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Efficacy of Problem-Based Learning Over Traditional Pedagogy on U.S. CPA Practice Exam Performance Among Chinese Accounting University Students

Bing Ouyang
Walden University

Walden University

College of Education and Human Sciences

This is to certify that the doctoral dissertation by

Bing Ouyang

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Deborah Focarile, Committee Chairperson, Education Faculty
Dr. John Flohr, Committee Member, Education Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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MSA, Indiana University, 2008

MBA, Harding University, 2007

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Dissertation Submitted in Partial Fulfillment

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Doctor of Philosophy

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Abstract

In recent years, many university students in China choose to take U.S. CPA exam to discover more job opportunities in international companies. In my study, I investigated whether and how PBL may influence Chinese accounting majors' performance on U.S. CPA practice exam, specifically in the Financial Accounting and Audit sections. Although PBL has been recommended as a promising methodology, not much empirical research has been published in accounting education. A gap exists in the literature regarding the potential influence that PBL teaching methods may have on student performance on U.S. CPA practice exams.The purpose of my quantitative study was to determine the effectiveness of PBL by examining the U.S. CPA practice exam scores of students who regularly engaged in PBL and those of students who did not. PBL teaching methodology was used as the theoretical framework. Archival data were collected from 152 accounting students in a Chinese university. The dependent variable was the U.S. CPA practice exam scores. The independent variable was the instructional methodologies to which two groups of accounting students were taught. One-way analysis of covariance showed that the mean post-test score of the PBL group was significantly higher than the mean post-test score of the non-PBL group for the CPA practice exam. I chose the standard significance level of $p = .05$ and a standard power level of .80; the number of groups was 2 and the number of covariates was 1.The findings of this study may contribute to social change by identifying whether PBL-facilitated teaching can help accounting students better prepare themselves for the actual U.S. CPA exam.

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Dedication

I would like to dedicate this study to the accounting faculty members and accounting students who were pursuing the Certified Public Accountant (CPA) license.

Acknowledgments

I would like to thank my family and friends, and my dissertation committee for their support and encouragement. The process of earning a PhD is long and time-consuming. Without the long-term support, it would have been impossible for me to persist in this journey. Therefore, I would like to acknowledge the people I mentioned above who encouraged, helped, and supported me along this arduous journey.

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Chapter 1: Introduction to the Study

Students who major in accounting take courses in areas that the program anticipates will enable them to pass the U.S. certified public accountant (CPA) examination on their first attempt as soon as they are eligible for taking the exam. Historically, however, such has not been the case. In fact, for the past two decades, initial passing rates have annually hovered around 50% (Fogarty & Lowensohn, 2017). The Minnesota Society of Certified Public Accountants (2020), for instance, confirmed that this pattern has continued throughout the reporting period of 2017-2019, during which time the pass rates ranged from 44% to 60%. Unless business schools enact revisions in pedagogy, these rates are not likely to change (Conteh & Oke, 2019).

Accounting instructors have attempted to prepare their students for the U.S. CPA exam by providing practice exams based on the actual questions on the four parts of the exam. Recent curricular revisions have attempted to address learning objectives beyond mere memorization of technical material to address the low passing rates (Conteh & Oke, 2019). However, despite these innovations, accounting instructors for the most part teach the way they were taught and have continued to focus on technical material associated with the content of the U.S. CPA exam. Thus, they have continued to overlook those broader skills that are heavily tested in the U.S. CPA exam and can affect the U.S. CPA exam pass rates (Fogarty & Lowensohn, 2017). The problem-based learning (PBL) method pioneered in medical schools could be an effective means of addressing the gaps in accounting education, the U.S. CPA exam, and the skills that practicing accountants need. PBL is an effective instructional tool that invites student engagement, utilizes real-

world cases, enhances critical-thinking and collaborative skills, and expects that students will apply what they have learned (Lim et al., 2020).

Recently, China has started to adopt the International Accounting Reporting Standard (IFRS) and recommended that accounting students learn from the U.S. accounting standards (Hao et al., 2019). Moreover, many accounting students in China choose to take U.S. CPA exam to discover more job opportunities in international companies. As of March 31, 2022, 261 Chinese companies went public in the United States (US-China, 2022). Thus, there is a great need in China for accountants with U.S. accounting in their training backgrounds. Some universities in China also offer accounting programs with similar accounting curricula to U.S. accounting programs (Smith et al., 2018). The students are selected for inclusion in the study based on their interest in acquiring a U.S. CPA license or an international accounting license, such as the license issued by the Association of Chartered Certified Accountants (ACCA; Hao et al., 2019). Accounting instructors in China also actively look for better learning methods for their accounting students to be assured that they are better prepared for the international accounting license exam, including the U.S. CPA exam (Smith et al.2018).

The research may make a positive contribution to social change through confirming whether PBL methods will help Chinese accounting students better prepare for the U.S. CPA exam, for which the current passing rate of first-time exam takers is relatively low (Conteh & Oke, 2019). Since the Audit and Financial Accounting(FAR) courses in China are quite similar to these two courses in the United States, the Audit and FAR sections are the areas upon which I intend to focus on for this study in both the

accounting curriculum and practice exam as instructional approaches have been shown to influence U.S. CPA exam performance (Fogarty & Lowensohn, 2017).

In the long term, significantly improving U.S. CPA exam pass rates of first-time exam takers will help accounting students better prepare themselves for their chosen career path (Crossman, 2017) and ease their transition into the profession from university. If the strategies of PBL are thus shown to be successful, such projects can routinely be applied to accounting education with a high degree of confidence. Furthermore, if PBL is effective, its application in university accounting programs may ease the transition of accounting students from training to practice, and result in a more positive initial induction into the profession. Since failure on the U.S. CPA exam must be a highly demeaning experience for well-trained accounting aspirants, limiting that frustrating experience could have a positive effect on the practice of the profession. In this chapter, I discuss the background of the study, elaborate on the problem statement, and consider both the purpose of the study and necessary definitions. Then I provide relevant assumptions and discuss the scope and delimitations, the limitations, and the significance of this study in terms of implications for social change.

Background of the Study

Accounting education is one of the most challenging programs that students encounter in business schools (Coughlan & Brydon-Miller, 2014). Accounting programs require business majors to take courses such as intermediate accounting, cost accounting, auditing, and taxation; these courses are specifically designed to help students prepare for the four major components of the U.S. CPA exam: (a) auditing, (b) regulations, (c)

business environment, and (d) financial accounting (Wouters, 2013). According to Conteh and Oke (2019), the average national U.S. CPA exam pass rates from 2013 through 2016 ranged from 47.06% to 55.8%. Because only about half of eligible candidate enter the profession after their initial attempt at the U.S. CPA exam, accounting may well be considered as one of the most challenging postsecondary fields (Coughlan & Brydon-Miller, 2014). The Minnesota Society of Certified Public Accountants (2020), for instance, has confirmed that this pattern of approximately 50% failure has continued through the reporting period 2017-2019, during which time the pass rates ranged from 44% to 60%. The exam takers also performed poorly in the audit and financial accounting (FAR) sections of the exam during these same three years (see Table 1). Although the pass rates of U.S. CPA candidates vary, the failure rates overall have persisted over a few decades, and rates are unlikely to change unless corrective measures are implemented (Whitten & Brahmasrene, 2002). The problem I investigated was that it was unknown whether and how PBL may influence Chinese accounting majors' performance on CPA practice exam, specifically in the Financial Accounting and Audit sections.

Table 1

U.S. CPA Pass Percentages by Exam Section

U.S. CPA exam section	2017	2018	2019
Audit	49	51	51
Business environment	53	59	60
Financial Accounting (FAR)	44	46	46
Regulations	47	53	56

The PBL method has already been employed in medical schools but has not generally been accepted as instructional practice in business schools and faculties of commerce in the academic preparation of accountant (Barut et al., 2016). Historically, instructors of accounting courses have employed practice exams in a U.S. CPA review course to prepare students for the U.S. CPA exam. Researchers indicate that performance on practice exams is an accurate predictor of student performance on the U.S. CPA exam, particularly when both are similar in terms of difficulty level and format (Shin et al., 2020).

The U.S. CPA exam constitutes a major hurdle for many accounting students as it is exhaustive and lengthy. Instructors in business schools are constantly looking for instructional strategies that will enable their students to bridge the gap between the academic program they have been pursuing for several years and the demands of the workplace as reflected in the U.S. CPA exam. Fogarty and Lowensohn (2017) described changes to the U.S. CPA exam and discussed how the recent revision attempted to address learning objectives beyond mere memorization of technical material. Fogarty and Lowensohn identified a gap between purposes of the U.S. CPA exam and academic values related to technical content, skills development, and realism or relevance of students' education. According to Fogarty and Lowensohn, instructors tend to focus their teaching on technical material which is directly related to the content of the U.S. CPA exam, and less on broader skills needed by candidates and the relevance or authenticity of accounting education in relation to candidates' first positions in public accounting.

Noting that the U.S. CPA exam belongs to the accounting profession—with minimal input from accounting educators, Fogarty and Lowensohn (2017) suggested that educators should adjust their teaching to prioritize individual technical topics, recognizing that not all topics are equally important, and devote more attention to core competency development. This suggestion is consistent with recent calls by researcher-practitioners, such as Moilanen (2017), for reform in teaching methodologies.

Moilanen (2017) called for an innovative revision in accounting education so that academic programs would meet the professional needs of the accounting industry and help to ensure that newly graduated accounting professionals pass the U.S. CPA exam. A student's engagement in the classroom has been found to play a role in U.S. CPA exam performance (Cordis & Pierce, 2017). One solution to better prepare students for the U.S. CPA exam may be to adapt a PBL approach like that spearheaded by the school of medicine at McMaster University in Hamilton, Ontario. In medical studies, PBL has been shown to enable students to grapple with real-world issues in a cooperative learning model. PBL methodology invites increased student participation, often makes use of real-world cases, consistently requires that students apply what they have learned, and offers an organizational structure that can help accounting students improve their critical-thinking and problem-solving skills while learning accounting concepts (Barut et al., 2016).

Accounting education in postsecondary institutions, moreover, has faced a persistent problem associated with gaps between instruction and preparation for the certification exam (Cordis & Pierce, 2017). The question remains how to adjust teaching

methodologies, rather than curriculum, to close this gap. Specifically, I intend to explore the effectiveness of PBL in addressing the perceived disparity between the conventional pedagogy-based accounting curriculum and U.S. CPA exam practice exam performances. Although PBL is more time-consuming than conventional academic lectures and even focused tutorials, PBL results in deep learning by compelling students to become active learners who must apply their knowledge and demonstrate the efficacy of their findings (Dawes, 2017).

The research may help accounting educators make decisions about adopting PBL teaching methods in accounting courses to prepare students in a more targeted manner for the U.S. CPA exam. Changes made to accounting courses based on constructivist pedagogical methods may result in increased success for students in their accounting courses, on their U.S. CPA exam, and in the profession. The most significant benefit of PBL may be enhancing the ability of accounting graduates to make effective contributions to the economic strength of their communities through enhanced problem-solving and collaborative skills (Crossman, 2017).

Problem Statement

The problem investigated in this study was that it was unknown whether and how PBL may influence Chinese accounting majors' performance on U.S. CPA practice exam, specifically in the Financial Accounting and Audit sections. University instructors tended to teach the way they were taught, imposing their strengths and their limitations upon the next generation (Bline et al., 2016). Although PBL has been recommended as a promising methodology, to date, not much empirical research has been published to

support its implementation in accounting education. A gap exists in the literature regarding the potential influence that PBL teaching methods may have on student performance on U.S. CPA practice exams (Moilanen, 2017). As it was impractical to get the real U.S. CPA exam score results between two groups of students as a means of comparison, I used the U.S. CPA practice exam scores as the measurement with which to graph the relative performance between two groups of students drawn from the same general population of accounting majors. Based on current literature, I concluded that researchers have not investigated how PBL may better prepare accounting students for the U.S. CPA exam.

Purpose of the Study

The purpose of this quantitative study was to determine the effectiveness of PBL by quantitatively examining the CPA practice exam scores of students who regularly engaged in PBL and the scores of students who did not. The theoretical framework is PBL teaching methodology. The dependent variable is practice exam scores from the two groups of students. The independent variable is the instructional methodologies that the two groups of students have experienced; this variable has two levels, a pretest (used as a covariate) and posttest (used as a dependent variable).

Research Question and Hypotheses

In alignment with the purpose of this study, I designed the following quantitative research question to reflect the possibility that PBL method as an instructional strategy has the potential to affect the students' performances on U.S. CPA practice exam. The null form of the research hypothesis naturally posits those innovative instructional

strategies to be insufficient in bridging the academic and U.S. CPA practice exam preparation gap.

