Student Use of General Ledger Software: Performance, Effort, And Attitudinal Differences

Jeannie M. Folk, (E-mail: folkje@cdnet.cod.edu), College Of DuPage

Abstract

This study addresses the effects of using general ledger software (GLS) to complete selected end-of-chapter problems in the first course of a three-course Principles of Accounting sequence. When GLS is used to complete such problems, much of the computational and summative effort of the accounting cycle is performed by the computer rather than the student. The performance, time spent completing the assignments, and attitudes of 46 students who used GLS (the GLS students) to complete four assigned problems were compared to those of 24 students who completed the same problems manually (the manual students). The GLS students performed as well as the manual students on multiple-choice questions covering basic accounting cycle concepts. Notably, the GLS students expended significantly less effort, measured by self-reported completion times, than the manual students. In terms of attitude, the GLS students agreed more strongly than the manual students that the problems were interesting and enjoyable, and disagreed more strongly that completion of the problems was a difficult task. Although not statistically significant at the .05 level, the GLS students also agreed somewhat more strongly that the task increased their desire to be an accounting major. These results indicate that the choice is relatively simple. A learning methodology that includes GLS use is at least as effective as one that requires only manual completion of assigned problems. As such, because that learning methodology is also the much more efficient of the two, students in introductory financial accounting courses should use GLS to complete selected end-of-chapter problems.

Introduction

One of the departmental goals of the Accounting Program at the College of DuPage is to “increase the number of learning opportunities utilizing state-of-the-art methodologies and alternative methods of delivery, yet not lessen the value or importance of the

use of traditional methods.” We are currently using the fourth edition of *Principles of Accounting* by Weygandt, Kieso and Kell in our three-course Principles of Accounting sequence. When this textbook was selected, the members of the selection committee agreed that students should be exposed to one of the technology supplements that support the textbook. The committee decided on the General Ledger Software

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(GLS) package, a software supplement that can be used by students to complete selected end-of-chapter problems. John Wiley & Sons, Inc., the textbook publisher, agreed to package the GLS with the textbook at a very reasonable cost to students.

Research supports the committee's decision. Pincus (1995) notes that the American Accounting Association (AAA) recommended that accounting education move away from its emphasis on record-keeping functions in its 1986 report entitled, "Future Accounting Education: Preparing for the Expanding Profession." The Accounting Education Change Commission was formed in 1989 by the largest CPA firms and the AAA to provide leadership in changing accounting education to ensure responsiveness to the needs of students and employers. The AECC has made numerous recommendations, including a recommendation that the latest technology be integrated into the accounting curriculum. Wyer (1993) notes that changes in technology, among other factors, have increased the difficulty of the work performed by accountants. Williams (1993) notes that accountants make use of general ledger software packages in the workplace. Interestingly, Eskew and Faley (1988) did not include the use of technology in their list of determinants when they developed a model to explain student examination performance in the first college-level financial accounting course. However, their decision to exclude (or overlook) the effects of the use of technology on student performance might have been due to the fact that technology was being used sparingly in accounting education at that time.

Numerous sections of Principles of Accounting I, the first course in the Principles of Accounting sequence, are taught by both full and part-time faculty members at College of DuPage, a large community college west of Chicago, with approximately 35,000 students. Unexpectedly, only two full-time and one part-time accounting faculty members required student use of GLS in Principles of Accounting I during the year that

the textbook described above was adopted. A number of factors may have caused this lack of widespread use. Two possible reasons are discussed below.

