The Effect of Computer-Based Assisted Learning on Students' Performance and Attrition in Introductory Accounting Courses

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ABSTRACT

The Accounting Education Change Commission (AECC) values and encourages pedagogical studies that would assist in attracting students through the delivery of *First Course in Accounting*. The AECC identifies *content* and *instructional methods* as the two most important areas that need attention. This study examines the effectiveness of a computer-based assisted learning (CBAL) on students' performance and attrition in the first introductory accounting course. The CBAL is a modified supplemental instruction program with an interactive lecture and computer-based IT component. In a three-year experimental study, the overall grade point average (GPA) of the CBAL students were compared to that of a matched paired control group. The two cohorts were further matched on SAT scores as *strong* and *weak*, respectively. We found that there was incremental value in terms of students' performance from CBAL. That is, the GPA of the CBAL students was significantly higher than that of the control group and the attrition rate of the CBAL students is directionally lower than that of the control group. Thus, it appears that the CBAL program is effective in enhancing and improving students' grades in the first introductory accounting course.

Keywords
Computer-Based Learning, Computer-Assisted Learning, Student Performance, Student Attrition, Introductory Accounting Course

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INTRODUCTION

Introductory accounting courses are part of the core requirements for every business college student and serve as a gateway for students planning to major in accounting. Instead of being popular core courses and motivating a significant number of students to seek careers in accounting, prior studies suggest that introductory accounting courses are generally regarded as high-risk[1] and are characterized by high failure and high withdrawal rates (Widmar 1994; Etter, Burmeister and Elder 2001). The high risk and failure rates attracted the attention of many researchers, especially the Accounting Education Change Commission (AECC), which issued the *First Course in Accounting: Position Statement No. Two* in 1992. This Position Statement charged AECC with the responsibility of improving accounting education so that accounting graduates would possess the necessary skills to succeed in business.

This study replicates Supplemental Instruction (SI) with a Computer-based Assisted Learning component we referred to as CBAL. CBAL is a coordinated and structured interactive lecture and computer-based SI model intended to (1) help students gain an understanding of the value and importance of accounting information, (2) motivate students' interest and learning and (3) increase students' performance and reduce failure and withdrawal rates in introductory accounting. CBAL is not an alternative means of in-class instruction or a replacement for in-class instruction; rather, it is a program designed to give students a blended approach of instruction and practice that was absent in the normal introductory accounting course. In this study, we examine the effectiveness of CBAL as it relates to students' performance, failure, and withdrawal rates in introductory accounting. We compare the performance, failure, and withdrawal rates of students who participated in the CBAL program to that of a matched paired control group based on mean SAT scores.

The AECC focuses its mission primarily on the first accounting course as an important building block for success in academic work for both accounting and non-accounting majors. The Commission envisioned that the first course in accounting should be an introduction to accounting rather than an introductory procedural course. The AECC identified content and instructional methods as the two most important areas that needed immediate attention.

Educators also examined the pedagogical issues in accounting and recommended that introductory accounting courses be redesigned to improve students' performance and to motivate students to become accounting majors (Arendale 1994, Albrecht and Sack 2000; Johnson, Phillips, and Chase, 2009). Therefore, educational efforts designed to assist students in successfully completing the introductory accounting courses should be of interest to both students and educators. The overall result following the application of CBAL indicated that the mean course GPA of the CBAL students is significantly higher than that of the control group in most categories.

The rest of this paper is organized as follows: section 2 reviews the relevant theory and literature. Section 3 discusses the development of the hypotheses. Section 4 describes the methodology applied. Section 5 presents the description of the results, and section 6 provides the discussion and conclusion.

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[1] High-risk courses are those courses in which the risk of failing the course is generally high, that is, 30% of the students usually receive a failing or withdrawal grade among academically weak students.

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REVIEW OF RELEVANT LITERATURE AND THEORY

Tutorial and Supplementary Instruction

There is a large body of literature that examines the effect of technology on students' learning performance. Pedagogically, such studies span a variety of science, art, and business disciplines, for example, accounting (Apostolou, Blue, and Daigle, 2010; Johnson, Phillips, and Chase, 2009; Jones and Fields, 2001), teaching English as a foreign language (Tsai and Jenks, 2009; Shang, 2007; Liu, Moore, Graham, and Lee, 2003), oral skills, reading comprehension, and vocabulary (Kim, and Gilman, 2008; Abraham, 2008; AbuSeileek, 2007; Dolan, Hall, Banerjee, Chun, and Strangman, 2005), and Endodontics Education (Al-Jewair, Qutub, Malkhassian, and Dempster, 2010). While most of these studies reported a significant positive effect of technology on learning performance (Tsai and Jenks, 2009; Johnson, Phillips, and Chase, 2009; Abraham, 2008; AbuSeileek, 2007; Jones and Fields, 2001), others were of mixed results. For example, students perceived both negative and positive aspects about computerized testing in managerial accounting, while overall perceptions tended to be more negative than positive (Apostolou, Blue, and Daigle, 2010; Shang, 2007).

Tutoring and Supplemental Instruction (SI)[2] have been used by a number of institutions to evaluate the effectiveness of the responses to the shortcomings noted by the AECC and other accounting educators. Both methods have been found to increase students' performance in the underlying course. Tutoring is an approach designed to react to students' academic difficulties (Jones and Fields 2001), and it is intended to help students pass the course by serving as a healing process, which brings "relief" to the student. However, our primary focus in this study is on SI. SI has been defined as a structured collaborative model designed to assist students in mastering course concepts and to concurrently increase their reading, reasoning, and study skills (see Jones and Fields, 2001; Etter, Burmeister, and Elder, 2001).[3] SI is a reaction to students' learning difficulty, also tagged as a healing process, that brings relief and a possible "cure" to students' learning difficulty in the course. In contrast to tutoring, the delivery of SI usually involves the participation of several instructors with several assistants for a limited duration of one year. Typically, the SI instructor evaluates the performance of the students. The instructor both administers and grades exams that he/she prepares at the end of each program.

Description of CBAL and its Application

CBAL is an integrated hybrid model of SI, tutoring, and a hands-on computer lab program in which students learn basic accounting concepts in teams at various modules. It was of-

[2] SI was initially developed in the mid 1970s at the University of Missouri, Kansas City to address high attrition rates for certain courses in the institution's 6-year medical school program (Etter, Burmeister and Elder, 2001). SI addresses high-risk courses but not necessarily students at risk. The SI program is administered in a variety of ways. Some are introduced at the beginning of the first two weeks of the semester on a trial basis before the actual program is launched, while others begin right at the start of the accounting course until the end.

[3] Additional information has been provided in the appendix for comparing tutoring to other models

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fered as a free, non-credit course in a state-of-the-art technology classroom with a capacity of 35 students, each with a computer terminal that was connected to the internet. The class met every Tuesday evening from 5:00 to 6:30 p.m. This particular day and time were carefully chosen to accommodate the participation of most students, including evening students. Students were instructed prior to enrollment that once they signed up for the program, they would commit to it until it was completed. This worked well both for students and for the study. Licensed computerized accounting software with accompanying text was specifically acquired for the CBAL program and installed in the accounting computer lab. Students taking module 1 could use the computer program to see how transactions affect financial statements. Upon recording a transaction, the affected financial statements were highlighted on the computer screen. This way, students could better understand transactions because they were able to map each one and its effects on other sections of financial statements in real time.