RQ: What is the extent of difference in U.S. CPA practice exam scores between students who participated in PBL and students who participated in traditional method when controlling for scores on a U.S. CPA pretest?

H_0. There is no significant difference in U.S. CPA practice exam scores between students who participated in PBL and students who participated in traditional method when controlling for scores on a U.S. CPA pretest.

H_a. There is a significant difference in U.S. CPA practice exam scores between students who participated in PBL and students who participated in traditional method who did not when controlling for scores on a U.S. CPA pretest.

Theoretical Framework for the Study

The theoretical foundation for this study is PBL theory. As early as 1916, the educational philosopher John Dewey, reacting to the assembly-line or industrial model of 19th century education, proposed that teachers should tap into the natural tendency of human beings to observe, apply knowledge, and imagine possible solutions in a collaborative context (Dewey, 1944). Whether the problem is text-based, mathematical, or scientific, Dewey contended that teaching is most effective when teachers pose problems for their students to solve. The important aspect of PBL is the process of developing problem-solving strategies collegially rather than arriving at a single, predetermined way of resolving an issue. PBL facilitates the development of social learning, group focus, team building and cooperation, and communication skills (Dewey

1916, 1944). In 1971, instructors at McMaster University's medical school, following Dewey's active learning precepts, developed an application of PBL theory suitable for adult education, specifically the training of physicians. PBL theory falls under the following categories: contextual learning, information learning processing theory, and cooperative learning theory (Neufeld & Barrows, 1974). Researchers who have examined the effects of PBL theory found that, when academic programs use PBL methods extensively, students achieve better learning outcomes and efficiencies in such professional studies as medicine and education (Peeples et al., 2017).

Nature of the Study

The nature of this study is quantitative with one research question. I used archival data from the final U.S. CPA practice exam and a pretest to allow statistical analysis of the results from accounting students participating in PBL (experimental) and non-PBL (control) instructional methods. The physical setting was at a Chinese university, and the subjects are accounting majors who were in their final year. The timeline involves a single university semester. Approximately 152 student participants who are trained to be international accountants divided into two sections took a pretest based on actual questions from that exam, attended classes using either traditional pedagogy or PBL instruction, and then took a posttest identical in format and similar in content to the pretest. The difference in performance demonstrates the efficacy of PBL. The study has one independent variable and one dependent variable. The dependent variable was practice exam scores from the two groups of students selected. The independent variable was the instructional methodologies which the two groups of students have experienced.

The independent variable is categorical. The dependent variable was measured by the exam scores which are continuous. The pretest score was the covariate.

The parallel form constructed pretest was used as covariate to account statistically for preexisting differences among students in each section of the accounting course (Gierl et al., 2017), and testing was conducted with the two groups of accounting students at the beginning and again at the end of their semester. A separate instructor who has the necessary knowledge of and experience using the designated pedagogical method taught each course. An analysis of covariance (ANCOVA) was conducted to identify any differences in U.S. CPA practice exam scores following PBL or non-PBL course instruction (Warner, 2013). The ANCOVA test was selected in preparing this analysis as this research design has an independent variable with two levels, a pretest (used as covariate) and posttest (used as dependent variable).

Definitions

The following operational definitions that I used in the study, synthesized from various studies, describe the nature of the control and experimental groups, the general content of the pretest and posttest, and the difference between conventional pedagogies and PBL.

Accounting major: A student who has embarked upon a course of study that involves taking foundational business and accounting courses in the first two years of undergraduate study, followed by a concentration of specialized courses dealing with such topics as financial accounting, auditing and more (Chaffer &Webb, 2017).

Accounting practice exam: An exam composed of questions compiled by the accounting class instructors from the actual past U.S. CPA examination questions released by American Institute of Certified Public Accountants (AICPA) each year, going back 5 years, to 2017.

Certified Public Accountant (*CPA) exam*: It is a U.S. professional test of competency in accounting tasks, skills, and issues presented and written in English. The exam is generated randomly from a large item-bank (Lawson et al., 2014).

Problem-based learning (PBL) teaching method: PBL uses case study and problems as a foundation to get students actively involved in the learning process and it is student centered and inquiry based (Dewey, 1944).

Traditional teaching methods: Instructors use lectures, tutorials, assignments to conduct teaching and it is mainly teacher centered (Stanley & Marsden, 2012).

Assumptions

This study involves several assumptions about the student participants and their instructors. For the purposes of this study, I assumed that students actively engaged in the course learning and followed their instructors' guidance, whether they are engaged in PBL learning activities or traditional lectures and assignments. I have further assumed that the instructors in this study are certified to teach at the university level in China as well as the exam content.

Scope and Delimitations

The scope of this study includes 152 accounting undergraduates who have been studying accounting at a Chinese university over the last 3 years; these students have

received training under a prescribed curriculum determined by international accounting and American general accounting principles. Although the practice exams these students take are in English, students are allowed to use a hard copy of an English and Chinese dictionary to look up the English terms in Chinese if they find such translation necessary, which can be part of limitations. The sample population was expected to be three classes of approximately 40 to 65 students per class, with an estimated total of 152 students. The students are selected for inclusion in the study based on their interest in acquiring a U.S. CPA license or an international accounting license, such as the license issued by the ACCA. The population for this study is be limited to Chinese accounting students who are interested in taking the U.S. CPA exam in China. The sample size to be studied was limited to 152 students because of the enrollment in the target university, the enrollments in the program, and the year in which students were enrolled in the accounting program.

Limitations

I did not plan to seek the views concerning PBL methodologies from either the instructors or the participating students as I could not control such attitudes. There were several other factors that were beyond the control of this study, but which may impact test scores and data analysis results. For example, the amount of time that each student spent studying practice exam materials outside of class likely varied, and the amount of preparation time may affect the student's performance on the U.S. CPA practice exam. Prior to this specific research, the instructors involved have already conducted similar teaching experiments with other accounting students, who may therefore feel that such practice was busywork rather than meaningful preparation.

While the student-participants' study habits were not within the control of this study, such habits must be acknowledged, including how more industrious students may explore past U.S. CPA exams and, should they encounter similar questions, may have an advantage on the practice exams that is not related to the course's instructional practices. An additional challenge lies in the fact that this study's quantitative design does not generate data that measures either the caliber of the instruction or effectiveness of the instructor in their facilitation of instructional activities (PBL or traditional). Students took the practice exam in English with some key terms translated for them into Chinese; consequently, the practice exams' employing English accounting terminology may affect students' performance because of some minor language barriers. The internal validity is the measure of the extent to which the two tests (pre- and post-) provides a trustworthy level of rigor for the study; the pretest and posttest scores from two groups of 152 participants from a random selection can provide a good level of confidence for this study (Warner, 2013). However, the fact that participants could choose to drop out in the middle of study may have led to attrition and bias, phenomena which could decrease the confidence level one may place in the data (the performance levels of the two groups on the posttest). That the instructors use similar test questions in pretest and posttest may also have compromised the integrity of the testing, which may in turn threaten the study's external validity. As I was not connected to the instruction of the courses during implementation and was not unable to observe instruction, I had to rely on the integrity of faculty reports concerning their instructional approaches.

Significance of the Study

This study may contribute to social change by identifying whether PBL teaching can help accounting students better prepare for the U.S. CPA exam, and more smoothly transition from the classroom to the workplace. The research may help accounting educators decide whether they should adopt the PBL teaching methods in accounting courses to prepare students in a more targeted manner for the U.S. CPA exam. Changes made to accounting courses based on more student-centered instructional methods may result in increased student success in courses, on the students' actual U.S. CPA exams, and ultimately their success in the profession, and their ability to make effective contributions to the economic strength of their communities (Crossman, 2017).

Summary

The national averages of U.S. CPA exam pass rates in the past decade suggest that accounting students approach these exams ill-prepared; in any given year, approximately half of first-time writers fail. Although PBL has been found to be an effective methodology in other disciplines, to date no empirical research has been published to support the contention that PBL will enable business schools to address the instruction–examination gap. The primary data source are scores on U.S. CPA practice exam pretests and posttests. If PBL strategies prove as effective as their advocates suggest, the experimental group should outperform the control group statistically. The hypothesis was that those in the experimental group should have an examination performance mean that is statistically superior to the mean of the group of students under the non-PBL method.

In Chapter 2, I summarize relevant research literature on PBL methodologies, discuss U.S. CPA exam preparation and its importance to the students' performance on the exam, and explain how PBL may improve student learning in accounting programs, and enable students to pass the U.S. CPA exam on their first attempt. A review of relevant literature suggests that accounting students find their chosen subject especially difficult, and that student GPAs are less effective as predictors of success on the U.S. CPA Exam. The gap between academic preparation and the real-world skills that the student must possess to succeed on the examination may be filled by the practical orientation of PBL as practiced in schools of medicine and faculties of education.

Chapter 2: Literature Review

The problem investigated was that it was unknown whether and how PBL may influence Chinese accounting majors' performance on U.S. CPA practice exam, specifically in financial accounting and audit sections. A complicating factor was that university instructors of accounting tended to teach the way they were taught, imposing their strengths and their limitations upon the next generation of accountants (Bline et al., 2016). Although a few researchers and theorists have proposed PBL as a promising methodology that could bridge the classroom and workplace divide, to date no empirical research has been published to support its implementation in accounting education. A gap exists in the literature regarding the potential influence that PBL teaching methods may have on student performance practice exams (Moilanen, 2017).

The purpose of this quantitative study was to determine the effectiveness of PBL by quantitatively examining the U.S. CPA practice exam scores of students who regularly engaged in PBL and the scores of students who did not. The chief difference between the two groups was the instructional design that each group experienced. This difference in pedagogy affected the students' levels of engagement, and thereby possibly influenced the differences between the posttest scores of the two groups, the control group, and the research group. Analyzing this data at a confidence level of 0.96 may reveal which strategy, the conventional or PBL, was more effective in preparing students for the U.S. CPA practice exam. Through reporting the results of this study, I hoped to encourage a general implementation of PBL in post-secondary accounting programs if such positive results were apparent.

In the following sections of this chapter, I begin with a discussion of the literature search strategy that enabled me to find studies related to PBL teaching effectiveness in medical education; accounting education; and U.S. CPA exam preparation, including matters affecting performance, and typical pedagogical approaches. Next, I discuss the theoretical framework used in my study and consider in depth the research literature on the PBL approach, effectiveness, and benefits as well as the importance of passing U.S. CPA exam.

Literature Search Strategy

As the preceding overview has suggested, articles selected from research studies conducted in the last decade, and particularly the last five years, concerning university accounting education address how innovations such as PBL have been introduced into the design of accounting education program curricula. These student-centered practices have the potential to strengthen accounting students' professional skills and to enable researchers to explore how students might enhance their performance in accounting education. The keywords searched were *accounting education, medical education, problem-based learning, problems, pedagogical approach,* and *US CPA exam preparation and performances in accounting teaching* in the databases ABI/INFORM Complete, SAGE Journals, and Education Source. As the search for PBL-based teaching on accounting has been limited to the last five years, I focused on reviewing PBL articles in other subjects, PBL methods of introduction, the pedagogical and professional implications of PBL, and U.S. CPA exam related education and accounting student career development, control groups, and the terms *pretest* and *posttest*. These articles have

provided me with enough information about PBL methodologies to inform my research design.

Theoretical Foundation

The theoretical foundation for the current study was PBL theory. The history of this innovative pedagogical strategy goes back to 1916, when the educational philosopher Thomas Dewey, reacting to the assembly-line or industrial model of 19th century education, proposed that teachers should tap into the natural tendency of human beings to observe the world around them, to apply knowledge, and to imagine possible solutions by working with other students in a collaborative mindset (Dewey, 1944). Prior to Dewey, assessment in public education had been focused on formal examinations. In contrast, Dewey (1944) proposed a more skills-based approach that would relate the curriculum to the kinds of problems students would encounter in the workplace, problems that required the application of theoretical knowledge with a view to deliverable outcomes. Dewey contended that, whether the problem is text-based, mathematical, or scientific, active learning works more effectively than conventional lecture pedagogy because active learning requires that teachers set real-world problems for their students to solve collaboratively.

From 1969 onwards, instructors at McMaster University's medical school, following Dewey's precepts, developed an application of PBL theory suitable for adult education, specifically the training of physicians. The McMaster Medical School's website listed the following instructional elements under education methods as the chief features of its PBL instructional design: small-group learning, faculty facilitation, use of

patient-based cases, and operating within a well-defined set of learning objectives (McMaster, 2021).

PBL theory falls under the following categories: contextual learning, information learning processing theory, and cooperative learning theory (Neufeld & Barrows, 1974). Researchers who examined the effects of PBL theory have found that when academic programs use PBL methods extensively, students achieved better learning outcomes and efficiencies in such professional studies as medicine and education (Peeples et al., 2017).