During the first quarter of the adoption of this textbook, faculty members requiring use of the GLS package reported that their students were experiencing a variety of problems with the software. Many of these problems appeared to be caused by the wording of the instructions of the end-of-chapter problems. The instructions assume and, thus, are geared towards manual completion of the problems. As a result, the instructions set forth in the textbook did not always provide clear guidance when students attempted to use the GLS package to complete the problems. For example, the steps that must be performed to complete a given problem often must to be performed in a different order (other than that set forth in the end-of-chapter textbook materials) when the GLS package is used to complete the problem. The publisher did supply a GLS user's guide to students. However, the instructions set forth in the user's guide were general in nature. Step-by-step instructions for the individual problems that could be completed with the software were not available to students. Many students were frustrated by their inability to adapt the manual instructions to a computerized environment. In response, an Instructional Design project was undertaken at the College of DuPage during Summer 1997 that included the development of materials designed to support the use of the GLS package for eighteen of the end-of-chapter problems. These support materials included step-by-step instruction manuals for students and software-specific solutions manuals for instructors. The support materials were provided to faculty members prior to the fall 1997 quarter, the first quarter of the year subsequent to the year of adoption of the textbook. During the 1997-98 school year, a few faculty members continued to require student use of the GLS for assigned problems; others awarded extra credit to students using the package to complete selected end-of-chapter problems. These support

materials minimized the problems reported by students and instructors. However, use of the GLS by accounting faculty members was still lower than expected.

Generally, the end-of-chapter problems that were selected for this research study required the students to perform most, if not all, of the steps described below. These steps are commonly referred to as the steps comprising the accounting cycle: analyze and prepare entries for each transaction described in the problem, record the transactions entries in a journal, post the journal entries to the general ledger, prepare an unadjusted adjusted trial balance, prepare and record adjusting entries in a journal, prepare an adjusted trial balance, prepare financial statements (balance sheet, income statement and statement of owner's equity), prepare, record and post closing entries, and prepare a post-closing trial balance.

Because the steps in the accounting cycle are introduced in order throughout chapters 1 through 4 in the textbook, end-of-chapter problems in chapter 2 do not contemplate completion of steps 5, 6, 8 and 9, and those in chapter 3 do not contemplate completion of steps 8 and 9.

Certain steps are performed by the computer rather than by the student when a GLS package is used. Reding, Cummings and Hopkins (1992) noted that the use of software to complete an accounting problem shifts much of the computational effort from the student to the computer (as is the case in a business setting when the computational effort is shifted from the accountant to the computer).

When the student manually completes an end-of-chapter problem, the student must perform all of the required steps. When the student uses GLS to complete the end-of-chapter problem, the student completes steps 1 and 2, and simply commands the computer to perform the procedures required in steps 3 through 9. Steps 3 through 9 are computational and summative in

nature (i.e., transactions are sorted by type and then totaled, and various reports that summarize the information are generated).

As a result of the shift in computational and summative efforts from the student to the computer, some accounting faculty members expressed concerns about the effects of GLS use on student performance (or learning). Others countered that the "cost," if any, that arises from the use of this software is more than offset by the important "benefits" which accrue with its use. As discussed further below, this "cost" refers to the decrease in student learning that might result when students use the GLS to complete selected end-of-chapter problems in lieu of solving those problems manually. Some faculty members even questioned whether student performance would actually decrease when the GLS is used. One of the "benefits" expected would relate to the decrease in the time spent (or effort expended) by students to complete the end-of-chapter problems when students use the GLS. In addition, some faculty members expected a general improvement in attitude when students use the GLS. This Innovation Incubator project was undertaken to address these issues. As such, the effects of GLS use on student performance (or learning), time spent (or effort expended), and attitudinal differences are addressed below.

Review of Related Research

A variety of articles, books and World Wide Web sites address the changes that are taking place in accounting education and the performance benefits that arise when accounting students use technology. With the exception of one, all of the studies reviewed were quantitative in nature.

AECM, "Accounting Educators Using Computers and Multimedia, is an Internet-based group that "provides a forum for discussions of all hardware and software which can be useful in any way for accounting educators at the college/university level." AECM has over 600

members in 31 countries. During May 1997, an overview of the plans for this research study was provided to the members of AECM. AECM members were asked to comment on related experiences or studies. Five respondents indicated that they use GLS in their first-year accounting courses; six others indicated that they do not. None of the respondents indicated that they had researched the benefits of student use of GLS.