With short exercises and multiple-choice questions, student teams in this module could discuss accounting issues, input their solutions, witness the effects of transactions on the computer screen, and receive feedback with explanations. As students worked on a series of problems and exercises, laboratory assistants who were recruited from the National Association of Black Accountants (NABA) and from the University lab worked the room and helped answer students' questions. Early graduation from the CBAL program was offered to students based on prior pilot CBAL students who believed that they could effectively handle the introductory accounting course materials after taking the first test.

Unlike SI and tutoring models, where the learning emphases are reactive and directed towards responding to students' academic difficulty, CBAL is a proactive and preventive approach to learning. CBAL was initially designed as an intervention program for retaining minority students at a university in the Northeast who, because of low grades, have been observed to drop out of college at the end of their sophomore year. As the news of CBAL spread, it was immediately decided to open the program to all interested students enrolled in the first introductory accountancy course regardless of their ethnicity or prior academic preparedness.

The CBAL program varies from other traditional SI programs in a number of ways. CBAL is primarily a proactive, preventive approach, as it addresses students' difficulty in a course at an early stage, whereas SI programs are mainly reactive. For example, SI caters primarily to students who are at "high-risk" and in danger of failing the course (Wasik, 1998; Etter, Burmeister and Elder, 2001; Jones and Fields, 2001). Also, CBAL is designed to eliminate anxiety, stimulate interest, enhance learning, and improve students' retention, independent of the students' academic strength. Unlike SI, the delivery of CBAL involves one instructor with or without the help of professional and lab support staff.

Selection, Implementation, Attendance, and Assessment

Each CBAL session lags the classroom session by one week and thus lays emphasis on what was learned during the prior week. This allows students, who by now should have gone over class notes and completed homework for one week, to ask questions in order to improve or enhance their understanding through hands-on problem solving using the CBAL computer software.

The CBAL program is open to all students with no restriction to "weakness bias" since it is independent of students' academic strength in the underlying accounting course. However, students who anticipate some weakness in the first accounting course are particularly encouraged to attend. For SI, weak students are the initial target group, but only after an initial two-

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week open trial basis. CBAL is applied at the beginning of the course when course registrations are completed. Attendance in CBAL is strictly voluntary. Students may leave only when they are comfortable enough to handle the underlying introductory course material by themselves; otherwise, they are encouraged to stay. In contrast, the SI program is applied in two stages: the first two weeks are a trial, followed by voluntary attendance of the actual SI program. Student participation in SI could be either voluntary or mandatory. If voluntary, students may leave at any time during the program (Jones and Fields, 2001).

The evaluations of students in CBAL are done externally, independent of the instructor of the program, usually through a common final exam prepared by non-CBAL instructors. In SI, the instructor performs the evaluations of students.

Computer-Based Interactive Learning in CBAL

The CBAL is unique in that it uses a combination of interactive lecture, hands-on computer-based exercises and learning sessions to help students learn basic accounting concepts.[4] SI is not usually computer-based (Wasik, 1998; Etter, Burmeister and Elder, 2001; Jones and Fields, 2001). In CBAL, students were placed in a dyad group, each with a computer terminal equipped with the accounting software used for the CBAL program. Students worked in dyad groups throughout the entire program. Dyad groups were organized as follows: While some students maintained the same group for two or three successive sessions, students were usually assigned new group members each session. Students were encouraged to interact voluntarily with new group members at every session while professionals walked from one group to another.

Each student had hands-on and one-on-one help solving problems and exercises using the accounting software selected for the program. With computers, students had immediate feedback to assess their own preparedness and knowledge of the material being learned. The use of computers also facilitated continuous online testing using multiple choice and problem solving questions involving debits and credits, T-accounts, adjusting entries, closing entries, general ledger, and finally, preparation of financial statements.

Use of professionals as Lab Assistants During CBAL

Computer-Based Assisted Learning uses professionals in accounting practice as role models and lab assistants. While working on the computer-based software, lab assistants recruited from NABA and the accounting lab from the participating University helped answer students' questions. The use of professionals as lab assistants seemed to give students confidence that their questions would be answered correctly. By taking advantage of these resources, students who might not go to office hours for fear of wasting the professor's time or students who are stigmatized by peers for asking too basic questions during class would now be more comfortable learning the course material.

Theory Development

The concept of providing additional tutorials or out-of class instructions to assist students in mastering course content is not new. Studies by Etter, et al. (2001), and Jones and

[4] In the current study, the CBAL program is operationalized as those who participated 9CBAL) compared to the matched paired group.

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Fields (2001) have examined the effects of implementing SI on students' performance in accounting. They report that SI has been effective in improving students' performance and in reducing attrition rate. Specifically, Etter, et al. (2001) examined nine years of data for 132 courses involving 9,053 students in 21 four-year colleges and universities in the US, out of which 2,425 participated in SI. The results show that SI students' course average was C+ compared to C for non-SI students, indicating that the program was effective in improving student's grades. The results also indicate a significant drop in the withdrawal rate compared to the non-SI group.

Jones and Fields (2001) further examined the effectiveness of SI when it was made voluntary versus mandatory. The results were consistent with those of the Etter, et al (2001) study. Specifically, Jones and Fields' (2001) SI results from 1,359 students in nine sessions of Principles of Accounting indicate that SI was effective at increasing academic performance. Further, the results show that participation in both voluntary and mandatory SI sessions was found to be positively associated with the total points earned in the course. It was also observed that the level of SI attendance might have played a role in the benefits obtained in the increased performance for both voluntary and mandatory attendance phases of the study.

We anticipate that the practices of CBAL should offer greater learning for students. This is consistent with Gick and Holyoak (1980), who suggest that students learn best when the instructor makes explicit relations among cues. Relating one cue to another apparently enables learners to retrieve and recall what was learned more effectively. Building on the cognitive theories of learning, Gernsbacher (1997) suggests that the building block of learning is the ability of the learner to *comprehend* information. Comprehension involves building a coherent mental representation or structures in memory for things learned. When additional new information is received, the new information is then mapped onto the existing mental structures.

Gernsbacher argues that when new information coheres with existing mental representation, the information is more easily comprehended by the learner than when the new information does not cohere with or has little relation to what was mentally represented. This implies that information that coheres with information in memory is likely to further enhance the encoding of new information more easily as well as make its availability for recall, recognition, or retrieval more likely. Consequently, learners are more likely to retrieve information that was successfully or strongly represented in memory than information that was not strongly represented. Dorchy, Segers, and Buehl (1999) further elaborated upon the mental structure theory by suggesting that the learner participates in the learning process by integrating new information that coheres with the learner's prior knowledge and experiences.

Using a situational model viewpoint, Zwaan and Radvansky (1998) suggest that people do use situation models when comprehending information. According to a situational model, what is stored in memory includes a set of instructions for mentally representing a situation encompassing those things that may be special about the situation. In an example involving restaurant script, Zwaan and Radvansky (1998) note that a restaurant script might be easier to comprehend if the trip to the restaurant is to a specific location on a specific day.

These theories are relevant to our study in that the CBAL students would have developed mental structure for the accounting concepts being introduced in their introductory accounting course before attending the CBAL program in two specific ways: (1) the students had one week of introductory accounting course material before attending the CBAL program, and (2) the material being reviewed in the CBAL program lagged the accounting concepts covered in the respective introductory accounting classes by one week as well. Thus, the CBAL students

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had ample opportunity to build mental structures for accounting concepts before receiving the CBAL program information.