Disciplines such as education and medicine have been using PBL as a teaching strategy and an approach for the past 60 years at the postsecondary level, beginning with the McMaster School of Medicine in Hamilton, Ontario, Canada, in the 1960s. The advantages of PBL have only recently been noted, however, in research studies into its application in accounting courses. For example, Ahmed and Kannaiah (2018) saw a few advantages in moving away from the instructor-centered approach of the lecture towards the student-centered, active-learning strategies of PBL. Lim et al. (2020) categorized the pedagogical advantages as follows:

- develops students' problem-solving skills,
- encourages students' collaborative learning,
- fosters students' self-regulation,
- motivates students to learn accounting,
- improves students' understanding of accounting concepts (p. 95).

Although PBL has been proven effective in other professional programs (notably in training physicians at the McMaster University School of Medicine in Canada), the

effectiveness of this approach has yet to be demonstrated in preparing accounting students for the U.S. CPA exam. PBL is a theory that implies that real-world problems solved innovatively and collaboratively more effectively prepare students for the professional workplace. Moreover, Johnstone and Biggs (1998) found similarities between accounting education and medical education and argued that students in accounting experience the same challenge as the students in medicine.

Literature Review Related to Key Variables and Concepts

The Use of Control Group and Experimental Group in Research

The composition and experiences of the control group and the experimental group in my recent study involved the very same research methods and procedures. Zhou (2018) found that PBL methodology was not any more effective than conventional instructional methods used in the ESL control group; however, certain variables may have confounded Zhou's results. Zhou was interested in enhancing critical thinking skills among English Education majors in Jiangxi Province, using as measuring devices student questionnaires, direct interviews, and individual performance English tests. The subjects (35 in the experimental group and 39 in the control group) were identical in terms of their studies: they were English major sophomores from two classes, randomly selected from among a few such classes at second-year level of university in Jiangxi province. In the summary of the research, Zhou reported that PBL methodology was successful in shaping positive attitudes, as well as such critical thinking skills as linguistic analysis, and interpretation of text. However, Zhou also reported that PBL did not produce significantly better results for the experimental group on terminal English scores. The methodology was certainly

well conceived: the language test and student questionnaire data were entered into SPSS 22 for descriptive statistical analysis, paired sample *t*-test analysis, and independent sample *t*-test analysis. However, there were problems in the research design that led to problems in interpreting the efficacy of PBL. Zhou noted that Chen's (2013) study had demonstrated the positive effects of the PBL teaching model, particularly in the construction of new knowledge and the ability to acquire second language facility. Zhou admitted that the 2018 study failed to obtain the same conclusive results because the 2018 test cycle was brief, the experimental objects employed were different in scope and nature, and the control of variables was less than optimal because the experiments lacked the kind of long-term duration that I employed in my design. In short, improving linguistic facility is far more complicated than increasing content-area skills and knowledge in accounting at the post-secondary level.

The growing impact on accounting from both globalization and recent technological advancements such as artificial intelligence is now requiring university business students to acquire more core professional skills to meet corporate career demands (Wilkin, 2021). Wilkin adopted a research model that divided students into two separate groups, who were taught the same courses with two different teaching methods: the integrated and interactive approach, and the traditional approach. The researcher found that integrated and interactive approach encouraged students to be more engaged in their learning; the researcher arrived at this conclusion through comparing the learning performance results of the two separate groups of students, that is, the experimental and control groups. Huang and Zhang (2021) indicated that their research involved using PBL

teaching methodology to create problem scenarios for students to motivate them to learn more creatively. The authors indicated such music-related PBL-modified courses could be beneficial application of theory. The researchers also used a group of music majors from a university in the Shangdong province of China as the research population. In their experiment, they employed one group as the experimental group, and a second of equal numbers as the control group. The teaching for both groups of students involved 12 class hours. Before launching their experiment, the researchers administered a survey questionnaire on the feasibility of PBL instruction. From the two groups, 61 respondents participated in the survey; most of the respondents considered that PBL learning methods would give them more flexibility to adjust the time, learning pace, and rhythm of learning by themselves. The researchers divided the implementation of the PBL methods into three stages: pre-class review based on PBL, classroom instruction using PBL, and after-class review using PBL methodology. The researchers also mentioned that the PBL method placed emphasis on the students' creativity and innovation. There was measurable change over the course of the learning process, during which instructors were able to combine the various pre-class, in-class, and after-class assessment methods to evaluate the music literacy levels of the students. Based on what they saw as the effectiveness of PBL, the researchers concluded that PBL had advantages in music-related courses over conventional, instructor-centered teaching methodologies. However, PBL as a methodology had yet to be applied to less artistic subjects such as Business.

The next significant study into the effectiveness of PBL addressed this issue. A group of researchers studied the progress of 34 graduate students at a Ukrainian

university in a business English course (Nychkalo et al., 2020). Two different teaching methods were involved in the research. The students took part in a class that covered 34 academic hours (two academic hours per week). The 34 students were divided evenly into two groups: a control group and a test or experimental group. The control group was taught business English with traditional methods, but the test group was taught with a task-based methodology. The finding was that students who were taught under the task-based method were more productive in their learning performance. The key to such a finding is the credibility of the pre-test/post-test method of measuring gains in learning.

The Use of Pretest and Posttest in Research

Pretests and posttests are usually used to compare the performances of separate groups in research projects. This methodology informed, for example, the study by Saputra et al. (2019), who researched the effectiveness of collaboration between Jigsaw and PBL model in students' critical thinking skill development in accounting education. The researchers designed an experiment that used a pre-experimental group who received both a pretest and a posttest. They collected data from both the pretest and posttest scores and used *t* tests in applying the SPSS 23 program. Through their analysis, the researchers concluded that implementation of Jigsaw and PBL methods was effective in helping students to improve their critical thinking skills. The experimental research used a pre-experiment design involving just one group, who completed a pretest and a posttest. The researchers adopted the pretest/posttest design as the group being tested was given the experimental treatment before the researchers compared the results of the pretest with those of the posttest. The research report indicated some variables that may have

confounded these results. In addition, Zhou's (2018) design superficially resembled that for the current accountancy study (i.e., a pretest, various experimental materials, and a posttest). Zhou's design was far more complicated, in part because it was a mixed-methods study that solicited attitudes as well as compared objective test scores in a relatively short cycle with a much smaller number of participants than the number that I have incorporated into my study.

This important facet of PBL research was addressed in 2020 by a researcher who investigated the reliability of difference results that were collected before the pretest and posttest, that is, before and after the designed treatment (Gu et al., 2020). The researcher found that the experimental treatment did in fact address anxiety and other mental problems such as depression and addiction. The researcher used the IBM SPSS statistical software to conduct the analysis for the reliability test. Through analyzing the test, the researcher concluded that the significant differences between the pretest and posttest differences were believable and well-grounded.

A more recent study, one involving Engineering students in an Indian university found that most students enrolled, especially the first-year engineering students, found their courses extremely challenging (Gadad et al., 2021). Their instructors found it challenging to deliver the necessary knowledge to these first-year students using traditional lectures. Accordingly, the researchers applied innovative PBL strategies to the design of first-year engineering courses. The researchers, using the quantitative research method to analyze the students' learning performances, concluded that PBL was more

effective than conventional pedagogy as a learning methodology for engineering students in terms of long-term retention and skills acquisition.

PBL Method Application

The PBL method has been used in various teaching projects. Accounting would have to adapt to the new demands of the marketplace, particularly in terms of data analytics and enabling clients to make the right decisions regarding desired outcomes (Tschakert et al., 2016). The recent trend towards accountants having to adopt a client-service approach in their professional practice means that accounting graduates need to become computer-savvy statisticians. A few years ago, the World Economic Forum (2016), in its *Future of Jobs Report*, emphasized the new directions that accounting education must take to meet these new demands of the marketplace and focus on complex problem-solving, critical thinking, and general creativity, or thinking outside the box (Weforum, 2016). These new directions in accounting practice require significant changes in accounting education, both in terms of curriculum and teaching methodology. Instructors should stop telling students about solutions and instead enable students to discover their own solutions to real-world accounting problems.

In addition, researchers have explored the effectiveness of alternate instructional strategies as those typical of the PBL learning method replacing the non-PBL learning method. Andersen and Kjeldsen (2015), for instance, proposed using games based on accounting practices. Moreover, Tan (2019) used a collaborative learning process to teach students how to apply case-based materials. The 111 undergraduate Canadian university students in Tan's study engaged in collaborative, structured activities, with one

group playing the role of consultants and others the role of stakeholder. Students responded positively to the case-based class and developed skills that set them apart on the posttest, although 42% of the participants attributed their increased expertise to other factors, such as their individual efforts and the efficacy of study groups (Tan, 2019).

Researchers who have explored alternatives to the traditional lecture have tended to focus on collaborative learning, but they have not offered the specific methodology or research design that I used in my PBL study. For example, Opdecam and Everaert (2019) investigated the effects of PBL versus lecture-based tutorials on final exam scores in accounting. The data pool was considerable: Over 8 years at a Belgian university, 2,756 first-year students in a financial accounting course had a choice between attending a lecture-based tutorial (chosen by 1,955 students) or participating in a team-based tutorial (chosen by 801 students). The final mean score was significantly higher for the team-based group, but GPA was significantly higher for lecture-based learning. In other words, academic scores, or grades (reflected in students' grade-point averages) did not serve as accurate predictors of initial success on the U.S. CPA examination. Further, Christensen et al. (2019) studied the effect of team-based learning (TBL) on student attitudes towards four areas of accounting: (a) learning accounting, (b) teamwork as a learning tool, (c) the ability to work effectively in diverse teams, and (d) the tendency to identify with one of five roles in a team-based assignment. Aspects of innovative instruction included the flipped classroom and conducting a team readiness assessment test. The instructors conducted formative assessments collecting feedback from the students at the end of the course. With a participant base of 210 matched pairs at an Australian university, the

study's response rate was 48%. The overall results indicated that student attitudes towards accounting declined but that TBL reduced negative perceptions and improved attitudes towards the subject among those majoring in "quantitatively based degrees" (Christensen et al., 2019). Students did not report finding TBL a useful learning tool for accounting. However, the TBL exercise did result in the development of enhanced teamwork skills among participants, especially in terms of leadership roles such as a task-leader and socioeconomic leader. The researchers concluded that the use of TBL as an instructional tool may effectively enhance the employability of student participants (Christensen et al., 2019).

PBL Advantage: A Skills-Based Approach

PBL has been approved to be a skills-based approach in various teaching projects in the area of accounting. Researchers who have investigated the applied skills of recent accounting graduates have reported that these fledgling accountants generally lack the necessary accounting skills that employers expect (Chaffer & Webb, 2017). Moreover, Dzuranin et al. (2018) studied the issue of how to inject a hands-on approach in accounting courses to enable students to develop the critical-thinking skills necessary to pass the U.S. CPA exam and succeed in the workplace. Even university faculty in recent research polls have recognized the need for the implementation of a skills- and problem-based curriculum. Dzuranin et al., for example, indicated that most of the faculty whom they polled expressed the notion that critical-thinking skills should become a focus of instruction. Dzuranin et al. also mentioned that this 2018 survey of faculty showed a much-increased interest in hands-on teaching. The instructors whose opinions they

solicited emphasized the necessity for introducing data analysis, for example, in both stand-alone courses and in both undergraduate and graduate specialty accounting courses. A pedagogical approach that can address identified skill deficits, remarked Curtis (2017) should be skills-based rather than theoretical, although he contends that the latter theoretical approach is better suited to the university lecture theatre. Curtis in fact sees a place for the academic lecture in business education but regards PBL exercises as necessary adjuncts to theoretical lectures. An approach that may produce better pass rates and reduce the number of attempts for accounting graduates on the U.S. CPA examination would involve making that certification exam the object of PBL units (Stanley & Marsden, 2012). Accounting education is international, and not peculiar to one country, so that one wonders why research into the introduction of PBL methodology in accounting education originated not in the United States, the country largely responsible for the local U.S. CPA certification exam, but in the relatively less high-profile business schools of Australia (Stanley & Marsden, 2012). Nevertheless, the course of studies that researchers Stanley and Marsden (2012) have proposed utilizes those mainstream topics associated with the internationally administered U.S. CPA examination: financial accounting, taxation, business law, management accounting, computerized accounting systems and auditing. The researchers have proposed a radical overhauling of the teaching methodologies in Australian schools of business; they asserted that the traditional methods of teaching and assessment, such as, lectures, tutorials, assignments, and exams be largely replaced, simply because these conventional

methodologies do not facilitate accounting students' developing the 'people' skills that they will need to succeed in the workplace (Stanley & Marsden, 2012).