Some of the research articles cited below mention Computerized Practice Sets (CPS). Although computational and summative efforts are also shifted from the students to the computer when CPS are used, CPS differ somewhat from end-of-chapter problems that can be completed using GLS packages. In a general sense, students can use GLS to complete independent end-of-chapter problems. Each problem can be graded, and the student can consider the feedback provided before the next problem is attempted. The end-of-chapter problems assigned for GLS use would typically include many, if not all, of the accounting cycle steps described above. A CPS is typically made up of a single, integrated case. In some situations, the entire case is completed by the student and then graded by the instructor. In other situations, a CPS may be separated into individual assignments that are graded and returned to the students. However, the first assignment would generally only incorporate steps 1 through 4 above, the second steps 5 through 7, and the third steps 8 and 9.

Reding, Cummings and Hopkins (1992) studied the benefits of using a computerized practice set (CPS) in the first financial accounting course at Northern Illinois University. Achievement, assignment completion times and attitudes of students using a CPS were compared to the achievement, assignment completion times and attitudes of students completing the same practice set manually. They administered a written pretest before the problems were assigned to establish a baseline of the students' prior accounting knowledge. A different written posttest was administered upon completion of the as-

signment. These researchers separated their achievement measures (i.e., they developed three separate hypotheses). They reviewed differences in posttest scores on questions relating to accounting tasks that are not shifted to the computer, on those relating to accounting tasks shifted to the computer and on questions pertaining to computerized accounting systems. The students using the CPS scored lower on questions pertaining to accounting tasks shifted to the computer, but scored higher on those pertaining to computerized accounting systems. As a result, the researchers concluded that there is a pedagogical tradeoff. However, they also found that students using the CPS took significantly less time to complete the practice set.

Krause and Taylor (1988) qualitatively addressed the benefits of using microcomputers in the accounting curriculum at a small liberal arts college. They concluded that microcomputer integration in general was a successful supplement.

Abraham, Loughrey and Whalen (1987) examined the benefits of using a computer assisted accounting simulation (CAAS) in the second financial accounting course. (The CAAS described in this study is essentially the same as the CPS described above.) The performance, effort and attitude of students using a CAAS were compared to the performance, effort and attitude of students who did not. They noted that Edmonds (1984) used these same three criteria. Abraham, Loughrey and Whalen (1987) found that performance (measured by final exam grades) and effort did not vary significantly between the two groups of students. However, they concluded that the use of the CAAS resulted in a positive change in attitude in accounting and suggested that it might help reduce attrition rates. Their experimental group was required to complete the CAAS; however, the control group was not required to complete the same assignment manually. It is interesting to note that the requirement that students in the experimental group complete an additional assignment (i.e.,

the CAAS) did not result in improved performance.

Borthick and Clark (1987) surveyed learning theories and concepts relevant to research relating to the use of computers in accounting education. They discuss five criteria that can be measured. In addition to performance, attitude and time spent, they also described relevance to accounting practice and resource use.

Alkafaji and Schroeder (1986) performed a study similar to that of Reding, Cummings and Hopkins, but their subjects were Intermediate Accounting students. They developed an objective, thirty-four question multiple choice test to measure differences in performance for use as a pretest and posttest. These researchers expected the students using the CPS to score lower on the posttest than those completing the practice set manually. On the other hand, they expected that the students using the CPS would react more favorably to the assignment and spend less time completing the assignment. The posttest was administered after the assignment was completed. Although both groups showed significant improvement in scores on the posttest, the use of the CPS, in itself, did not significantly effect test performance and had little effect on attitudes. However, they did note that the students using the CPS spent significantly less time than the students completing the practice set manually.

Borthick and Clark (1987) note that a common weakness in selected studies relating to the use of computers by accounting students is the lack of control and/or failure to estimate the time spent by control and experimental groups of students. In some studies, students using computers actually spent more time than those who did not (e.g., when computerized tutorials are used as an experimental treatment). They note that the results attributed to the treatment may have been caused instead of, or at least in part by, the time differential. As such, they sug-

gested that the time expended should be controlled or at least monitored.

Hypotheses

The potential benefits of student use of GLS were categorized using Edmonds' (1984) three criteria of performance, effort and attitude. The performance, time spent (i.e., effort expended) and attitudes of students in the control group are compared to those of the experimental group in this study.