As suggested by Gernsbacher (1997), Zwaan and Radvansky (1998), and Dorchy, Segers, and Buehl (1999), each weekly CBAL review session information coheres with the accounting concepts that the students would have developed a mental structure for from their respective introductory accounting classes a week before. As a result, the CBAL students are more likely to comprehend the introduction to accounting concepts being presented at the CBAL than students not participating in the CBAL program. This process was also helpful as CBAL sessions started with what students had already covered in the prior week. The session then transitioned into new materials that would be covered in their respective classes during that week. This gave CBAL students the confidence to proactively be familiar with and prepared to face the materials in class.

HYPOTHESIS DEVELOPMENT

In addition to the mental structure theories, students are believed to perform more effectively by doing and by receiving regular feedback (Etter et al., 2001; Jones and Fields, 2001). In the CBAL sessions, students learned by doing. They entered transactions on their own using the CBAL software. Upon recording a transaction, the students would immediately see the outcome of the transaction in real time and how the outcome is distributed to the various parts of the income statement and the balance sheet. This feedback allowed students to better understand the transaction. The feedback is expected to give the students the ability to map each transaction and its outcome to the affected sections of the financial statements, again in real time.

Consequently, the CBAL students' overall GPA performance in the introductory accounting course is expected to be higher relative to the control students who did not participate in the CBAL program. Again, this is because the CBAL students are expected to have had a much richer mental structure to map the incoming coherent information than the control group.

Students also receive feedback with explanations upon entering their solutions to multiple-choice questions. For example, correct answers were rewarded by a smiling face object and an incorrect entry by a sad face object, with the option to try again for a chance to be correct or to look up the explanations as to why their selected solution was incorrect. If these computer-based tools and explanations were insufficient or inadequate, students could beckon to the lab assistants for help. The lab assistants would then explain to the students why the suggested solution was the correct answer. These practices are expected to enhance the CBAL students' understanding of the accounting concepts better than the control group.

Further, Merrill et al. (1992) and Holman (2000) argue that students perform better when they are placed in an active learning setting in addition to the normal lecture style and traditional classroom setting. According to this notion, certain types of learning situations might be particularly more effective in improving students' performance because they provide students with the appropriate feedback that enables them to assess whether their understanding of why a solution to a problem is correct or not. CBAL is an active learning environment. Students had control of a computer terminal into which they could work at their own pace or at a group's pace. As noted earlier, students had the option of discussing their solutions with a group member before individually entering the solution into the computer. In addition, they had access to lab assistants who worked the room throughout the session.

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In summary, we anticipate that CBAL students are more likely to comprehend and learn the accounting principles and concepts and to gain more knowledge about accounting principles and perform better in exams than students who did not participate in the CBAL.

Profile of Participants

Students participating in the CBAL program, particularly those with weak scholastic aptitude, are likely to have lower mean SAT scores than those who did not participate. We divided our sample into weak and strong cohorts utilizing median SAT scores for all participants. Those with lower mean SAT scores than the median SAT score are referred to as weak students and those with higher mean SAT scores than the median are referred to as strong students.

The CBAL program was originally aimed at students who anticipated difficulties in successfully completing the first introductory accounting course because they perceived themselves to be "weaker." However, other students who participated in the CBAL program, but who were not necessarily weaker, may have done so because they anticipated themselves being weaker in accounting courses, were self-motivated, or just wanted to take advantage of any available educational program to enhance the grade they would receive in the course. Students who participated in the CBAL program are referred to as CBAL students. Students in the same course sections of the introductory accounting course with the tutorial-assisted students, who did not participate in the tutorial, are referred to as NoCBAL students. We limit our sample to these two groups of students in this study to control for the effect of instructor and delivery style. It is anticipated that weaker CBAL students will have lower mean SAT scores than NoCBAL (students who did not participate in CBAL) and strong CBAL students. Our main hypothesis, therefore, is that the overall mean course GPA (CosGPA) of CBAL students will be significantly higher than that of the control group. Based on these expectations we test the following hypothesis:

H1: Overall mean SAT scores of CBAL students will be lower than NoCBAL students.

To test H1, we performed tests of interaction effects examining the comparison between the mean SAT scores of *weak* CBAL students and *weak* NoCBAL students**;** *strong* CBAL students and *strong* NoCBAL students**;** *weak* CBAL students and *strong* CBAL students; and *weak* NoCBAL students with *strong* NoCBAL students.

Effect of CBAL on Course Grade

One measure of performance in prior studies of supplemental instruction or tutoring is the overall grade the students received in the introductory accounting course (Jones and Fields 2001; Etter, et al. 2001; Geiger and Ogilby 2000). Another measure of performance is the attrition rate, where attrition is defined as failure rate and withdrawal rate (Jones and Fields 2001; Etter, et al. 2001; and Geiger and Ogilby 2000). CBAL involves helping students work through problems on a one-on-one basis using the computer-based interactive accounting software. The instructor and the program assistants are therefore able to provide immediate feedback and assistance to students as needed.

Further, unlike in a regular classroom where most students had limited time to have their questions and concerns addressed by the instructor, the CBAL program provides an environment and atmosphere especially for weak students to ask the instructor and program assistants

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any questions without being looked down upon by their peers. Therefore, weak CBAL students are likely to understand and learn the accounting principles and concepts during the CBAL sessions better than their NoCBAL counterparts. If weaker CBAL students gained more knowledge and understanding from the CBAL program, it is anticipated that they will receive equal or higher CosGPA than NoCBAL students. That is, we expect an incremental learning value from weak students who took advantage of the CBAL program compared to those that did not. This incremental learning is likely to occur among CBAL students because their course GPA would improve accordingly. Therefore, their performance after the CBAL program in the course would be equal to (at the minimum) or higher compared with NoCBAL students. Note that the NoCBAL students were those who felt there was no need for them to participate in the program because the course was not seen as a high risk. That is, the performance of CBAL students would ordinarily be lower without the CBAL program compared with NoCBAL students. Based on these expectations, we hypothesize H2 as follows:

H2: Mean overall CosGPA of the CBAL, per each student category of "weak student" or "strong student" will be higher than that of the NoCBAL counterparts.

To test H2, we performed tests of interaction effects examining the comparison between the mean CosGPA of weak CBAL students and weak NoCBAL students; the mean CosGPA of strong CBAL students and strong NoCBAL students; the mean CosGPA of weak CBAL students and both strong CBAL and strong NoCBAL students; and the mean CosGPA of weak NoCBAL students with strong NoCBAL students.

Students' Performance in the Second Course without CBAL

According to the Accounting Education Change Commission (AECC), Position Statement No. 2, the first accounting course should serve as a catalyst for enhancing future learning in the second introductory and upper-level accounting courses. Because students participating in the CBAL program did so while completing the first introductory accounting course, it is likely that the knowledge gained from the CBAL program would help them to successfully complete the second introductory accounting course equally as well as the NoCBAL students.[5] This arises because during the CBAL program, students received one-on-one assistance in the first introductory accounting course. We anticipate that the course grade of weak CBAL students in the second introductory course will be similar to that of their weak NoCBAL counterparts, even though the weak CBAL students had significantly lower mean SAT scores than the NoCBAL and received no CBAL program during the second course. This discussion leads to the following hypothesis:

H3: Mean overall SecGPA of the CBAL, per each student category of "weak student" or "strong student" will be higher than that of the NoCBAL counterparts.