Research into accounting programs delivered online has likewise strongly suggested that traditional approaches to accounting education are insufficient to prepare accounting students for their profession (Morgan, 2015). In their 2018 study of students' attitudes towards PBL in accounting courses, Wyness and Dalton (2018) did not focus on knowledge acquisition but on skill development and the researchers concluded that students regard PBL as a useful pedagogical strategy because they discover that it heightens student interest and engagement and encourages students to build their personal knowledge in such business areas as accounting, reporting, and auditing. Wyness and Dalton stated that students who have been exposed to it perceive PBL as an appropriate pedagogy for a more active style of learning in accounting education. Wyness and Dalton offered evidence that, because of their instructors' using PBL, students in experimental groups acquired employability-related skills in problem-solving, collaborative working, conflict resolution, report-writing, presentations, and research. However, Wyness and Dalton were as interested in the introduction of a sustainability module in accounting programs as they were in the value of PBL per se. This aspect of PBL has led to further research on the effectiveness of active learning.

In a 2020 study of the effects of PBL on the learning of accounting students in a post-secondary setting, researchers examined how instructors introduced PBL in introductory accounting courses in order to enhance their students' critical abilities and creative thinking skills (Nurkhin et al. (2020). The researchers noted improved learning

outcomes for students and discovered that the implementation of PBL in an Accounting course would improve students' final marks. The study, entitled "Applying Blended Problem-Based Learning to Accounting Studies in Higher Education; Optimizing the Utilization of Social Media for Learning," using a two-month time frame (September-October 2019) at the Faculty of Economics, Universitas Negeri Semarang, tested the efficacy of specific PBL strategies. To improve the quality of instruction the researchers incorporated a few contemporary pedagogical strategies within a PBL design, including mind-mapping, setting online quizzes, and enhancing students' social media interactions through Instagram and Google Classroom (Nurkhin et al., 2020). The limitation is that it was not PBL methods generally that were the focus of the study, but specific PBL-related strategies. Nevertheless, the findings of Nurkhin et al. suggested that PBL has positive outcomes for the learning and application of accounting concepts: the research has shown that a blended PBL classroom strategy enhances students' capabilities. Nurkhin et al. also indicated that students at the conclusion of the second month reported improved attitudes towards the subject, namely that they found learning is productive and enjoyable and that PBL enhanced students' attitudes towards course materials undoubtedly was a factor in quantitative measurements showing the success of the treatment in students' success in their course grades. Such conclusions supported broader studies of the efficacy of PBL as a student-centered pedagogy that tended to improve students' attitudes towards course materials by emphasizing student engagement and active learning strategies. For example, Zakaria et al. (2019) concluded that 95% of those who use PBL believed that as an instructional method it produced positive outcomes and could be applied to the

curriculum of any educational course, whether primary, secondary, or post-secondary. However, such studies rarely give a quantitative measure of the effectiveness of PBL such as might be derived from the classical design of pretest, experimental treatment, and posttest. That anecdotal evidence is neither verifiable nor reliable and led to studies involving the statistical significance of enhanced learning in PBL experimental groups.

In my own study, I used standard quantitative methodologies to investigate the efficacy of PBL as a teaching methodology and to determine if PBL could enhance the U.S. CPA practice examination performance of accounting students. The implication, of course, would then be that PBL is superior to conventional pedagogy in the training of accountant students.

The Benefits of PBL Methodologies: A Student-Centered Approach

Students of accounting need more than just technical preparation if they are going to function within the professional culture of an accounting firm. Experiential education has demonstrated the potential to facilitate critical thinking and problem-solving, two key capacities which the workplace requires of accounting graduates. Whereas the time required for extra planning for active learning may cause instructors difficulty as they attempted to transition away from the traditional pedagogy of the lecture, implementing PBL may well prove worth the additional effort. In fact, as an instructional method it reduced instructor stress because experiential learning enabled students to create their own knowledge rather than simply receiving it from an instructor; furthermore, students validated what they learn by applying their new knowledge, a process which enabled them to retain it over time (Apostolou et al., 2019).

The next study to be considered showed how accounting and finance students in their final academic year at an Irish university perceived the effectiveness of cooperative learning throughout the accounting curriculum (Healy et al., 2018). These researchers found that students regard the immediate benefit of group activities, and concluded that such activities enhance peer learning, communication, interpersonal, and leadership skills. Healy et al. concluded that repeated engagement in cooperative learning had positive outcomes for students socially and in terms of learning from their peers and transferring skills, even if the circumstances of implementation are less than optimal. Most of the students in their study agreed that group work facilitated interactions with other students and enabled them to learn from other students. Such studies underscore the value of teaching methodologies other than the lecture and the report, particularly in terms of building transferable accounting skills.

Although PBL has been utilized broadly as a pedagogical methodology in secondary schools since the 1960s and has even been employed in such professional programs as medicine and teacher-training at the post-secondary level, its use in accounting education is quite recent (Hansen, 2006; Soares et al., 2013). Ahmed and Kannaiah (2018) postulated that the paucity of publications on the application of PBL to accounting courses —nineteen articles have been published on this topic between 1998 and 2017, but only fourteen of these were empirical papers, a fact which implies some general reluctance among accounting educators to adapt PBL to their courses. Ahmed and Kannaiah also speculated that the slow uptake of BPL methods was the result of both the sheer range of topics and the limited number of problems available for teaching in

PBL. Nevertheless, they concluded that PBL has proven itself the best approach for teaching the principles of accounting (Ahmed & Kannaiah, 2018). They believed that the chief advantage of PBL was that it was an empirically validated approach that could raise students' academic performance as well as enhance their professional skills.

PBL is well established as an alternative pedagogical approach in the secondary school classroom, as demonstrated by a recent study in Brunei. Topics in the Cambridge Ordinary-level (O-level) curriculum for accounting in the final year of public school students in Brunei include all aspects of the formalized study of accounting, including its underlying concepts, its methodologies, its specialized terminology, the skills necessary to prepare financial statements, and interpret financial data (Lim et al., 2020). Whereas the study by Lim et al. focused on fourteen- and fifteen-year-olds who were studying the fundamentals of accounting, the topics, scope, and experiences of their research still have relevance for a post-secondary setting such as the one the present study has conducted. Given the age of the students in the studies mentioned, Lim et al., indicated that researchers have often found that many students report that they prefer to have the teacher rather than an exercise as the chief vehicle for learning; in particular, they seem uncomfortable serving as facilitators rather than mere recipients of knowledge. Students, in fact, often find PBL instruction challenging, and even daunting. Given that the number of students involved in this action research project was limited and did not allow for comparing the performances of an experimental and a control group, it is not possible to extrapolate how the findings of this study might apply to students of accounting in a post-secondary institution. However, Lim et al. then concluded that, when students embrace

the challenge of active earning, the implementation of PBL in accounting courses tends to have a positive influence on students' knowledge of accounting procedures. PBL activities give students a firm understanding of accounting procedures, an understanding which carries over to the posttest assessment. Students report that they feel more motivated to learn in the context of PBL, and that they acquired and retained accounting knowledge better than they would have from a conventional lecture.

There is no paucity of studies on the benefits of PBL in elementary and secondary schools, but the methodologies and conclusions of such recent studies as those of Beach (2017), Muniz (2019), Tighe (2020), and Cwynar (2020) have only general applicability for the implementation of PBL strategies in professional studies at a university. For instance, Beach was not as positive about the benefits of PBL in K-12 in terms of students' acquiring specific skill sets, because she focused instead upon the transferability of best practices and the function of the teacher in guiding students to be responsible for their own learning (Beach, 2017). Research such as Beach's has focused on the structuring PBL units, and on using PBL to foster in classes a sense of community, creating authentic learning tasks, and teachers' adding PBL strategy to their repertoire. However, such recent studies reflect the current emphasis on authentic learning and the development of meaningful skills through personal learning. Adopting PBL as the principal classroom methodology for delivering meaningful instruction and understanding leads to enhancement of the inquiry-based learning environment in both public elementary and secondary classrooms. Beach indicated that PBL has been successful because it holds learners accountable. Since PBL is the recent thrust of public-

school pedagogy, post-secondary instructors will likely find their students amenable to its strategies as they come to university already personally aware of the benefits of socially based and PBL learning. Students now bring the benefits of PBL to post-secondary studies with enhanced collaborative and leadership skills that enable them to transfer and apply knowledge rather than merely memorize it.

Muniz (2019) investigated the benefits of a very specific type of PBL, Knowledge Creation Problem Based Learning (KC-PBL), in a single subject, science; she has demonstrated that a teacher's using this type of PBL as opposed to conventional classroom methodologies results in markedly improved comprehension and performance for students in Grades 5 and 6. Unfortunately, her control-group experiment failed to prove her contention statistically that the control group were recipients of direct instruction, whereas the experimental group experienced KCPBL. Students in both groups wrote both a pretest and posttest so that the researcher could gauge the amount of learning taking place. The results of these tests reveal that the experimental and the control groups exhibited statistically significant differences from pretest and posttest scores, but no significant differences occurred between the two groups. Students in the experimental group achieved much better results than those in the direct instruction group because the application of rubrics used to measure understanding showed that the control group exhibited a significant ability to define a problem.

From a subjective perspective, teachers, and students alike credit PBL with superior effectiveness as an instructional strategy compared to standard pedagogical strategies, as shown by Tighe (2020). This study concluded that student-directed, task-

oriented learning possesses the potential to enhance 21st century learning because PBL enabled students to build and apply their own solutions. However, Tighe was not measuring outcomes but attitudes. She was correct in her evaluation of how students in Grades 6 through 8 in language arts and how social studies teachers positively regarded PBL. Using an attitudinal survey, she concluded that PBL had the potential to improve students' communication and collaboration skills, as well as their individual creativity, their lesson-planning, and their personal reflections.

Compton et al. (2020) reflected upon their experiences with the integration of PBL and their use of evaluative materials strategies in an undergraduate nursing research class. They adapted six content areas from the course to produce PBL tasks. They acted upon the assumption that understanding concepts and connecting those concepts to actual medical practice can be achieved when students in a nursing course actively construct and reconfigure their knowledge. Compton et al. have thus demonstrated for faculty and students the value of reflecting upon practice. Compton et al. also concluded that discussion among nursing faculty is necessary to understand thoroughly the importance of shifting from traditional pedagogies towards learner-centered, constructivist methodologies that reinforce critical thinking skills.

Cwynar (2020) has taken a more objective approach to demonstrating the superiority of PBL constructivist learning strategies over direct instructional methods. The commitment of the individual teacher seems to be the key to the successful implementation of constructivist theory in authentic tasks. Cwynar conducted a sequential, mixed-methods study to validate the effect of PBL on students' academic

performance. Using grade-specific State Standardized Assessment student achievement tests in English Language Arts (ELA), she employed a Spearman correlation to determine the statistical relationship between a teacher's reported degree of commitment to PBL in design and implementation and the actual pretest and posttest gains of that teacher's students on the ELA assessments. Cwynar found a weak but positive relationship between the teachers' reported commitment to PBL instruction and the achievement of their students' ELA tests. Cwynar concurred with teachers' reporting improvement in students' attitudes, skills, and transfer of knowledge with respect to providing greater variety in classroom learning. The teachers' goals in implementing PBL were consistently to enhance content knowledge and students' meeting achievement standards, as well as "facilitating and managing groups" (Cwynar, 2020, p. 34). Cwynar's emphasis on objectively measuring the effectiveness of PBL methodologies by employing standardized assessment suggested that her procedures and handling of the statistical analysis of data obtained could be useful in the projected study of the effectiveness of PBL in a post-secondary accounting course, despite differences in the ages of the students and the materials utilized in the authentic learning units.

Estimating the Effectiveness of PBL in Developing Communication Skills

Fábio et al. (2020) conducted a systematic review to measure the effectiveness of PBL for nursing students and nurses in improving their professional communication competencies. Searching PubMed, EMBASE, MEDLINE, PsycINFO, Cochrane Library, China National Knowledge Infrastructure, Wanfang Data Knowledge Service Platform, and VIP Database for Chinese Technical Periodicals, Fábio et al. attempted to identify all

the English and Chinese language studies that have employed PBL; their intention was to gauge the effectiveness of PBL in the development of professional communication competencies for nurses and nursing students. Then Fábio et al. independently assessed eligibility and extracted data. Fábio et al. conducted a quality assessment employing the Cochrane Collaboration's risk of bias tool for randomized controlled trials and Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument for quasi-experimental studies. They included a dozen low-bias studies; all but one of the articles demonstrated the effectiveness of PBL in developing the nurses' and nursing students' communication skills. Fábio et al. in their research showed no significant difference between PBL and the conventional methods.

