counts), promoting independent thinking (33 counts), and gaining more professional knowledge (30 counts). Some responses on encouraging self-directed learning follow:

“PBL encourages us to be active learners. We can acquire more accounting concepts than from books and it did not matter whether these concepts are highly important or not.”

“In PBL, we can use logic to think and learn, so we can gain a deeper impression of the learning material.”

“We are each responsible for motivating ourselves to preview themes and, through division of labor, to learn how to prepare reports.”

“This innovative method of learning increases learning pleasure.”

Some responses on promotion of independent thinking are listed below:

“PBL is suitable for many IFRS issues. It facilitates independent thinking.”

“PBL allows me to gain a deeper understanding of accounting procedures. I learn how to gather data for solving problems, not simply how to do textbook exercises.”

“In PBL, I have clearer understanding of definitions, and I am able to get out of the conventional way of learning by doing exercises.”

Some responses on gaining more professional knowledge are as follows:

“In PBL, I study for a deeper understanding of Intermediate Accounting content, not simply to prepare for exams.”

“It seems easier to learn from practical, real-world cases.”

“In PBL, I am motivated to look up international bulletins and related extracurricular books for needed data. Therefore, learning is more in-depth and I have a much better understanding of those blind spots I encounter.”

In addition, this study also surveyed the experimental group regarding PBL operation (see Appendix I for details). The results indicated most students consider PBL unsuitable for application to Intermediate Accounting. First, the quality of student report varies; students are thus usually unable to have sufficient understanding of the problems they are not responsible for. Also, the experimental instruction period is so short that the benefits of PBL may not emerge. In experiments with “small group inquiry” approach, students in the experimental group also found it does not help

them learn how accounting issues are dealt with. All these problems have an adverse effect on learning effectiveness of PBL students.

The open-ended questionnaire results also showed most students considered PBL application unsuitable for intermediate accounting (38 counts). Below are sample responses:

“Some Intermediate Accounting concepts are harder to grasp and are not mentioned in the Basic Accounting course. Without teachers’ explanations, students may find it stressful to do an individual report on any of these concepts.”

“We do not possess a whole lot of professional accounting knowledge, so it is tougher for us to acquire new knowledge through PBL process.”

“In PBL, it is difficult to grasp an accounting concept involving a lot of professional knowledge, or one that is controversial”.

In addition, a large proportion of PBL students also mentioned problems about improper implementation (35 counts) and learning outcomes (47 counts). Some of the issues raised are:

“Too many themes, Does not give us time to go over reports prepared by other groups.”

“We are asked to report too frequently, which usually entail much discussion. So most of our time is spent on preparing reports.”

“We tend to lose our direction when the learning theme covers too large a territory or involves concepts that are too profound.”

“We are busy enough with our school homework. This learning approach takes up too much of our time. Because our foundation is not solid enough, this learning approach is not as easy as it seems.”

“PBL requires us to seek answers on our own. We waste a lot of time on exploration and have very little time for textbook exercises that are more likely to appear in the exam.”

Although many have criticized the current education system’s many unreasonable measures, as well as low learning motivation on the part of students and declining

enthusiasm on the part of teachers, still we believe by changing their teaching methods and course content, classroom teachers can enhance students' learning effectiveness and attitude. Especially in the PBL implementation process, through interaction with small groups, we see many students' passion for exploring knowledge kindled. On the podium, students confidently and methodically talk about constructing their own solutions to problems, and outside class time they discuss problem causes and solutions. The student-teacher relationship is more intimate, with each party enjoying and learning from the other in the process.

6. CONCLUSION AND SUGGESTIONS

This study aims to echo the reform of the accounting professional bodies and practitioners of accounting education to improve the quality of accounting education; this study is based on a single course Accounting Intermediate Accounting of the University, using PBL experimental method to investigate its effect on accounting students' learning. The PBL teaching model implemented by the Department in this study uses Stanley & Marsden (2012)'s FIRDE strategy, and Hong (2001)'s PBL mode of operation, designed to be more in line with real-world problems.

The study's findings indicated that PBL can significantly improve student's learning outcomes. Also, in the after-class survey conducted for the experimental group on students' feelings and perception regarding PBL, we found that more than half of the students regardless of learning effectiveness gave positive responses. And the better students in beginning accounting experienced learning growth significantly higher than the average student.