[5] The content of the first and second introductory accounting courses are somewhat different. While the first course focuses on financial accounting, the second focuses on managerial and cost accounting systems.

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To test H3, we also performed tests of interaction effects examining the comparison between the mean SecGPA of weak CBAL students and weak NoCBAL students**;** the mean SecGPA of weak CBAL students and that of CBAL and strong NoCBAL students; and the mean SecGPA of strong CBAL students and that of strong NoCBAL students**.**

The Effect of CBAL on Attrition

Another measure of performance examined in Jones and Fields (2001), Etter, et al. (2001), and Geiger and Ogilby (2000) is the attrition rate, where attrition is defined as failure rate and withdrawal rate. Since the structure of CBAL provides a conducive and nurturing environment for learning, it should help students to persist and successfully complete the course. Consistent with Etter, et al. (2001), the attrition rate for the CBAL student cohort is expected to be lower than the NoCBAL students, leading to the following hypothesis:

H4: The attrition rate of CBAL students will be lower than the attrition rate for NoCBAL students.

METHODOLOGY

CBAL was conducted in the Accounting Center for Electronic Learning and Business Measurement (ACELAB) at a business university in the Northeastern part of the U.S. Student participation in the tutorial was voluntary. At the beginning of each semester during the three-year study, the CBAL program coordinator sent an announcement (see Appendix B) to the coordinator of the introductory accounting courses.

The coordinator then distributed the announcement to the instructors teaching these courses and encouraged them to announce this free tutorial opportunity in their respective classes. A copy of the announcement was also posted on the "AllSections" course website. The announcement introduced CBAL as a free non-credit opportunity that would assist students with an understanding of the various accounting concepts and their practical applications in decision-making. The announcement further indicated that CBAL should help students gain an understanding of various financial transactions from a non-specialist point of view and could serve as an aid to studying, reviewing, and understanding the materials in the introductory accounting course. The CBAL program lasted 90 minutes and met once a week for twelve weeks. This information was also communicated to the students in the announcement. Interested students enrolled in the program by sending an email to the CBAL coordinator or by attending the CBAL during the first day of class. On that first day of the CBAL, the instructor announced to the class that CBAL's objective was to help enhance their knowledge of accounting, not to serve as a forum for doing homework.

Each CBAL session was conducted with the following four objectives: (1) to provide an overview of key areas that should have been covered during their respective normal class delivery in the preceding week, (2) to provide students with the opportunity to ask questions to be discussed together with the full participation of CBAL students, (3) to place students in a dyad group to have hands-on and one-on-one problem solving exercises and problems using the accounting tutorial software that accompanied the textbook used for the CBAL program, and (4)

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to provide students the opportunity to assess and provide feedback on how effective the CBAL session met their individual needs in understanding the accounting concepts they had learned.

With the permission of the author of the textbook, the CBAL software was installed on the 35 ACELAB computers. As students worked on series of computer-based multiple-choice problems and exercises, laboratory assistants recruited from the National Association of Black Accountants (NABA) and the ACELAB helped answer students' questions.

Computer-Based Assisted Learning students were given the opportunity to graduate from the CBAL program if they scored a passing grade of 80 percent or better on their first test in the introductory accounting course taken after the sixth or the seventh week into the semester. Early graduation from the CBAL program was offered because students in a pilot tutorial class believed that they could effectively handle the introductory accounting course materials after taking the first test. In short, the CBAL program had sufficiently prepared them. Normally, the average score of the first test for all sections ranges from 65% to 70% depending on the year. About 20-25% of the student cohort graduated after the first test in their introductory accounting course.

There were two main reasons why we did not test the effectiveness of those students who graduated early. First, we assumed that there would be no effect of CBAL on students who graduated early because of the staggered nature of the graduation. Some students attended only one session, while others two or more. We felt that since not all students graduated early at the same time, it would be difficult to assess the effectiveness of CBAL on this group. Secondly, it was difficult to tell if those who graduated early ought to have been classified as NoCBAL students in the first place but chose to take the test for early graduation just to reaffirm their confidence in the course.

A total of 79 students participated in the CBAL program for the three-year duration of the study, but only 74 fully completed the program. Four students were unable to continue with the program because they withdrew from the introductory accounting course, and one student audited the course and did not receive a letter grade.

Dependent Variable

There are two main dependent variables of interest in this study. The first dependent variable is student performance as measured by two factors: (1) the first introductory accounting course GPA (CosGPA) and (2) the second introductory accounting course GPA (SecGPA). These factors measure the difference in the mean overall or specific GPA for those who participated in the tutorial and those who did not. The second dependent variable of interest is the academic profile of students who participated in the study and those who did not as measured by their overall mean SAT scores (math and verbal combined). As noted earlier, the CBAL was open to every student who was interested in it. Therefore, it was important to differentiate between those "weak" students for whom the program was originally intended and "strong" students who simply wanted to take advantage of any available educational opportunity.

Data Items and Analysis

We requested that the institutional research office at the participating institution provide data for participants' SAT math and verbal scores, grades received on the first introductory (CosGPA) and the second introductory (SecGPA) accounting courses, and attrition rate, that is, failure and withdrawal rates (CBALATR). We analyzed the data using the ANCOVA analysis and the chi-squared statistical test where applicable. For most of the analyses reported, the com-

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bined data for CBAL and NoCBAL weak and strong students were analyzed first, followed by separate analyses for CBAL and NoCBAL weak students and CBAL strong students.

RESULTS

Prior to presenting the hypotheses tests, we provide descriptive data for the CBAL and NoCBAL students' mean SAT scores, first introductory course GPA (CosGPA), and second introductory course (SecGPA) in Table 1 and attrition rate (CBALATR) in Table 3.

Descriptive Statistics

Table 1, panel A presents the descriptive statistics for the overall mean SAT scores for both weak and strong CBAL and NoCBAL students. The overall mean SAT scores for NoCBAL students is 1090.45, while the combined mean SAT scores for CBAL students is 1053.91. The mean SAT scores for weak NoCBAL and weak CBAL students are 1003.26 and 960.24, respectively. The mean SAT scores for the strong NoCBAL and strong CBAL students are 1185.14 and 1199.63, respectively.

Table 1, panel B presents the descriptive statistics of the overall mean course GPA (CosGPA) and for both NoCBAL and weak CBAL and strong students on a 4.0 scale. The overall mean CosGPA for NoCBAL and CBAL students are 2.54 and 2.79 respectively. The mean CosGPA scores for weak NoCBAL and weak CBAL students are 2.60 and 2.75 respectively. The mean CosGPA scores for the strong NoCBAL and strong CBAL students are 2.60 and 2.83 respectively.

Similarly, Table 1, panel C presents the descriptive statistics for the overall mean second introductory accounting course GPA (SecGPA) and for both NoCBAL and weak CBAL and strong students. The overall mean scores of SecGPA for NoCBAL and CBAL students are 2.67 and 2.54 respectively. The mean SecGPA for NoCBAL and weak CBAL students are 2.56 and 2.35 respectively. The mean SecGPA for NoCBAL and strong CBAL students are 2.78 and 2.73 respectively. Finally, Table 3 presents the overall attrition rate (CBALATR) for CBAL students. The mean attrition rate for CBAL is 6.33%, which is a little lower than the 8.85% for the NoCBAL student.