Integrating Augmented Reality-Based Materials into PBL Learning Tasks

Fidana and Tuncel (2019) found that the design of PBL activities assisted marker-based augmented reality (AR) for the study of physics. Such integration assures that students will be more stimulated than they would be in a class using traditional methods. In a series of semi-structured interviews, the physics students reported that they found the AR applications more useful, more authentic, and more interesting. Fidana and Tuncel concluded that AR applications in PBL facilitated their understanding and analysis of the problem. These findings, if implemented, could assist teachers in developing interactive learning environments. Their study showed increased students' learning achievement, promoted students' positive attitudes towards physics, and enhanced students' long-term retention of physics concepts.

PBL Enhances Job Readiness

One of most significant differences between post-secondary education and education at earlier levels was that employers expect university graduates to be ready for employment (Ngereja et al., 2020). Accordingly, Ngereja et al. indicated that the most challenging problem in tertiary-level education was to make sure that graduating students have developed the generic attributes and necessary competencies, such as critical thinking, independent problem-solving, communicating effectively, and collaborating with colleagues. Ngereja et al. also indicated that in addressing these challenges, tertiary-level institutions have turned to additional instructional tools, notably PBL, AR, and gaming scenarios. The essence of constructing effective PBL units was creating circumstances that fostered student collaboration and engagement. Hildebrand et al. (1971) emphasized the importance of gauging the caliber of teaching to facilitate student engagement, and such research underscores the importance of asking intellectually challenging questions. Jackson and Meek (2020) also indicated that embedding work-integrated learning into accounting education through student-centered learning and PBL could potentially help students learn more effectively.

The Need for PBL Methodologies in Accounting Programs

In my own study, I investigated the potential benefits of PBL as a student-centered instructional approach as compared to teacher-centered lecture methods. In using experimental and control groups, I found that PBL units could be directly relevant to areas of the U.S. CPA exam, and the pre- and posttest design could provide an objective measure of the efficacy of PBL in U.S. CPA exam preparation. The specific

problem that I addressed in my study was how university faculty members could reconfigure their teaching methodologies to better prepare senior accounting students for the U.S. CPA exam. Recent research has proposed some answers. For example, through their examination of 700,000, first-time, U.S. CPA examination sittings between 2005 and 2013, Bline et al. (2016) observed a high correlation between faculty member research interests, teaching specializations, and student performance on the U.S. CPA exam. Students who had instructors whose specialization was accounting and who possessed expertise in auditing tended to have better performances on the related examination section. In fact, faculty member specialization was closely related to elevated performance on all four sections of the exam. According to Cordis and Pierce (2017), if faculty members were more highly motivated to introduce their students to a profession as it is practiced, they would be more inclined to help students learn about the requirements of the workplace. Currently, many business students must spend additional time preparing for the U.S. CPA exam after graduation because they have received insufficient instruction in university business classrooms, and consequently, they may feel ill-prepared for the professional examination (Fogarty & Lowensohn, 2017).

What is required, then, is a general revision of the methodologies employed in post-secondary accounting courses. For example, in concluding a study of the efficacy of context-specific case studies in preparing students for the U.S. CPA exam, Moilanen (2017) stated that academic accounting programs could meet the professional needs of the accounting industry.Specifically, Moilanen proposed that university business faculty members should provide more practical teaching content and training to help students

acquire real-world accounting knowledge which would enable them to use accounting application software effectively and more easily pass the U.S. CPA exam as soon as they graduate.

Although such disciplines as medicine and education have found PBL to be an effective methodology in engaging students in real-world exercises associated with their profession (Gierl et al., 2017) and some theorists have recommended PBL as a promising methodology for accounting education (Bergstrom et al., 2016), to date no researcher has published empirical research to support this contention. The gap in the literature I have identified is the potential influence PBL teaching methods may have on student performance on U.S. CPA practice exams. The research problem stemmed from the lack of fit between the requirements of the accounting workplace and the competencies measured by the U.S. CPA examination on the one hand, and accounting education as delivered in business schools and business school instructors on the other. In this study, I investigated a possible solution to this issue in the form of utilizing PBL to introduce real-world challenges, including team-based problem solving and data analytics, and specific components of the U.S. CPA exam in accounting courses.

Bridges and Hallinger (1999) originally identified eight elements of PBL design with the following structure: (a) introduction, (b) problem scenario, (c) learning objectives, (d) guiding questions, (e) resources, (f) products, (g) assessments, and (h) time constraints (Goodin et al., 2010). The incorporation of this structure and these design principles into one item is termed a PBL event (Barrows, 1994). The event was

composed of the written PBL, the module, the necessary preliminary experiences, and research (Goodin et al., 2010).

Importance of Instructor and Student Involvement in the Classroom

The key to successful PBL design as measured by student satisfaction surveys is fostering student engagement and collaboration. Jones (2016) contended that classroom engagement in the learning process is essential for students if they are to have better learning results and become more motivated. Jones also pointed out that, if instructors can actively involve students in their classroom interactions, students will be more satisfied with the learning process. Dolnicar et al. (2017) reported that having a healthy instructor–student relationship can significantly improve students' enthusiasm about what they learn in class. Student engagement is positively impacted by innovative instructional methods that encourage active communication, that is, creating circumstances for students to engage in meaningful dialogue with their instructor and each other. Dolnicar et al. stated that active communication through innovative teaching methods has the potential to improve student learning. Dawes (2017) agreed, also finding that active teaching through using various teaching methods, computer software, and equipment can produce better outcomes in the student learning process. Mower (2017) stated that a thorough integration of student learning processes in academic courses will better assist students to acquire knowledge and more deeply understand what they learn in class. Dawkins et al. (2020) suggested reorganizing the accounting curriculum; however, they did not consider adjusting or augmenting instructional strategies. Olson (2020) advocated sensitivity training for accounting faculty to address contemporary diversity and inclusion

issues but did not consider the necessity to change time-honored instructional methodologies. Moreover, Olson considered the possibility that the provision of a "more inclusive environment " (could include more student-centered teaching approaches (p. 58). Olson also welcomed initiatives that would help students improve their learning experiences and which would lead to their smooth induction into the profession.

Kent (2016) in a doctoral thesis noted a lack of competency among recent accounting graduates in the execution of simple accounting procedures. However, despite the now-proven efficacy of PBL methods in addressing such issues, accounting instructors' reluctance to introduce innovative pedagogical strategies remained a major stumbling block. Kent also found that employers of accounting graduates and even professional accounting organizations have agreed that the training schools do not have the right kind of curriculum and supporting technology to address the kinds of problems that recently graduated accountants tend to encounter in the workplace. The composition of Kent's theoretical framework, which encompassed Kolb's experiential theory, Dewey's experiential theory, and Engelmann's theory on direct teaching was directly relevant to learning by experiencing.

The Importance of an Accounting Graduate's Acquiring a U.S. CPA License

A U.S. CPA license is an important measure to identify accounting students' professional knowledge and skills, according to Boyle et al. (2013). Chang et al. (2015) pointed out that employers in accounting firms prefer to hire well-trained accounting graduates, especially those with greater potential for acquiring their U.S. CPA licenses soon after graduation. Hargadon and Fuller (2015) also found that graduates with U.S.

CPA licenses are in great demand among various business entities and accounting firms. Durocher et al. (2016) found that accountants in the global marketplace with U.S. CPA licenses could have many more competitive advantages in their chosen career paths and enhanced opportunities for career success in comparison to their peers who lack the U.S. CPA license. Crossman (2017) found that, without a professional license acquired through writing the U.S. CPA exam, graduates would be restricted in their choice of career path in accounting and would have far fewer opportunities for corporate advancement and promotion. In other words, getting a degree in accounting without passing the certification exam is not an option for those students who would like to become practicing accountants.

Preparing for the U.S. CPA Exam

In addition to acquiring new workplace skills, accounting students must learn how to master the four content areas of the U.S. CPA examination: auditing, regulations, business environment, and financial accounting (Lawson et al., 2014). Here again, PBL may play a central role in accounting education. Shawver (2015) investigated the effectiveness of PBL approaches for improving student learning experiences in the financial accounting classroom but did not specifically explore how PBL methods could positively impact students' performances on the U.S. CPA exam. Sithole (2018) studied the effects of applying cognitive load theory on accounting students' performance in classroom learning and found that these could have implications for instructional design and for the ways in which instructors present information. Bergstrom et al. (2016) assessed the effectiveness of PBL in a university setting by comparing the learning

outcomes achieved by education majors who experienced PBL teaching methods with those outcomes attained by similar students who received conventional instruction (i.e., attending lecturers and writing research papers) and they found that the PBL method may be more effective than non-PBL methods in some content teaching.

U.S. CPA Exam Performance: The Gap Between Exam Preparation and Workplace Skill Requirements

Jones (2017) investigated how greater student engagement resulting from teaching method reform might address the gap between preparation and performance. Specifically, Jones investigated the relationship between the accounting program curricula offered by some universities and exam achievement and concluded that the standard curriculum did little to help students learn the fundamental skills of accounting required by the U.S. CPA exam.

Providing students with targeted preparation for the U.S. CPA examination produces stronger results (in terms of improved scores) than simply taking additional graduate coursework (Chaffer &Webb 2017). Chaffer and Webb stated that the new 150-hour course requirement for U.S. CPA certification throughout the United States has had a positive impact on both U.S. CPA rates of passing and perceived professional preparation for the workplace. The chief difference in passing rates among various types of candidates seems to be whether students have attended an accounting program that possesses accreditation from the Association to Advance Collegiate Schools of Business (AACSB), although whether the impact is consistently or inconsistently positive has yet to be determined (Shough et al., 2018). Chaffer and Webb also stated U.S. CPA

candidates from Master of Accounting (MACC) programs tend to report greater satisfaction in terms of their acquisition of practical accounting skills. This finding, in turn, suggested that there was a positive relationship between the caliber of an academic program that emphasized practical skills and the graduates' feeling that they had been properly prepared to enter the accounting profession. Furthermore, rates of program customization (i.e., allowing students to make several elective choices) tended to coincide with higher U.S. CPA exam pass rates. Shough et al. (2018) concluded that student satisfaction contributed to professional competency. This finding was particularly true of programs that permitted students to take a high degree of MACC coursework, although results are nearly as good for programs with relatively low elective customization.

There has long been a gap between accounting research and accounting practice in the business world and bridging that gap between the two dimensions collaboratively will take time (Jones, 2017). The gap which Jones identified was the product of the current curricula because what some universities offered in their accounting programs did little to assist students in learning the practical skills that the workplace requires. Jones also found that accounting students themselves would welcome a practical introduction to the profession. Aside from skill deficits, the lack of ability to pass the certification exam was a significant problem commonly noted in the research, but other potential problems included the inflexibility of the curriculum, the inadequacy of academic preparation (i.e., type of school and degree prior), and a general lack of customization. Furthermore, Coady et al. (2018) concluded that entry-level accountants encounter a gap between their educational preparation and their employers' expectations about both emotional

intelligence (EI) and non-EI skills. Priority indices and strategic mapping have shown which EI and non-EI skills instructors should focus upon in reorganizing curriculum (Apostolou et al., 2019). One of the strengths of PBL is that it fosters the collaborative abilities that are the hallmarks of EI.

In advance of their initial jobs, students wanted to understand the culture of the workplace that they would be entering as novice accountants (Jones, 2017). Yet another problem that informed the gap between academic preparation and workplace skills was that, as Kelly (2017) observed, university accounting faculty members and program leaders had not been very interested in helping their students learn about the practical and work-related aspects of accounting. Curtis (2017) advocated that emancipated action research was the most successful method to address this gap between actual workplace skills and academic preparation because it encourages students to learn how to modify or even eradicate structural impediments which tend to limit improvement.

Most Recent Paper on PBL

Offering a wider variety of teaching methods suitable to the subject of accounting and overcoming the shortcomings of traditional teaching methods such as the group lecture would maximize student learning (Hue,2021). Hue and his team radically altered the course's instructional design at the classroom level. However, he reported that he had difficulty with implementing anyone teaching method for all the subjects offered in a university. Therefore, he concluded, instructors must select and apply different teaching methods with proven effectiveness according to the individual characteristics of both the students and the course. Hue's results showed that flipped learning class activities would

result in improved student interest in learning curricular material. We may deduce that the application of the cooperative learning models of PBL and Guided Discovery Learning would be effective in improving students' critical thinking and problem solving, whereas utilizing conventional methods such as the lecture and whole-class discussion will be far less effective in enhancing students' critical thinking skills. Student motivation influences their ability to think critically and solve problems collaboratively. More highly motivated students have better critical thinking skills than students with moderate or low learning motivation. Consequently, an instructor's applying cooperative learning models of Problem Based Learning (PBL) and Guided Discovery Learning in delivering a curriculum is effective in improving critical thinking, whereas conventional instructional methods will be less effective in improving students' critical thinking skills (Mardi et al., 2021). Goni et al. (2020) mentioned that "Education is a conscious and planned effort to create a learning atmosphere" and Goini et al. also indicated that instructors must allow students to actively develop their problem-solving skill set so that they can utilize "religious spiritual strength, self-control, personality, intelligence" and interpersonal communication skills in a group setting. There was more to the learning process than rote memorization: understanding is facilitated by using and applying knowledge because "the child's brain is forced to remember various information without being required to understand the information it remembers to connect it with everyday life" (Goni et al., 2022). The principle that Goni articulated would apply to a post-secondary setting although his study involved the application of PBL in Grade 4 Mathematics, not a university accounting course.