On their perception of PBL, students concurred that PBL teaching will enhance their reading enjoyment of financial accounting texts and help improve their lifelong independent learning skills. In fact, in picking up IFRS accounting issues, students benefit greatly from the cultivation of independent thinking and judgment, as well as problem-solving abilities. Accounting practice professions require of its employees the ability to better identify problems, seek information, make decisions and acquire documentation capabilities. And on these dimensions, PBL learning is right on target in helping students develop relevant skills to enhance their future competitiveness in the workplace.

This study provides concrete suggestions below for accounting educators wishing to apply PBL to accounting curriculums, or researchers interested in the implications of PBL for future study:

- (1) Provide sufficient explanations about PBL before implementing PBL.
- (2) Use lecture-based and PBL approaches alternately and adjust the teaching approach depending on students' feedback. This way, students will have better ideas about PBL and what they should do in PBL.
- (3) Use real-world problems from easy to hard. Guide students to identify problems and induce their interest to reduce their fear of this new approach.
- (4) Use one example topic to familiarize students with the steps of PBL. Give students more time for preparation and discussion, and reduce the frequency of reporting to an appropriate level. Build an online sharing platform that provides references for problem discussion.
- (5) Use diverse evaluation methods, including teacher assessment, student self-evaluation, and peer evaluation. Tests can be essay questions or exercises of practical problems.

Despite our careful research design and analysis methods, some inherent limitations may still affect the generalizability of our findings. First, we allowed participants to form groups according to their own preferences. We could not prevent students with exceptionally good or poor performances being concentrated in one group. Therefore, we suggest future researchers adopt random grouping to avoid errors in experimental results. Besides, demand characteristics of the participants are likely to appear in a pre-test and post-test design (Kirk 1995). In this study, we have attempted to mitigate the influence of demand characteristics by employing a control group. Finally, to extend and generalize our research experiences, future researchers might consider applying PBL to other subjects, students in other years or other education systems (e.g., vocational education).

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APPENDIX I. Post-Experimental Survey Statistics on PBL Operation
Students' Perceptions of PBL Operation

| Item | Statements | Total | Mean | S.D. | Agreement % ^a |
|-------|---|-------|-------|------|-----------------------------|
| 1 | In PBL, the inconsistent quality of students' reports affects my learning effectiveness. | 266 | 5.12 | 0.94 | 81% |
| 2 | The "group inquiry" activity in PBL is not suited for application to Intermediate Accounting. | 218 | 4.19 | 1.17 | 77% |
| 3 | The PBL implementation period is too short for me to have more experiences with this approach. | 225 | 4.33 | 0.81 | 69% |
| 4 | In PBL, we usually pay less attention to units that other groups are responsible for. | 262 | 5.04 | 1.12 | 60% |
| 5 | The "class report" activity in PBL is not suited for application to Intermediate Accounting. | 213 | 4.10 | 1.21 | 58% |
| 6 | The frequency of "group reporting" is not high enough. This may affect evaluation of the implementation results. | 187 | 3.60 | 0.98 | 42% |
| 7 | I think PBL does not support my exam preparation. | 283 | 5.44 | 1.07 | 38% |
| 8 | Peer evaluation of group reports in PBL is not always fair. | 196 | 3.77 | 1.23 | 38% |
| 9 | I don't have lasting learning experiences in PBL context. | 204 | 3.92 | 1.06 | 35% |
| 10 | The "before-class discussion" activity in PBL is not suited for application to Intermediate Accounting. | 193 | 3.71 | 1.05 | 31% |
| 11 | In PBL, group members have inadequate interactions, which may result in poor learning outcomes. | 175 | 3.37 | 1.28 | 27% |
| 12 | The effect of PBL on academic achievement is not very conspicuous because it takes too much time to prepare for lessons in advance. | 247 | 4.75 | 1.14 | 21% |
| 13 | I think the case problems in PBL cannot cover the themes of Chapter 8~12 of Intermediate Accounting. | 213 | 4.10 | 1.09 | 17% |
| 14 | PBL case problems do not have a consistent level of difficulty, so the burden laid on student groups varies. | 236 | 4.54 | 1.26 | 13% |
| 15 | I prefer the lecture approach to PBL. | 226 | 4.35 | 1.30 | 13% |
| Total | | 3,344 | 64.31 | | |

Note (a): Percentage of agreement: The ratio of all response counts for which 5 or more points are given (i.e., slightly agree, agree, and strongly agree) to total response count.