The primary objective of this research study was to assess the differences in student performance (or learning) that arise when GLS is used in Principles of Accounting I to complete selected end-of-chapter problems. As discussed above, when GLS is used to complete an end-of-chapter problem, certain steps in the accounting cycle (i.e., the computational and summative efforts required by steps 3 through 9) are performed by the computer rather than by the student. That is, the student using GLS is only required to command the computer to execute these steps. Reding, Cummings and Hopkins (1992) referred to these steps as "SHIFT" tasks. These researchers referred to Kolb's (1984) description of the learning cycle in their study. In this regard, they described their expectation that "the active completion of SHIFT tasks by manual students contributed more to their understanding of the related accounting concepts than did computer students' passive review of automatically produced computer output." In this study, "computer" students completed a CPS, and "manual" students completed the same practice set manually.

On the other hand, the expectation in this study was that the performance of students using GLS would be at least as high as that of students who did not use GLS. This expectation was based on the researcher's informal observations about students enrolled in sections of Principles of Accounting I that were taught by this researcher during the 1996-97 and 1995-96

school years. Students enrolled in this researcher's sections of Principles of Accounting I during the 1996-97 school year were required to use the GLS with the new textbook that was adopted. GLS was not used in connection with the textbook that was used during the 1995-96 school year. In general, students enrolled in the 1996-97 sections appeared to perform as well as students enrolled in the 1995-96 sections. However, formal conclusions could not be drawn from these observations. Too many other variables existed (e.g., most importantly, the use of different textbooks by different authors). However, the expectation described above formed a basis for this study. The performance of students using GLS was expected to be at least as high as that of students who did not use GLS.

Differences in student performance were measured as described below. The null hypothesis tested to determine if a performance benefit accrued to students using GLS is the following:

H₁ - No significant differences exist in the performance measure of students using general ledger software versus those who do not.

A secondary objective of this research study was to assess the differences in time spent (or effort expended) that arise when GLS is used in Principles of Accounting I to complete selected end-of-chapter problems. Because time is a valuable and limited resource, Reding, Cummings and Hopkins (1992) noted that the time required to complete assignments is of pedagogical interest. They reasoned that "if two learning methodologies are equally effective, the most efficient of the two is generally preferred."

Students using the GLS would need to become familiar with the software in order to complete the first end-of-chapter problem. Based on informal observations made during the 1996-97 school year, the year of adoption, this "start-up" time appeared to be substantial in amount. On the other hand, a significant decrease in the

amount of this start-up time was expected as a result of the subsequent development and planned use of the instruction manual for students described above during the 1997-98 school year. Further, as discussed above, the computer performs the computational and summative steps required by the end-of-chapter problems. When combined, these factors could result in substantial timesaving.

As a result, an overall expectation developed that students using the GLS would spend less total time completing the assigned end-of-chapter problems than the students completing the problems manually. Differences in the total time spent to complete the problems assigned were measured as described below. The null hypothesis tested to determine if a timesaving benefit accrues to students using the GLS is the following:

H₂ - No significant differences exist in the total amount of time spent completing the selected problems by students using general ledger software versus those who do not.

Another objective of this research study was to assess the differences in student attitude that arise when GLS is used in Principles of Accounting I to complete selected end-of-chapter problems. Too often, based on his own experiences in the accounting classroom, the typical student might describe an accountant as someone who: pushes a pencil to record debits and credits, uses a calculator to ensure that columns of numbers are in balance, looks for and corrects errors, and summarizes the numbers for inclusion in accounting reports.

As discussed above, professional groups, such as the Accounting Education Change Commission and the American Accounting Association, support the integration of technology into the accounting classroom and a movement away from the emphasis on recordkeeping functions. Accountants are challenged by the use of technology in the workplace. Educators should ex-

pose accounting students to similar "real world" experiences. Students will benefit as they form more realistic images of the work of the accountant. The profession will benefit, as more students are intrigued, rather than turned off, by this career choice.

The related expectations in this study were that accounting students would prefer software use to manual completion of assigned problems, find the experience more enjoyable as a result, and, accordingly, be more open to accounting as a potential career choice. Such attitudinal differences were measured as described below. The null hypothesis tested to determine if an attitude benefit accrues to students using the GLS is the following:

H₃ - No significant differences exist in the attitudes of students using general ledger software versus those who do not.