PBL has the potential to align accounting theory and accounting practice, and to reduce the gap between the skills demanded by the labor market and those developed in the academic setting. Consequently, such studies as Goni's have utility in developing a PBL framework to analyze the perceptions of Accounting Science professors regarding PBL's classroom, effectiveness (Morais et al., 2022). Recent studies of PBL in the classroom show that post-secondary students consider the lecture method to be both difficult and dull. They reported that they felt that they lacked the energy and time to do the lengthy assignments that their professor set them—partly because the assignment method is used in every course they take. Instructors should not ignore challenges of traditional teaching strategies and must look for viable solutions. Even older instructors must be prepared to try new ideas, and implement an innovative, student-centered, and active instructional style that would result in a more positive and productive learning environment (Kavlu, 2022).

In conclusion, although a few recent research studies have noted problems in the academic preparation of accounting students for the certification exam for accountants, no definitive research has been conducted that demonstrates the effectiveness of PBL strategies and exercises in addressing the classroom and workplace gap. Clearly, conventional pedagogies have their limitations in preparing accounting students for the exam because student Grade-Point Average seems to be a poor predictor of success in the profession. Historically, a significant proportion of the candidates fail the exam on their first attempt, presumably because they are ill-prepared rather than under-motivated.

Summary and Conclusion

This review of recent literature concerning the effectiveness of PBL as a pedagogical methodology and the need for such innovation in the delivery of accounting curricula has demonstrated the need for research into the potential benefits of this methodology. Implementing PBL in such areas could enhance both accounting workplace skills and counter the challenges of the U.S. CPA exam. The literature demonstrates the need for targeted, quantitative research into the potential benefits of this student-centered pedagogy. The review specifically examines the benefits of using PBL methods in accounting education but has also examined the importance of passing the U.S. CPA exam for accounting students. Without an acceptable level of achievement on this professional exam recent graduates will not be able to advance in their careers. However, the focus of the literature review has been the importance of better engaging accounting students in the classroom.

In Chapter 3, I present the research methodology for the current study. The chapter includes a detailed description of the research design, the implementation timelines, the nature of the experimental and control groups as well as the instrumentation, and PBL strategies and projects that were employed.

Chapter 3: Research Method

The purpose of this quantitative study was to determine the effectiveness of PBL by quantitatively examining the U.S. CPA practice exam scores of students who regularly engaged in PBL and the scores of students who did not. This chapter covers the design, rationale, methodology, and the plan for data analysis. It also covers threats to validity and ethical considerations and offers a summary.

Research Design and Rationale

In the present study, I followed a pretest–posttest design using one-way ANCOVA. The dependent variable was practice exam scores from the two groups of students and the independent variable was the instructional methodologies that the two groups of students' experiences. I considered but rejected a possible qualitative design that would use anecdotal comments from members of the control group and experimental group regarding their satisfaction with the pedagogical methods they had experienced in their accounting courses. However, I rejected this component because it would be too subjective. Further, were I to elicit such remarks, comparison between the groups' comments would not be possible, as the control members may have heard about but would not have experienced PBL methods. A statistical examination of such anecdotal data would also not have been possible. Accordingly, using a quantitative approach, I collected the 2021 accounting class's archival scores from the U.S. CPA practice exam (posttest and pretest) to conduct statistical analysis regarding students participating in PBL or non-PBL instruction. By comparing these scores, I was able to determine the answer to the research question: What is the extent of difference in U.S. CPA practice

exam scores between students who participated in PBL and students who participated in traditional method when controlling for scores on a U.S. CPA pretest?

The instrument preparation involves a parallel-forms design (Gierl et al., 2017). The U.S. CPA practice test takes 4 hours to administer for both attempts (the pretest and posttest), with equal numbers of questions (100), similar types of questions, and a similar focus on using questions drawn from versions of past U.S. CPA exams.

Methodology

I adopted a quantitative approach to answer the research question, as the qualitative research method could involve survey responses, which can inject bias into the analysis of the research question (Warner, 2013). The quantitative research method can be used to establish generalizable facts about a research question through comparing scores, which are more objective on whether the PBL method can be more effective in preparing students for the U.S. CPA practice exam.

Population

The target population was 152 accounting majors in their senior year of university in China. All students in the study, whether in the experimental or control group, were in the same stage of their academic program, had comparable mathematical and accounting skills, and were preparing to sit for the U.S. CPA exam. The program had two instructors who were involved in this research; they had similar years of teaching experience and similar educational backgrounds. One instructor used PBL methodologies to teach financial accounting, reporting, and auditing. The other instructor used the non-PBL or

the conventional methodologies to teach the other group of the students, whom the design has designated the control group.

The 152 students were registered in the business school of the university, and they were almost evenly distributed between the two groups based on their scores on the university's entrance exam taken in their first year. The students were notified that they were invited to participate in this teaching experiment; the information letter briefly explained the intent of the study and the composition of the two groups as well as the nature of the educational experience that each group had. I did not make any requests to change any student's allocation into one or the other of the two groups. The U.S. CPA practice exam questions were compiled by the instructors themselves; they used actual U.S. CPA exam questions as their models. The instructors compiled 70 multiple-questions and 30 written-simulation questions for each of the 4-hour practice exams. The instructors with whom I worked used actual questions from recent U.S. CPA exams. Although the practice exams were in English, the students were allowed to use a hard copy of an English Chinese dictionary to look up the English terms in Chinese if they found such translation necessary. The raw statistical results from those two exams were available to me upon request once the instructors completed their final course evaluations.

Archival Data Procedures

The data set selected was archival, facilitating a comparison between the actual performance of students from two different backgrounds (those who have had traditional pedagogy and those who have participated in PBL) on the same pretest and posttests. The two classes have been chosen based on their availability for this research and the

willingness of their instructors to participate in this study. The instructors with whom I worked used actual questions from recent U.S. CPA exams. Using these authentic questions, I had access to the score reports on students' performances both before and after they have experienced PBL instructional methods. For the parameters set in G*power, I chose the moderate effect size of 0.25 to observe a significant effect on the data. I also chose the standard significance level of $p = .05$ and a standard power level of .80; the number of groups was 2, and the number of covariates was 1 (Faul et al., 2007; Gravetter & Wallnau, 2004). Based on the G*power, I determined that the number of participants in each group would be 134, for a minimum total of 269. However, because of the limited number of participants from a total of 152 divided into the control and experimental groups, I decided to proceed with the pool of 152. The two groups (the experimental and control groups) were chosen from the different accounting classes based on their availability for this research and the willingness of their instructors to participate in this study. Those students took the same or similar courses from those accounting classes.

Data Collection

The archival data were collected from the instructors with the departmental dean's authorization. Instructors of the two groups of students at the Chinese university carried out the pretest and posttest exams during the course, and the instructors used the standardized or model answers to grade the exams. The instructors used Microsoft Excel sheets to store their students' test results on password-protected computers. Then, the instructors sent both test results in Excel format with password attached for security to

me at the end of school semester; neither the students' names nor other school information was disclosed, and students were assigned a research number. The Excel sheet was kept secure in my possession and was destroyed upon the completion of the research. I also applied for Institutional Review Board (IRB) approval through Walden University. The IRB approval number for this study is 11-15-22-0442199. Although there was no IRB office in the Chinese university which was home to this study, approval from the related department head has already been obtained. Once approval was received from both institutions, I organized and analyzed the data collected.

Instrumentation and Operationalization of Constructs

Students are assessed with pretest and posttest U.S. CPA practice exam questions (AICPA, 2022). The study employed actual U.S. CPA exam practice questions, and the practice test consisted of 70 multiple-choice questions and 30 fill-in-the-blank calculation questions. Each question counted for one point. The practice exam measures students' knowledge understanding, knowledge application, and critical analysis skills as required by the U.S. CPA exam blueprint. Each test was approximately 4 hours in length, although students were permitted to leave at the end of the third hour. Each 4-hour U.S. CPA practice test involved questions based on the financial accounting and audit content sections of the U.S. CPA exam to align with those portions of the exam that historically have had the poorest passing rates with the course curriculum. Both the pretest and posttest focused on questions drawn from versions of previously published U.S. CPA exams, with the instructors making minor adjustments. The same types of questions with similar difficulty levels have been used for the pretest and posttest. The exam results

were used by the instructors to evaluate their students' final grades for the accounting course. Upon the completion of evaluation, the results were independently delivered to me by mail or in person.

Data Analysis Plan

I used SPSS software to analyze the results and answer to the research question: What is the extent of difference in U.S. CPA practice exam scores between students who participated in PBL and students who participated in traditional method when controlling for scores on a U.S. CPA pretest? I then conducted an ANCOVA test under the analysis assumption requirement. The study has an independent variable with two levels, a pretest (used as covariate) and posttest (used as dependent variable). An ANCOVA test was chosen since it could be used to determine the statistical significance of differences between two sets of scores (Warner, 2013). Before the data entry, I ensured that the score numbers from 152 students were complete and in the format for analysis. The scores could range from 0 to 100 but will likely range from bare pass (50) to A+ (above 90). I intended to exclude the outliers from the collected data as their aberrant results might be a result of my inadvertently using unique participants.

The parallel form constructed pretest was used as covariate to account statistically for preexisting differences among students in each section of the accounting course. The 4-hour U.S. CPA practice exam has been divided into two exams (pretest and posttest), with equal numbers, types, and focus of questions drawn from various versions of past U.S. CPA exams. Although soliciting comments from respondents about their attitudes towards PBL instructional projects was likely to produce positive comments, the

objective results graphed the relative effectiveness of PBL over conventional instructional methods.

Data Reliability and Validity

The instructors recorded these scores as part of their course evaluation, and scores were measured by the standard questions. The practice exam questions were not subjective questions; rather, they consisted of two types of questions: multiple-choice questions and task-based simulations. However, a few external threats to the data validity may impact the research results. For example, instructors may be motivated to focus on the result of an exam instead of teaching or coaching. Furthermore, a researcher was not able to ensure the monitor process did not impact the instructors during the teaching process, and consequently internal validity may be compromised (Campbell & Stanley, 1963).

Additionally, roughly two thirds of the pretest and posttest questions were slightly modified in number related questions to reduce the risk that students may have seen the questions before from the public sources. This modification of the questions was consistent with adaptation of the real U.S. CPA exam questions used in the practice exams. Take, for example, this actual question:

> Gary, a consultant, keeps accounting records on a cash basis. In year 2, Gary collected *$300,000* in fees from clients. On 12/31/Year 1, Gary had accounts receivable of *$50,000*. On 12/31/Year 2, Gary had accounts receivable of *$70,000,* and unearned revenue of *$6,000*. If Gary used accrual basis, what would service revenue be for year 2? (AICPA, 2022)

The numbers in italics have been changed to different sets of numbers, but the theory behind the question remains the same. A sample exam and a report on validity and reliability data for the exam were published on AICPA's official website (AICPA, 2022). The U.S. CPA practice exam questions were based on past U.S. CPA exam questions publicly released by AICPA. The accounting department of the university provided modified questions to the instructors for use as a template and example to formulate their own practice tests. The content level and difficulty level were the same as the levels of those of past exam questions released by AICPA. The practice test consisted of two types of questions: multiple-choice questions and task-based simulations, and the practice exam questions were the same for all participants.

Threats to Validity

It was quite likely, for example, that students from one group may have compared the teacher's method with students from the other group. The danger was that students in the research group could have shared not only their enthusiasm for PBL, but discussed in detail the PBL exercises in which they were engaging. Thus, students in the control group may have felt that they were receiving inferior instruction and less attention; the instructors must also attempt informally to go through the PBL methodologies they have discussed with students in the experimental group. To what extent this informal practice could contaminate the study was difficult to assess, but the internal validity, the extent to a trustworthy level of a study (Warner, 2013), should not be compromised. However, if participants had chosen to drop out in the middle of study, both attrition and bias may have resulted, thereby decreasing the confidence level. The pretest and posttest used

similar test questions; this feature may impact the validity testing factor, since it may threaten the external validity (Warner, 2013).