H1 predicts that the SAT profile of CBAL students would be lower than that of NoCBAL students. That is, we expect the mean SAT score for the combined CBAL students to be lower than the mean SAT score of NoCBAL students. When CBAL students are segregated into weak and strong groups, the mean SAT score of weak CBAL students is also expected to be significantly lower than that of weak NoCBAL students. However, the mean SAT score of strong CBAL students is not expected to be higher than that of strong NoCBAL students. Our expectations are based on the premise that most CBAL students opted to take the CBAL program because they perceived themselves to be weaker in the introductory accounting course.

To test H1, the overall mean SAT score for the CBAL student group was compared to that of the NoCBAL student group using ANOVA with the SAT as the dependent variable and Participation (CBAL vs. NoCBAL) and Profile (Weak vs. Strong) as the independent variables. The ANOVA results presented in Table 2, Panel A show that the main effect of Participation (CBAL versus NoCBAL) was not significant ($F = 2.49$; $p < 0.1149$). The main effect of Profile, however, was significant ($F = 542.32$, $p < 0.0001$). There was an interaction effect of Participation and Profile ($F = 10.11$, $p < 0.0015$), suggesting that differences in the mean SAT scores for

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TABLE 1: Descriptive Statistics

Panel A. Descriptive Statistics for Participants (CBAL) and Non Participants (NoCBAL) Mean SAT Scores

	OVERALL	WEAK	STRONG
CBAL	N = 69 1053.91 (150.67)*	N = 42 960.24 (98.98)	N = 27 1199.63 (87.73)
NOCBAL	N = 1189 1090.45 (114.61)	N = 619 1003.26 (67.60)	N = 570 1185.14 (72.18)

Panel B. Descriptive Statistics for Participants (CBAL) and Non Participants (NoCBAL) Course GPA (CosGPA)

CBAL	N = 69 Mean 2.79 (.095)	N = 42 Mean 2.75 (.125)	N = 27 Mean 2.83 (.151)
NOCBAL	N = 1189 Mean 2.54 (.022)	N = 619 Mean 2.60 (.040)	N = 570 Mean 2.60 (.043)

Panel C. Descriptive Statistics for Participants (CBAL) and Non Participants (NoCBAL) Second Course GPA (SecGPA)

CBAL	N = 64 Mean 2.54 (.078)	N = 40 Mean 2.35 (.094)	N = 24 Mean 2.73 (.123)
CBAL	N = 1031 Mean 2.67 (.019)	N = 521 Mean 2.56 (.027)	N = 510 Mean 2.78 (.027)

* Numbers in brackets represent standard deviation

CBAL and NoCBAL students depends upon whether the student profile was either weak or strong. An observation of the means for the Participation variable indicates that CBAL and NoCBAL mean SAT scores are 1053.91 and 1090.45 respectively. Since there was no main effect of participation, H1 was not supported. Overall, the mean SAT scores of CBAL and NoCBAL students appear to be not significantly different in the two groups without taking into account the profiles of the two groups.

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TABLE 2: Results of Analysis of Variance

Source	Df	SS	MS	F	P-Value
Panel A: ANOVA Results for Mean SAT Scores					
Participation	1	12680.56	12680.56	2.49	0.1149
Profile	1	2763578.205	2763578.205	542.32	0.0001
Participation x Profile	1	51512.015	51512.015	10.11	0.0015
Error	1254	6390240.76	5095.890		

Panel B: Result of simple effects tests for participation holding student profile constant	**t – Value**	**P-Value**
Mean SAT Scores		
Weak CBAL vs. Weak NoCBAL	3.780	0.0009
Strong CBAL vs. Strong NoCBAL	1.031	0.7315
Weak CBAL vs. Strong CBAL	19.705	0.0001
Strong NoCBAL vs. Weak NoCBAL	13.560	0.0001

Panel C: ANCOVA Results for Course GPA (CosGPA)					
Participation	1	2.278	2.278	3.87	0.0493
Profile	1	0.091	0.091	0.15	0.6339
SAT	1	43.492	43.492	73.96	0.0001
Participation x Profile	1	0.139	0.139	0.24	0.6270
Error	1253	736.874	0.588		

Panel D: Result t-tests for effect of Participation on Weak versus Strong Student Cohorts.	**t – Value**	**P-Value**
Course GPA (CosGPA)		
Weak CBAL vs. Weak NoCBAL	1.1711	0.6452
Strong CBAL vs. Strong NoCBAL	1.5807	0.3900
Weak CBAL vs. Strong CBAL	0.4599	0.9677
Strong NoCBAL vs. Weak NoCBAL	1.0380	0.7271

Panel E: ANCOVA Results for Second Course (SecGPA)					
Participation	1	0.968	0.968	2.71	0.0998
Profile	1	5.034	5.034	14.11	0.0002
GPA	1	212.426	212.426	595.51	0.0001
Participation x Profile	1	0.337	0.337	0.95	0.3310
Error	1090	388.817	0.357		

Panel F: Result t-tests for the effect of Participation on Weak versus Strong Student Cohorts in the	**t – Value**	**P-Value**
Second Course GPA (SecGPA)		
Weak CBAL vs. Weak NoCBAL	2.124	0.1460
Strong CBAL vs. Strong NoCBAL	0.4287	0.9736
Weak CBAL vs. Strong CBAL	2.4484	0.0689
Weak CBAL vs. Strong NoCBAL	4.4042	0.0001

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Considering the interaction effects, we explore the scholastic profile of the students and effects on participation. We examined to see if the mean SAT score for weak CBAL students would be lower than that of weak NoCBAL students. This was tested by analyzing the Participation by Profile interaction effect, holding Profile constant and looking at the simple effect of participation. The result shows that the mean SAT score of the NoCBAL student group is significantly higher than that of the weak CBAL student group ($t = 3.780$, $p < 0.0009$). The mean SAT score for weak NoCBAL students is 1003.26, compared to 960.24 for the weak CBAL students. This shows that weak students who participated in the CBAL program are scholastically weaker than their weak NoCBAL counterparts. Using similar methods, we analyzed the mean SAT scores of strong CBAL and those of strong NoCBAL students. The result shows that the mean SAT score of the strong CBAL student cohorts is not significantly different from that of the NoCBAL group ($t = 1.031$, $p > 0.7315$).

The mean SAT score for strong CBAL students is 1199.63 and 1185.14 for the strong NoCBAL students. These means show that strong students who participated in the CBAL program are scholastically similar to their strong NoCBAL counterparts. Finally, we examined the mean SAT scores of weak CBAL students and strong CBAL students, and the mean SAT scores of weak NoCBAL and strong students. Results of these interaction effects ($t = 19.705$, $p < 0.0001$) and ($t = 13.560$, $p < 0.0001$) are consistent with our finding of H1. We anticipated in H1 that the overall mean SAT score of CBAL students would be lower than NoCBAL students. The results turned out to be statistically significant ($p < 0.0001$) at both weak and strong levels.