Methodology

Control and Experimental Groups

The control group was comprised of one intact section of the Principles of Accounting I course taught by the researcher, an experienced instructor, during the winter 1998 quarter. The experimental group was comprised of two intact sections of the Principles of Accounting I course taught by this same instructor during the winter 1998 quarter. Both groups met for fifty minutes daily Monday through Thursday. The control group met at 10:00. The two experimental sections met at 9:00 and 12:00.

It was not possible to randomly assign students to the control and experimental groups.

However, students did not know which sections would be using the GLS package when registering for the course, and they were not allowed to switch between sections. The 10:00 sections was designated as the control group and the 9:00 and 12:00 sections as the experimental group before registration listings were provided to the instructor. Participation in the study was not voluntary.

Students withdrawing from class were withdrawn from the study, and students not completing all aspects of the study (i.e., those who did not complete all four of the assigned end-of-chapter problems and those who did not take the posttest) were dropped from the study.

The control group was comprised of 24 students having an average age of 21.3 and average grade point average of 2.7. The experimental group was comprised of 46 students having an average age of 21.2 and average grade point average of 2.9. Majors were self-reported by the two groups of students as summarized in table 1.

Borthick and Clark (1984) noted that motivation and attitude toward learning are non-cognitive, or affective, aspects of learning. They also noted that a student's degree of computer anxiety might be one aspect of attitude that affects learning. These two groups of students reported similar levels of experience with personal computers. The various levels of experience with personal computers can be summarized as follows. The response "none" was reported by 8.3% of the control group and 6.5% of the experimental group, "some" by 75.0% of the control group and 78.3% of the experimental group, and "extensive" by 16.7% of the control group and 15.2% by the experimental group.

Table 1

Major	Control Group		Experimental Group		Average	
Accounting	2	8.3%	4	8.7%	6	8.6%
Other	16	66.7%	32	69.6%	48	68.6%
Undecided	6	25.0%	10	21.7%	16	22.8%
Total	24	100%	46	100%	70	100%

Pretest

A written pretest was administered during the first week of the quarter to compare the prior accounting knowledge of the two groups of students. The pretest was comprised of twenty-five multiple-choice questions chosen from the first six chapters of the testbank accompanying the course textbook. A summary of the content of these twenty-five questions is provided below. The results of the pretest were not provided to the students. The pretest was not reviewed with the students.

Each question was worth one point. The control group correctly answered an average of 11.2 questions. The experimental group correctly answered an average of 10.8 questions. This difference in mean scores was not statistically significant at the .05 level.

Experimental and Control Tasks

The task performed by all students participating in this study was divided into four assignments. Each assignment was comprised of an end-of-chapter textbook problem (i.e., problems 2-5, 3-5, 4-5A and the chapter 6 mini-case). (Refer to the *Introduction* for a discussion of the accounting cycle steps inherent in each problem.) The task was completed over a five-week period beginning during the third week of the quarter. The experimental group used the GLS package to complete the four assigned problems. The instructor did *not* introduce or overview the GLS in class. However, the Student Instruction Manual provided to each student contained a set of instructions for each of the four problems. These instructions were essentially the same as those provided in the textbook, with the exception that the instructions were specifically revised to reflect GLS use.

Students in the control group were informed that they would not be using the GLS package in this course. On the other hand, students in the experimental group were informed

that they would be required to use the GLS package in this course. The GLS package (Windows version 2.0) was installed on the network in the Academic and Computing (ACC) lab on campus. That same version of the GLS package was shrink-wrapped with all new copies of the textbook. Students purchasing used textbooks could separately purchase a GLS package, if they desired. As such, all students in the experimental group were allowed to choose between using the GLS in the ACC lab on campus or installing and using the software on some other personal computer. All experimental group students had access to the same User's Guide prepared by the publisher for the GLS package. Accordingly, the researcher chose not to control this variable.