Ethical Procedures

The participants were informed of the purpose of this research at the end of semester when the scores of the second practice exam are released to them. They were aware of the general research design, including the purpose and methods to be used in the study. They were, however, able to change groups once the study began. The data were collected with the permission of the administration office from the university in China and from Walden University's IRB office, even though universities in China do not have similar IRB offices. All the students' exam grade data were identified and labeled in allocated numbers (instead of with the students' names) to protect confidentiality and preserve anonymity. I stored the data in a secured digital storage space, thereby protecting the privacy of the data collected; this procedure will prevent public access to data. I did not have any direct financial interest or conflicts in terms of conducting such research. The instructors and the students would not, for example, qualify for merit pay or research grants from the participating institution. The letter soliciting students' informed consent would explain that they had the option to transfer to a different class if they did not wish to participate in the research study. Informed consent required that the potential participants be informed of any hazards or problems that might arise from their participation, and data were derived directly from students' pretest and posttest practice exam scores with the approval from the department of the Chinese university, and students' identification information would not be disclosed (see Warner, 2013).

I collected the test results from a pretest and a posttest from the two groups of students and kept their identities and the name of the university itself strictly confidential to protect the students' privacy. To anonymize the data, I coded each respondent's results, and no names were used in the writing of the data analysis chapter. Each participant was identified in the study only by an arbitrarily assigned number. No individual was identified, but students were able to learn whether they were in the experimental or the control group.

Limitations of the Study

It was difficult to control how much time each student in the two groups spent studying for this course after school hours, especially after students were given the results of their first practice exam. In other words, students who did not do well on the exam may choose to take extra time to prepare for the second exam. The more time they spent on studying exam questions for this course, the better the results they could achieve. I assumed that the percentage of hard-working students and less diligent students were similar within these two groups as the students were allocated to the two groups based on their entrance exam performance results at Year 3 when they were choosing their majors. Students took the practice exams in English with some key terms interpreted in Chinese on the exam, a feature of the test which might affect students' performance due to some minor language barriers.

Summary

The purpose of this quantitative study was to determine the effectiveness of PBL by quantitatively examining the CPA practice exam scores of students who regularly

engaged in PBL and the scores of students who did not. The present study followed a pretest–posttest design, which used a one-way ANCOVA. The dependent variable was practice exam scores from the two groups of students, and the independent variable was the instructional methodologies that the two groups of students experienced. Accordingly, using a quantitative approach, I collected archival scores from the U.S. CPA practice exam (posttest and pretest) to conduct statistical analysis regarding students' participating in PBL or non-PBL instruction. I adopted a quantitative approach to answer the research question, a practice which could inject bias into the analysis of the research questions (Warner, 2013). The quantitative research method was used to establish generalizable facts about a research question through comparing scores, which were more objective on whether the PBL method could be more effective in preparing students for the U.S. CPA practice exam.

In Chapter 4, I present the data derived from surveying the experimental and control groups and the results of this study. The findings are given with full statistical analysis in Chapters 4 and 5. I also elaborate on the possible effectiveness of PBL methodologies on accounting tasks as tested on the practice exams in these final two chapters.

Chapter 4: Results

The purpose of this quantitative study was to determine the effectiveness of PBL by quantitatively examining the CPA practice exam scores of students who regularly engaged in PBL and the scores of students who did not. The experimental group of students received instruction that utilized PBL methodology. The control group of students was taught using the non-PBL method. Both groups took the same pre- and post-practice exams. The research question and hypotheses for this study are as follows:

RQ: What is the extent of difference in U.S. CPA practice exam scores between students who participated in PBL and those students who participated in traditional teaching methods, when controlling for scores on a U.S. CPA pretest?

H_0. There is no statistically significant difference in U.S. CPA practice exam scores between students who participated in PBL and those students who participated in traditional teaching methods, when controlling for scores on a U.S. CPA pretest.

H_a. There is a statistically significant difference in U.S. CPA practice exam scores between students who participated in PBL and those students who participated in traditional teaching method, when controlling for scores on a U.S. CPA pretest.

In this chapter, I provide the necessary background information related to CPA practice exam scores from the two groups of students, reports of the results, and an analysis of the data for both groups through the SPSS (Version 27) charts. Further information is also provided about the data collection processes and procedures. I then present descriptive charts with data variance calculated through SPSS, along with the test

assumptions and an appropriate statistical analysis. I conclude with a summary of the answers to the research question listed above.

Data Collection

For the parameters set in G*power, I chose the moderate effect size of 0.25 to observe a significant effect on the data. I also chose the standard significance level of $p = .05$ and a standard power level of .80; the number of groups was 2, and the number of covariates was 1 (Faul et al., 2007; Gravetter & Wallnau, 2004). Based on the G*power calculation, I determined that the number of participants in each group would be 134, for a minimum total of 269. However, because of the limited number of participants from a total of 152 divided into the control and experimental groups, I decided to proceed with the pool of 152. There was no discrepancy between the expected data and the data that were collected and received. The data were archival, collected from the university department from the 2022–2023 school year study group.

The physical setting was an unnamed Chinese university, and the subjects were accounting majors who were all in their senior year. The timeline of the study spanned a single university semester. Precisely 152 student participants' scores from the practice exams were collected; each participant was in training to become an internationally qualified accountant. The pool of subjects was divided into two groups, both of whom took a pretest based on actual questions from the CPA exam. The students attended classes using either traditional pedagogy (the control group) or PBL instruction (the experimental group). Subsequently, all students took a posttest that was identical in format and similar in content to the pretest. The instructors collected the scores from the

pretest and posttest for the two groups of students and compiled the data in Excel format with password protection. I then collected the data, as planned, from the instructors' departmental office. The students' gender, ethnicity, and age information were not identified as I did not intend to investigate the influence of these demographic factors. The total population of this research project was 152 students, and no one dropped out from either of the two classes. All the students participated in both the pretest and posttest of the CPA practice exam.

Results

This section provides information related to the statistical tests conducted through SPSS, beginning with a review of the research question for this project and an explanation as to how the question was chosen, as well as the reasoning behind its selection. Also included here is a brief explanation of each assumption required for conducting the statistical tests and assumption test results, as well. At the end, I provide a summary of the significance of each test as measured in the data.

Research Question

The research question was as follows: What is the extent of difference in U.S. CPA practice exam scores between students who participated in PBL and students who participated in traditional method when controlling for scores on a U.S. CPA pretest? Participants were divided into two separate groups: the PBL group (n = 76), and the non-PBL group (n = 76). Data are presented for mean, standard deviation, and data range for both pretest and posttest scores in Tables 2 and 3 through descriptive statistics of the two groups.

Table 2

Preintervention Score Descriptives

Control group and one intervention			Statistic	Std. error
Control	Mean		85.4474	.81824
	95% confidence interval for mean	Lower bound	83.8173	
		Upper bound	87.0774	
	5% trimmed mean		85.5219	
	Median		85.5000	
	Variance		50.884	
	Std. deviation		7.13329	
	Minimum		70.00	
	Maximum		99.00	
	Range		29.00	
	Interquartile range		10.00	
	Skewness		-.091	.276
	Kurtosis		-.848	.545
Intervention	Mean		84.9868	.71193
	95% Confidence interval for mean	Lower bound	83.5686	
		Upper bound	86.4051	
	5% trimmed mean		85.1316	
	Median		85.0000	
	Variance		38.520	
	Std. deviation		6.20643	
	Minimum		70.00	
	Maximum		96.00	
	Range		26.00	
	Interquartile range		9.00	
	Skewness		-.286	.276
	Kurtosis		-.201	.545

Table 3

Postintervention Score Descriptives

Control group and one intervention			Statistic	Std. error
Control	Mean		81.3092	.86400
	95% confidence interval for mean	Lower bound	79.5880	
		Upper bound	83.0304	
	5% trimmed mean		81.5234	
	Median		81.0000	
	Variance		56.733	
	Std. deviation		7.53214	
	Minimum		63.50	
	Maximum		94.00	
	Range		30.50	
	Interquartile range		11.88	
	Skewness		-.261	.276
	Kurtosis		-.644	.545
Intervention	Mean		88.8487	.58099
	95% confidence interval for mean	Lower bound	87.6913	
		Upper bound	90.0061	
	5% trimmed mean		88.9912	
	Median		89.0000	
	Variance		25.653	
	Std. deviation		5.06492	
	Minimum		78.00	
	Maximum		97.50	
	Range		19.50	
	Interquartile Range		8.00	
	Skewness		-.466	.276
	Kurtosis		-.793	.545

As shown in Table 2, the mean for pretest score from the control group is 85.44, and the mean for posttest score from the intervention group is 84.98. These results indicated that both groups of students had a similar level of understanding of accounting knowledge and skills before they took the courses in the project. On the contrary, as shown in Table 3, the mean for pretest score from the control group is 81.30, and the mean for posttest score from the intervention group is 88.84. These results also indicated that the students in the intervention group seem to have derived more advantages from the PBL teaching methods.

The ANCOVA is used to check for difference between experimental and control group scores, in relation to a controlling variable (covariate). In this study, I assigned the pretest scores as the covariate. The following seven assumptions must be met before the data collected is sufficient for the ANCOVA test. All seven assumptions are given below, with a brief description of each and how they have been met or not met.

1. The dependent variable and the covariate variable have been measured on a continuous scale. The pretest and posttest scores range from 60 to 99 and are measured at the interval level. Therefore, this assumption has been met.
2. The independent variable shall consist of two or more categorical and independent groups. In this study, the independent variable is formed by two separate and independent student groups, one taught by PBL methodology and the other by non-PBL methodologies. Therefore, the second assumption has also been met.

3. A continuous covariate exists. The CPA practice exam score was continuous and thus, this assumption has been met.
4. Independence observations. There was no relationship between the observations in each group, as each student stayed in his or her own group, and no student was allowed to switch groups during the studies in the semester. Since this was indeed the case, the assumption was met.
5. The control variable should be linearly related to the dependent variable at each level of the independent variable. There was a linear relationship between pre- and post-intervention for PBL, as assessed by visual inspection of a scatterplot. The control group scored lower on the pretest than the PBL group, as shown in Table 3. The data set is roughly equally distributed. However, the slopes of the lines were not considered to be homogenous, as seen in the scatterplot in Figure 1.
6. There was not a homogeneity of regression slopes as the interaction term, which means the assumption was not met. One can see from the scatterplot that there was appropriate homoscedasticity or homogeneity of variances. Such a configuration of the data is necessary because parametric tests tend to be sensitive to outlying dissimilarities, which tend to skew the results. There were violations of the homogeneity of regression, but these may have been the consequence of the small population sizes in this study. Thus, there was no need to abandon the use of the ANCOVA, which permitted the use of

G*Power 3 to calculate both appropriate sample sizes for the control and experimental groups and sampling protocols (see Faul et al., 2007).

7. The results of the Levene's test led to the rejection of the null hypothesis because of the homogeneity of equal variances: *p* value of .064, which exceeds the .05 confidence level; the *F* value is 3.476. Therefore, the data met the assumption for the homogeneity of variances.

Figure 1

Scatterplot of Change Difference

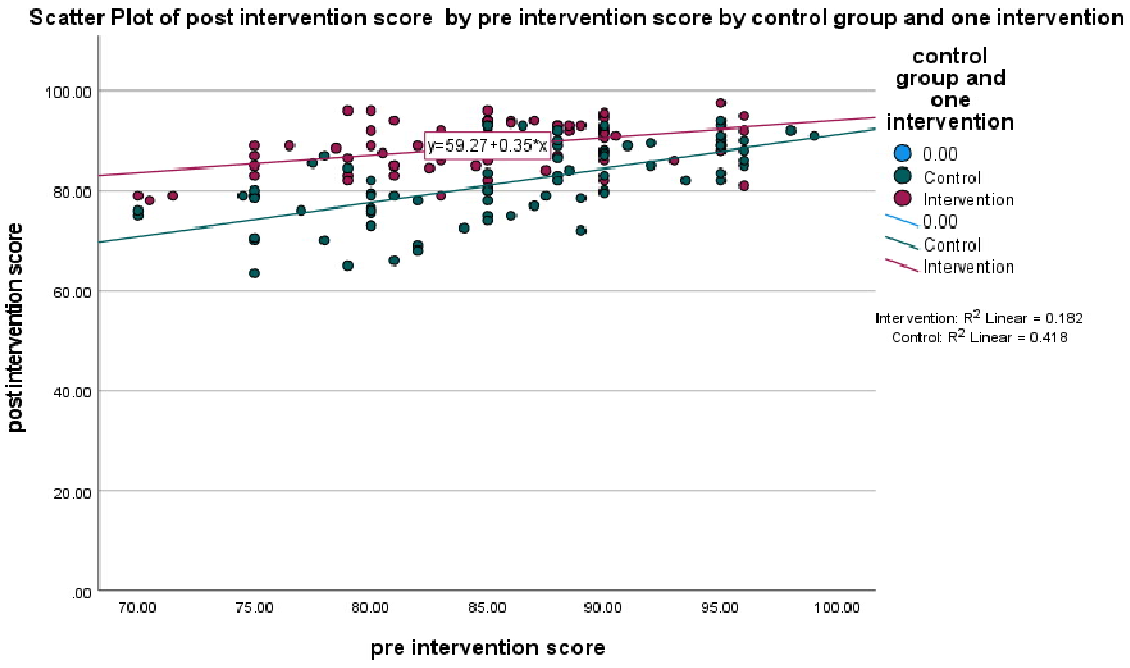

Table 4

Levene's Test of Equality of Error Variances

F	*df*1	*df*2	Sig.
3.476	1	150	.064

Note: Design: Intercept + pre + Group. Tests the null hypothesis that the error variance of the dependent variable is equal across groups. Dependent variable = postintervention score.