Students' Course GPA in the First Introductory Course

Hypothesis 2 predicts no significant difference in the overall course GPA of CBAL and NoCBAL students. However, our interaction effect predicts a higher course GPA for weak CBAL students than for weak NoCBAL students. We also predict no difference in the course GPA of strong CBAL and strong NoCBAL students, no difference between the course GPA of weak CBAL students and that of strong CBAL or strong NoCBAL students, and a lower course GPA for weak NoCBAL students than strong NoCBAL students. An analysis of covariance (ANCOVA) was used to test these hypotheses, with SAT as the covariate. The test of equality slopes shows no significant interaction effect between the covariate and participation ($F = 1.91$; $p < 0.9097$) or profile ($F = .48$, $p > 0.4900$). That is, for H2, we compared the overall mean course GPA of CBAL students and NoCBAL students using ANOVA. The main effect of Participation was significant ($F = 3.87$; $p < 0.0493$), suggesting that the CBAL program is effective in enhancing students' overall GPA. Results of the interaction effects (course GPA of CBAL and NoCBAL weak students), suggests that the mean course GPA for CBAL students is 2.75. This is directionally higher than 2.60, the mean GPA of NoCBAL weak students, although it is not statistically significant ($t = 1.1711$; $p > 0.6452$).

Results comparing the mean course GPA of strong CBAL students to that of NoCBAL strong students show that the mean course GPA for strong CBAL students is 2.83 compared to 2.60 for the strong NoCBAL students and the difference is not significant ($t = 1.5807$; $p < 0.3900$). This suggests that strong CBAL students also benefited from the CBAL program. However, when the course GPA of weak CBAL students is compared to that of strong CBAL students and strong NoCBAL students, the mean course GPA of weak CBAL students is 2.75 and that of strong CBAL students is 2.83; the difference is not significant ($t = 0.4599$; $p < 0.9677$). Likewise, the mean course GPA of strong NoCBAL students is 2.60, which is less than the 2.75 mean course GPA of the weak CBAL students. However, this is not significant ($t =$

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1.0380; p > .0.7271). These results also show that the CBAL program was effective. For example, the mean CosGPA of the weak CBAL students is 2.75—directionally higher than that of weak NoCBAL students and strong NoCBAL students, even though the weak CBAL students have lower mean SAT scores and are considered to be scholastically weaker than weak NoCBAL and strong CBAL students.

Finally, we compared the mean course GPA of weak NoCBAL and strong NoCBAL students. The mean course GPA of weak and strong NoCBAL students is identical at 2.60, suggesting no performance difference in the two groups who did not participate in the CBAL program. Therefore, the preceding analyses indicate clear differences in the profiles of students who participated in the CBAL program from those who did not.

Performance of Students in the Second Course without CBAL

In H3, we further analyzed the performance of the CBAL students in the second introductory course, where no CBAL program was offered, to see the lasting effect of the CBAL program. If CBAL was effective in helping students successfully complete the first introductory course, students should retain enough knowledge to allow them to also obtain an average course grade that is similar to that of the NoCBAL students in the second introductory accounting course, even though no CBAL program was provided in the second introductory course. Based on this notion, we hypothesized in H3 that the mean overall GPA (SecGPA) for CBAL and NoCBAL cohorts in the second introductory course would not be significantly different from one another.

H3 was tested by using ANCOVA analysis with Participation and Profile as the independent variable and mean CosGPA from the first course as the covariate. The test of equality of slopes shows no significant interaction between CosGPA and Participation (F = 2.83; p > 0.0926), between CosGPA and Profile (F= 0.42; p >0.5195), and between CosGPA, Participation, and Profile (F= 0.16; P > 0.6889). The results allowed us to run ANCOVA without the interaction terms involving the covariate. The overall ANCOVA model for SecGPA was significant (F= 199.94; p < 0.0001). The main effect of Participation was not significant (F= 2.71; p < 0.0998). The overall mean GPA in the second introductory course (SecGPA) for CBAL students was 2.54 compared to 2.67 for the NoCBAL group, showing support for H3.

When interaction effects are considered, we predict that CBAL weak students' SecGPA would not be significantly different from that of weak NoCBAL students. We tested this by comparing the mean SecGPA for weak CBAL students and weak NoCBAL students. The results show a significant main effect for profile (F= 14.11; p < 0.0002). However, there was no significant interaction effect between participation and profile (F= 0.95; p < 0.3310). This result suggests that in general, students who participated in CBAL during the first course are no different in their SecGPA from those who did not participate in the CBAL program based on their scholastic profile. Using t-tests we ran individual analyses comparing weak CBAL students and strong CBAL students. The results show that the mean SecGPA for weak CBAL students (2.35) is not significantly different from 2.56, the mean SecGPA for weak NoCBAL students (t = 2.1241; p < 0.1460). This result strengthens our support for H3.

Further interaction effect predicts that the mean SecGPA for weak CBAL students would not be different from that of strong CBAL and strong NoCBAL students. These were tested by comparing the means of weak CBAL and strong CBAL students and weak CBAL and strong NoCBAL students using the t-test. The results show that the mean SecGPA of strong CBAL students (2.73) is higher than that of weak CBAL students (2.35) with a marginally sig-

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nificant difference (t = 2.4484; p < 0.0689). The mean SecGPA of strong NoCBAL students (2.78) is significantly higher (t = 4.4042; p < 0.0001) than that of weak CBAL students (2.35). This, however, did not support H3. Finally, we predict that the SecGPA of strong CBAL students will be equal to or higher than that of strong NoCBAL students. This was tested by comparing the means of CBAL and NoCBAL strong students. The result shows that mean SecGPA of the two groups are not statistically different (t = 0.4287; p > 0.9736). That is, H3 is further supported.

The Effect of CBAL on Attrition

The degree to which CBAL can reduce the attrition rate for the first introductory course is investigated in H4. The expectation is that at the margin, there will be no significant difference in the attrition rate between CBAL students and NoCBAL students or that the attrition rate would be smaller for the CBAL students. The analysis was conducted by constructing a 2x2 factor model of Participation (CBAL and NoCBAL) and Attrition (passing or failure/ withdrawal). The Chi-Square test of independence was employed as the statistical test of interest. As shown in Table 3, panel A, the analysis of the results failed to reveal a significant difference between the attrition rates in the two groups, the Chi-Square test was not significant (P > .5305). The attrition rate for the CBAL student group is 6.33 percent compared to 8.85 percent for the NoCBAL student group. The CBAL group has a slightly higher passing rate (93.67%) than the NoCBAL group (91.15%). These results generally support H4, that the attrition rates are not significantly different although the direction clearly shows that the attrition rate for the CBAL students is smaller than that of the NoCBAL students.

TABLE 3: Descriptive Statistics and Chi-Square Test of Attrition Between CBAL and NoCBAL Students

Panel A: Descriptive Statistics for Attrition Rate between CBAL and NoCBAL Students

	SecGPA	CBAL ATR	PASSR
CBAL (Overall)	N = 70 2.55 (0.87)	N = 5 6.33%	N = 74 93.67%
NoCBAL (Overall)	N = 1161 2.68 (0.79)	N = 115 8.85%	N = 1183 91.15%

Panel B. Result of Chi-Square Analysis of Attrition Rate Between CBAL and NoCBAL Students

Status	df	X^2	P
CBAL versus NoCBAL	1	0.393	0.5305

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DISCUSSION AND CONCLUSION

The objective of this study was to ascertain the effectiveness of CBAL on students' performance in the first introductory financial accounting course. The results suggest that CBAL program has been positively effective in enhancing students' performance in the course. In particular, students who participated in the CBAL program successfully completed the introductory accounting course with a higher overall mean grade than their NoCBAL counterparts (2.79 versus 2.54). While the overall groups of CBAL and NoCBAL were further classified into their weak and strong cohorts, the results show that both weak CBAL and strong CBAL students gained from the CBAL program. The results also show that the knowledge gained from the CBAL program helped students to successfully complete their second introductory accounting course. The study also extended the effect of CBAL to the second sequence of the introductory accounting (management accounting) course where CBAL was not offered. The results indicate that there was no statistical significant difference between the overall mean SecGPA of CBAL and NoCBAL students. The overall mean SecGPA was 2.54 for CBAL students compared to 2.67 for the NoCBAL students. The results did not show any significant difference. This means that CBAL students in general were able to retain sufficient knowledge gained in the CBAL program to be comparable with their NoCBAL counterparts.

These results are encouraging because they demonstrate that CBAL is effective in enhancing students' performance in the introductory accounting course. Note, however, that the SAT scores of students who participated in the CBAL program, especially weak CBAL students, were significantly lower prior to participation than the NoCBAL counterparts. However, at the end of the CBAL program, weak CBAL students outperformed all the other groups, including the strong NoCBAL students, with a higher course GPA. Additionally, there was no statistical difference in the withdrawal and failure rates among students in both the CBAL and NoCBAL students. These results support our hypotheses that the CBAL program could be effective in enhancing students' overall performance in introductory accounting courses.

LIMITATIONS

The external validity of this study as to its applicability to different institutions could be in question. For example, the study used participants from only one business institution in the Northeastern part of the U.S. This could be a limitation for two reasons. First, the fact that it is a business institution, one would think that students were mentally prepared to handle accounting courses compared to non-business schools. Secondly, there may be geographical differences from taking the same course in another institution in the South or Western part of the country. For these two reasons, it is therefore not wise to generalize on our findings.

Another intuitive limitation to this study is the manner in which students were recruited. Students who enrolled in the study were not screened with respect to their actual motives. Some students may have attended the CBAL simply to test their knowledge of accounting principles. Because the CBAL program was open to all students, it departed from its original purpose, helping minority students, and therefore, no demographic analysis was conducted. This aspect could be included and applied in future studies to control for minority and gender differences. Self-selection bias could also be a limitation of our study. Students were encouraged to volun-

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tarily interact with new group members at every session. We are not sure if this had any effect on the results, compared to instructor-assigned groups or the formation of permanent group members for the entire program.

SUGGESTION FOR FUTURE RESEARCH

Research in supplemental instructions is a relatively recent phenomenon in accounting education. As a result, opportunities exist for further empirical investigation employing various methods. One area for further investigation is the comparison of the CBAL and SI models across business and non-business colleges. Another interesting area of investigation could be to examine how technology interfaces with traditional SI models and CBAL. Gender differences as well as intended course majors could be informative areas to investigate further. Since the participants in this study are from a private business university, it may be useful to apply CBAL to other Colleges and Universities to control for private vs. public academic concentrations. A follow-up study may also be worthwhile to see if CBAL students were motivated to the extent that they enrolled in upper (intermediate) accounting courses and eventually electing to graduate with accounting majors.

REFERENCES

Abraham, L. B. 2008. Computer-mediated glosses in second language reading Comprehension and vocabulary learning: A meta-analysis. *Computer Assisted Language Learning*. 21 (3): 199 – 226. Also at: http://www.tandfonline.com/toc/ncal20/21/3

AbuSeileek, A.F. 2007. Cooperative vs. Individual Learting of Oral Skills in a CALL Envrinment, Computer Assisted Laanguage Learning, 20(5): 493-514. Also at: http:// www.tandfonline.com/toc/ncal20/20/5

Accounting Education Change Commission (AECC). 1992. The First Course in Accounting: Position Statement No. Two. *Issues in Accounting Education. (Fall): 249-251.*

Accounting Education Change Commission (AECC). 1996. *Positions and Issues Statements of the Accounting Education Change Commission*. Sarasota, FL: American Accounting Association.

Albrecht, W.S. and R.J. Sack. 2000. Accounting Education: Charting the Course Through a Perilous Future. *Accounting Education Series*, Volume No. 16. A Joint Project of: AAA, AICPA, IMA, Arthur Andersen, Deloitte & Touché, Ernst & Young, KPMG, and PricewaterhouseCoopers.

Al-Jewair, T. S., A. F. Qutub, G. Malkhassian, and L. J. Dempster. 2010. A Systematic Review of Computer-Assisted Learning in Endodontics Education. *Journal of Dental Education.* 74(6): 601-611.

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American Institute of Certified Public Accountants (AICPA). 1999.

Apostolou, B., M. A. Blue, and R. J. Daigle. 2010. Student Perceptions about Computerized Testing in Introductory Managerial Accounting. *Journal of Accounting Education*. 27 (2): 59-70.

Arendale, D. 1994. Understanding the Supplemental Instruction Model. *New Directions for Teaching and Learning*, (60): 11-21.

Baldwin, B.A. and R.W. Ingram. 1991. Rethinking the Objectives and Content of Elementary Accounting. *Journal of Accounting Education*, 9(1), 1-14.

Bonner, S.E. and P.L. Walker. 1994. The Effects of Instruction and Experience on the Acquisition of Auditing Knowledge. *The Accounting Review*, 69 (1): 157-178.

Dochy, F., M.Segers and M.M. Buehl. 1999. The Relations Between Assessment Practices and Outcomes of Studies: The Case of the Research on Prior Knowledge. *Review of Educational Research*. (69): 145-186.

Dolan, R. P., T. E. Hall, M. Banerjee, E. Chun, and N. Strangman. 2005. Applying Principles of Universal Design to Test Delivery: The Effect of Computer-based Read-aloud on Test Performance of High School Students With Learning Disabilities. The Journal of Technology, Learning, and Assessment. 3(7): Available from http://www.jtla.org.

Doran, M.B., M.L. Bouillon and C.G. Smith. 1991. Determinants of Student Performance in Accounting Principles I and II. *Issues in Accounting Education*, (Spring): 74-84. Eskew, R.K. and R.H. Faley. 1988. Some Determinants of Student Performance in the First College-Level Financial Accounting Course. *The Accounting Review*, (January) 137-147.

Etter , E.R., S.L. Burmeister and R.J. Elder. 2001. Improving Student Performance and Retention Via Supplemental Instruction. *Journal of Accounting Education*, (18): 355-368.

Geiger, M. A., & Ogilby, S. M. 2000. The First Course in Accounting: Students' Perceptions and their Effect on the Decision to Major in Accounting. *Journal of Accounting Education*, (18): 63-78.

Gernsbacher, M.A. 1997. Two Decades of Structure Building. *Discourse Processes.* (23): 265-304

Gick, M.L. and K.J. Holyoak. 1980. Analogical Problem Solving. *Cognitive Psychology* (12): 306-355.

Holman, L. 2000. A Comparison of Computer-Assisted Instruction and Classroom Bibliographic Instruction. *Reference & User Services Quarterly*, (Fall): 53-60.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-06-20 via free access

Jones, J.P. and K.T. Fields. 2001. The Role of Supplemental Instruction in the First Accounting Course. *Issues in Accounting Education*, (November): 531- 547.

Johnson, B. G., F. Phillips, and L. G. Chase. 2009. An Intelligent Tutoring System for the Accounting Cycle: Enhancing Textbook Homework with Artificial Intelligence. *Journal of Accounting Education*. 27(1): 30-39.

Kim, D. and D. A. Gilman. 2008. Effects of Text, Audio, and Graphic Aids in Multimedia Instruction for Vocabulary Learning. *Educational Technology & Society, 11* (3), 114-126.