Even though the homogeneity of regression assumption was not met, I decided to employ the ANCOVA test because the assumption violations may have been caused by the small sample population size (N = 152) as the effects of PBL methods of instruction have not been reported with a sample of Chinese accounting students on CPA practice exam in the past literature. As shown in table 5, the results revealed a significant effect for group teaching method on test performance.

Table 5

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4104.518a	2	2052.259	72.213	<.001	.492
Intercept	1409.486	1	1409.486	49.595	<.001	.250
pre	1944.459	1	1944.459	68.419	<.001	.315
Group	2301.732	1	2301.732	80.991	<.001	.352
Error	4234.535	149	28.420			
Total	1108580.000	152				
Corrected Total	8339.053	151				

Dependent Variable: post intervention score

a. R Squared = .492 (Adjusted R Squared = .485)

The partial eta squared (η_p^2) of .352 shows a strong effect for the type of instruction on the test scores.

Summary

Two sets of tests were run to determine differences between two groups, pretreatment, and posttreatment for the PBL group, and pre-entry and exit tests for the non-PBL group. The two groups' pretest mean scores were not significantly different. An ANCOVA test was run to compare the effect of PBL interventions on the students' performances on the CPA practice exam. The mean in posttest scores, as shown in Table 2, indicate the PBL research group mean score was significantly higher than the control (non-PBL) group on their posttests, when their scores on the pretest are considered. The control group's mean score on the posttest was lower than the mean for the pretest scores. The two groups' posttest mean scores after adjustment for the pretest (covariate) were significantly different at the 0.95 level of confidence. Thus, the differences met the confidence level required to reject the null hypothesis.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study in a university setting was to determine the effectiveness of PBL by quantitatively examining the U.S. CPA practice exam scores of students who have and have not regularly engaged in PBL. I have addressed the extent of the differences in the U.S. CPA practice exam scores between the two groups of otherwise comparable students in a postsecondary institution in China. I used an ANCOVA to determine a significant effect of PBL interventions on the students' achievement on U.S. CPA practice exam. Through this analysis, I found that PBL teaching methods, as opposed to conventional lectures, can potentially improve students' individual performances in CPA practice exams.

Interpretation of Findings to the Empirical Literature

The findings of this study confirm similar findings of the various research studies discussed in Chapter 2. Researchers who have examined the effects of PBL theory have found that, when academic programs employ PBL methods extensively, students achieve better learning outcomes, and are more efficient in such professional studies as medicine and education (Peeples et al., 2017). Through the teaching methods implicit in PBL, students may become more motivated than those students who have been instructed under such traditional teaching methods as lectures. For example, Huang and Zhang (2021) indicated that by using PBL teaching methodology to create problem scenarios for students, they were able to motivate students to learn more creatively. Nychkalo et al. (2020) also concluded that students taught under the task-based assignment methods tend to be more productive in their learning performance. Saputra et al. (2019) reported that

implementing Jigsaw and PBL methods has been effective in helping students to improve their critical thinking skills. Gadad et al. (2021) likewise employed quantitative research methods to analyze the students' academic performances and have concluded that PBL tends to be more effective than conventional pedagogy as a learning methodology for engineering students.

Some theorists have recommended PBL as a promising methodology for accounting education (Bergstrom et al., 2016). Opdecam and Everaert (2019) investigated the effects of PBL versus lecture-based tutorials on final exam scores in accounting. Their data pool was considerable; over 8 years at a Belgian university, 2,756 first-year students in a financial accounting course chose between attending a lecture-based tutorial (chosen by 1,955 students) or participating in a team-based tutorial (chosen by 801 students). The final mean score was significantly higher for the team-based group, but GPAs were significantly higher for lecture-based learning. Through the present study on this subject, I have concluded that the Chinese accounting students involved in this research study also improved their performances on the U.S. CPA exam scores due to participating in the PBL pedagogical method.

In the non-PBL (control) group, students in the present study had not performed as well as they did on the pretest under the traditional teaching method. Gu et al. (2020) also concluded that the PBL experimental treatment did in fact address anxiety and other mental and emotional problems such as depression and addiction. Dzuranin et al. (2018) found that most of the faculty they polled expressed that critical-thinking skills should become a focus of instruction. In other words, students taught under the PBL method may

have shown more interest in their studies. Furthermore, students who have experienced PBL tend to validate what they learn by applying their new knowledge, a process that enables them to retain such knowledge over time (Apostolou et al., 2019).

Interpretation of Findings in Relationship to the Theoretical Framework

PBL is the theoretical foundation for my study of control and experimental groups of Chinese accounting students. As an innovative teaching strategy, PBL may be traced back to the American educational philosophy originated by John Dewey in 1916. He reacted to the lockstep learning model implicit in the mass production assembly line, since this industrial model had served as a model for 19th-century education in Great Britain and the United States. Reacting to the acquisition of strictly theoretical knowledge by rote, Dewey stated that teachers should utilize the inherent human tendency to observe and learn from their experience of the environment in their lessons. In particular, he was interested in applying knowledge in practical situations and developing practical solutions to real-world problems, preferably through collaborative activities with peers (Dewey, 1944).

Before Dewey's emphasis on the application of knowledge, formal assessment of learning in public education tended to focus on rigorous written examinations in all subjects. Contradicting this assessment methodology, Dewey (1944) proposed a practical, skills-based approach whereby students should apply their curricular learning to the kinds of problems they would encounter in societal workplaces. Rather than measuring learning by examination, Dewey proposed that students should be given problems that require the application of theoretical knowledge; the report or result had to emphasize deliverable

outcomes. Dewey's contention was that all knowledge—including text-based, mathematical, and scientific knowledge—was worthless unless students could actively use it to solve problems. Theorists have called the Dewey strategy "active learning." This form of demonstrating mastery of knowledge is more effective than conventional lecture pedagogy because it requires teachers to set real-world problems for students to solve.

Dewey's active learning model became the basis for assessment at McMaster University's medical school from 1969 onwards. Instructors adapted Dewey's precepts to adult education, specifically the training of physicians. The website of the McMaster Medical School describes the following instructional elements of PBL instructional design: small-group learning with faculty serving as facilitators; use of actual, patient-based cases; and having students work within a well-defined set of learning objectives (McMaster, 2021). PBL involves learning in context, processing information, and collaborative problem-solving; in total, these constitute cooperative learning theory (Neufeld & Barrows, 1974). In measuring the effects of PBL over conventional pedagogy, educational researchers have concluded that, if an academic program employs PBL methods extensively, students will achieve better learning outcomes. Student learning designed to be congruent with the principles of PBL will be more efficient in professional studies such as medicine and education (Peeples et al., 2017). Academic areas such as education and medicine have been using PBL as a learning strategy since 1960 at the postsecondary level, beginning with the McMaster School of Medicine in Hamilton, Ontario, Canada. Only very recently, however, have studies in the instruction of

accounting principles shown that PBL is highly effective in undergraduate accounting courses.

Limitations of the Study

The limited number of students involved in this study's control and experimental groups may have impacted the linearity relationship in the data generated. There was no plan to follow up the objective data's findings by seeking the students' and the instructors' views concerning what they may regard as the benefits of PBL methodologies, as one cannot control for such attitudes in analyzing the data. There are several other factors that will lie beyond the control of this study but that may impact test scores and data analysis results. For example, the amount of time that each student spends studying practice exam materials outside of class will likely vary, and the amount of preparation time may well affect any given student's performance on the U.S. CPA practice exam. Prior to this specific research, the instructors involved had already conducted similar teaching experiments with other accounting students, many of whom seem to have felt that such a practice is busywork rather than meaningful preparation.

Although the student-participants' study habits are not within the control of this study, such habits must be acknowledged, including how more industrious students may explore past U.S. CPA exams; should they encounter similar questions, they may have an advantage on the practice exams that is not related to the course's instructional practices. An additional challenge lies in the fact that this study's quantitative design did not generate data that measure either the caliber of the instruction or effectiveness of the instructor in his or her facilitation of instructional activities (PBL or traditional). Students

in the present study have taken the practice exam in English with some key terms translated for them into Chinese. Consequently, the practice exams' employing English accounting terminology may have affected some students' performance because of some minor language barriers. The internal validity, which is the measure of the extent to which the two tests (pre- and post-) provided a trustworthy level of rigor for the study, must be considered; the pretest and posttest scores from two groups of 152 participants from a random selection can provide a good level of confidence for this study (see Warner, 2013). However, the fact that participants were able to choose to drop out in the middle of study may have led to attrition and biased examination of the phenomena which may decrease the confidence level one may place in the data (the performance levels of the two groups on the posttest). That the instructors use similar test questions in pretest and posttest scenarios may also compromise the integrity of the study's testing, which may in turn threaten the study's external validity. As a researcher, I was not connected with the actual classroom instruction of the courses during implementation; since I have not been able to observe the actual instruction, I must rely on the integrity of faculty's reports concerning their instructional approaches.

Recommendations

I have included a discussion of the recommendations based on the study's findings. Included are recommendations for future further study on the limitations mentioned in prior chapters, as well as a brief discussion of the recommendations for possible methodological changes for future research. From the findings, I noted that the two groups of pretest mean scores were essentially the same as the students were selected

at a similar level of their academic knowledge. The two groups of posttest mean scores after adjustment for the pretest (covariate) were significantly different. Finally, the control groups mean score on the posttest was lower than the pretest. Since the present study used only 152 students from a university accounting program in China as the sample size, I recommend that future research studies in this area use a bigger sample size, ideally with over 310 students, which is at least double the size of the current sample. Among other factors is the recommendation that accounting counterparts in North America consider using PBL instructional methods as an experiment for their accounting students in their senior years before they prepare for the CPA exam. Future researchers may consider using the actual CPA exam scores as their posttest scores and using the CPA practice exam questions in the pretest. This is an area of further research to explore.

The Implications of PBL for Positive Social Change

Any methodology that increases the initial pass rate on the CPA exam is probably superior to the conventional pedagogies currently employed in many business schools to prepare accounting students for the professional exam. University students in China tend to feel that their education has prepared them for their profession and are likely to be more engaged as learners as those accounting graduate may have more opportunities to work in China for global companies with their U.S. CPA credential. Even if they have only a passing score on the CPA exam, they will tend to have more confidence in career paths as many of them choose to take on the challenge of the daunting U.S. CPA exam. Furthermore, recent Chinese graduates who have been exposed to PBL will probably have the kinds of collaborative and critical thinking skills valued in the workplace. They

are likely, therefore, to be more effective as professionals, and will better serve their clients, thereby benefiting the whole of society. The instructors will need to know that student classroom engagement in the learning process is important for students to have effective learning results and students can be more motivated through enhancing their level of engagement with the curricular material.

Conclusion

Based on the statistical analysis shown, it can be concluded that accounting students' performances on the CPA practice exam can be improved through changing the instructor's teaching methods in the regular instructional processes typically employed in schools of business, shifting from teacher- or instructor-focused instruction to instructional strategies based on PBL method.

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Appendix: U.S. CPA practice Exam Sample Questions

The sample questions are as follows:

1. Which of the following reasons more likely would make a CPA **not** to accept a new audit engagement?

   A. Management's failed to provide schedules to prior auditors on a timely basis in the past.

   B. The CPA was not able to review the predecessor auditor's working papers.

   C. Management does not plan to make all financial records available to the CPA.

   D. The CPA does not understand well enough of the business' operations and industry.

2. In the year 2021, Big Co. had an unrealized gain of $10,000 on a debt investment classified as available-for-sale. Big's corporate tax rate is 15%. What amount of the gain should be included in Big's net income and other comprehensive income at the current year end?

	Net income	Other comprehensive income
A.	$10,000	$0
B.	$7,500	$2,500
C.	$2,5000	$7,500
D.	$0	$7,500