Liu, M., Z. Moore, L. Graham and S. Lee. 2003. A Look at the Research on Computer-Based Technology Use in Second Language Learning: A Review of the Literature from 1990 – 2000. *Journal of Research on Technology in Education*, 34(3): 250 – 273.

Martin, D. and D. Arindel. 1994. Understanding the SI Model. In D. Martin and D. Arindel. Supplemental Instruction: Improving First-Year Student Success in High Risk Courses (3-10). Columbia SC: National Research Center for the Freshman Year Experience and Students in Transition.

Merrill, D.C., B.J. Reiser, M. Ranney, and J.G. Trafton. 1992. Effective Tutoring Techniques: A Comparison of Human Tutors and Intelligent Tutoring Systems. *The Journal of the Learning Sciences* 2 (3): 277-305.

Renkl, A., H. Gruber and H. Mandl. 1998. Learning from Worked-out Examples: The Effects of Example Variability and Elicited Self-Explanations. *Contemporary Educational Psychology* (23): 90-108.

Shang, H. 2007. An Exploratory Study of E-mail Application on FL Writing Performance. *Computer Assisted Language Learning.* 20(1): 79 – 96.

Tsai, R. & Jenks, M. (2009). Teacher-Guided Interactive Multimedia for Teaching English in an EFL Context. *Journal of Educational Multimedia and Hypermedia, 18*(1): 91-111.

VanLehn, K. 1996. Cognitive Skill Acquisition. *Annual Review of Psychology*, (47): 513-530

Wasik, B.A. 1998. Volunteer Tutoring Programs in Reading: A Review. *Reading Research Quarterly* (33): 266-292.

Widmar, G. 1994. Supplemental Instruction: From Small Beginnings to National Program. *New Directions for Teaching and Learning*, (60): 3-10.

Williams, D.Z. 1991. The Challenge of Change in Accounting Education. *Issues in Accounting Education*, Spring, 6(1): 126-133.

Wooten, T.C. 1998. Factors Influencing Student Learning in Introductory Accounting Classes: A Comparison of Traditional and Nontraditional Students. *Issues in Accounting Education*. (May): 357-378.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-06-20 via free access

Zwaan, R. A. and G. A. Radvansky, 1998. Situation Models in Language Comporehnsion and Memory. Psychological Bulletin. 123(2): 162-185.

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APPENDIX A: A Comparison of Tutorial, Supplement Instruction, and Computer-Based Assisted Learning

Characteristics	Tutorial	Supplemental Instruction (SI)	Computer-based assisted learning (CBAL)
Orientation	(i) Coordinated class, lesson or instruction with one or more instructors to one or more students. (ii) Attendance is varied - voluntary and at times mandatory. (iii) Not computer-based. (Wasik, 1998; Jones and Fields, 2001; and Etter, Burmeister and Elder, 2001).	(i) Structured collaborative model by one instructor, but with support staff to a class or group of students. (ii) Attendance is varied - voluntary and at times mandatory. (iii) Not computer-based. (Jones and Fields, 2001; Etter, Burmeister and Elder, 2001).	(i) Coordinated and structured model conducted by one instructor with or without the help of support staff. (ii) Attendance is voluntary. (iii) Computer-based. (iv) Integrating concepts, applications and hands-on problem solving.
Objective	(i) **Reactive:** As a reaction to students' academic difficulty. (ii) To help and assist students survive in passing the course. (iii) A healing process, which brings some "**relief**."	(i) **Reactive & Proactive:** A reaction to students' academic difficulty. (ii) To help and assist students survive in passing the course. (iii) A healing process, which brings "**relief**" and possible "**cure**."	(i) **Proactive:** To help students gain an understanding and the importance or value of accounting information. (ii) To motivate their interest and enhance their learning. Passing the course becomes a byproduct. (iii) A prevention approach, which brings "**confidence**."
Motivation	Designed for students who are at "high-risk" and in danger of failing the course. (Wasik, 1998; Jones and Fields, 2001; and Etter, Burmeister and Elder, 2001).	Designed for students who are at "high-risk" and in danger of failing the course. (Jones and Fields, 2001; Etter, Burmeister and Elder, 2001).	Designed to eliminate anxiety, stimulate interest, enhance learning and to improve retention.
Timing and duration of Program	(i) Applied after "high risk" students have been identified. It starts at anytime during the course of the program. (ii) Students come and go at anytime.	(i) Applied in two stages: First two weeks on a trial basis followed by a voluntary attendance of the actual SI program. (ii) Students may leave at anytime during the program. Jones and Fields, 2001).	(i) CBAL is applied at the beginning of the course when course registrations are completed. (ii) Students may leave only when they are comfortable to handle it by themselves, otherwise encouraged to stay.
Selection Criteria	**Default:** Weak students as the default.	**Default:** Weak students, but after an initial two-week open trial basis.	**Default:** Open to all with no student weakness bias. However, students who anticipate some weakness in the course are particularly encouraged to attend.
Assessment	Evaluations of students are done by the same instructor (s).	The same instructor does the evaluations of students.	Evaluations of students are done externally, independent of the instructor.
Institutional Source	Conducted at the same or different schools. Business and non-business.	Conducted at the same or different schools. Business and non-business.	Conducted at the same business school.

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APPENDIX B: Recent Announcement of the CBAL Program: Tutorial Program in CB201 — Invitation to Participate

You are invited to participate in a FREE tutorial program for GB201 this Fall semester. Based on our experience, we believe that many students are afraid of taking accounting related courses; therefore we are implementing the tutorial program for a limited number of students who are taking GB201 in this Spring semester. We believe that by participating in the tutorial, you will increase your chances of successfully completing GB201. The tutorial will be taught by Dr. "One of the Authors."

This tutorial is a non-credit program that will meet once a week on **Tuesdays** from 5:00PM to 6:30PM in JEN 305. The purpose of the tutorial is to provide students, taking GB201 with the elementary understanding of the main accounting concepts and their practical application in decision-making. The tutorial explores the accounting procedures used to gather, record, and convert transactions into useful information and their practical application in decision-making. This lab-oriented tutorial uses software to examine and explain how accounting information (financial statements) is generated and applied in decision-making. That is, students will be able to understand accounting transactions in a non-technical way.

Importance of Tutorial to Students
Students in GB201 who enroll in the tutorial will gain an understanding of the effects of various transactions on the financial statements from a non-specialist point of view. The tutorial will serve as an aid to studying, reviewing, and understanding the accounting course materials presented in your current GB 201 introductory accounting course.

Design
The tutorial is a hands-on lab program in which students learn basic accounting concepts in teams. For example, students taking module 1 of the tutorial will see how transactions affect the financial statements right away. Upon recording a transaction, the affected financial statements will be highlighted on the same computer screen to show the effects of the transaction. This way, students can better understand the transactions because they will be able to map each transaction and the result of that transaction to affected sections of the financial statements in real time. With short exercises and multiple choice questions, student teams in this tutorial can discuss the accounting issues, input their solutions, witness the effects of the transactions on the computer screen, and receive feedback with explanations. The tutorial will meet in JEN 305 and teaching assistants will be available to answer questions and tutor those who may need one-on-one tutoring.

How to participate
To participate, please send email to "one of the authors" or call 781-891-2353. You may also give your name to your GB 201 instructor. Spaces are limited and students are enrolled in the tutorial program on a first come, first served basis. More information will be provided later to those who enrolled in the tutorial.

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