It should be noted that a "Checklist of Key Figures" that includes check-figures for the textbook problems is generally available to all students using the textbook. As such, this checklist was provided to all students in the experimental and control groups during the first week of the quarter. This checklist included check figures for the four problems assigned. (The trial balance amount was provided for problem 2-5. The trial balance amount, adjusted trial balance amount, and net loss, ending capital and total asset figures were provided for problem 3-5. The trial balance amount, adjusted trial balance amount, and net income and total asset figures were provided for problem 4-5A. The trial balance amount, and net income and total asset figures were provided for the chapter 6 mini-case.)

Twenty course points were allocated to the first three problems, and forty course points were allocated to the last problem. Each problem was graded and returned to the students well before the due date of the next problem. These 100 course points were awarded to motivate the students to complete the problems, and amounted to one-sixth of the points used to determine course grades.

Student names are recorded in their data files when the GLS data diskettes are initialized (whether the student uses a networked computer on campus or another personal computer). The student's name appears on all printouts generated by the GLS. Based on discussions with development personnel at John Wiley & Sons, Inc., publisher of the textbook and the GLS package, and on personal experience, the student name cannot be changed after initialization nor can any of the data files be copied from one diskette to another. As such, it would not be any easier for students using the GLS to use another student's work than it is for students not using the GLS to complete the assigned problems.

As noted above, certain required steps are performed by the computer, rather than by the student, when GLS is used to complete the problem. As such, to ensure that the number of points awarded to students in the control and experimental groups was as fair as possible, approximately 80% of the points awarded for each problem related to the correct analysis of the transactions (i.e., the accuracy of the entries that were journalized). The remaining points were awarded simply for completion of the other required steps. For example, each student received points for posting all of the transactions from the journal to the ledger. Points were not deducted for any errors that were made in the posting process by students in the control group. However, such errors were noted on the assignment.

Each student self-reported the time spent completing each assignment at the time the assignment was submitted. However, all students were informed that the time spent would have no effect on their grades.

Posttest

A written posttest was administered during the eighth week of the quarter. Students were allowed fifty minutes to complete the posttest. The first part of the posttest was comprised of the same twenty-five multiple-choice ques-

tions that were included in the pretest; the second part of the posttest included fifteen additional questions chosen from the first six chapters of the testbank accompanying the course textbook.

Both tests were designed to measure student understanding of concepts relating to the accounting cycles of service companies and merchandisers as set forth in the first six chapters of the textbook. A summary of the content of these forty questions is provided below.

A survey similar in form and substance to the questionnaire used by Reding, Cummings and Hopkins (1992) was distributed after the posttest was returned to the students. This survey focused on student attitudes and is set forth below.

Results

Student Performance

H₁ - No significant differences exist in the performance measure of students using general ledger software versus those who do not.

The total mean score of 88.9 on the four assigned problems completed by the experimental group was significantly higher than the total mean score of the control group of 80.0. This difference is significant at the .05 level. As discussed above, all students in the study were provided check figures for each of the problems assigned. As such, all students had the opportunity to complete the assignments, refer to the check figures provided, and attempt to identify and correct any errors made. As a result, high mean scores were not unexpected. As such, these mean scores were not considered to be a dependable measure of student performance.

The overall "presentation" of each of the assignments submitted was not considered in the grading criteria. However, the assignments submitted by students in the experimental group

were more professional in appearance (e.g., stapled, properly labeled, etc.) In general, based on comments made by students and the condition of the assignments submitted, the researcher observed that students in the experimental group appeared to take more pride in their assignments. The experimental group students also seemed to be more motivated to identify and correct errors in order to arrive at the check figure that had been provided. It is possible that the students' perceptions of the assignments themselves may have affected their scores.

It should be noted that the prior accounting knowledge of the students, measured by the pretest, did not directly affect the performance of the students on the posttest. The effects of the pretest on student performance were not individually statistically significant at the .05 level.

The mean score of the control group of 11.2 on the pretest was slightly higher than the experimental group's mean score of 10.8. On the other hand, the mean score of the control group of 17.8 on the first part of the posttest was slightly lower than that of the experimental group of 17.8. The first part of the posttest was comprised of the same 25 questions that appeared on the pretest. In addition, the mean difference between the pretest scores and the scores on the first part of the posttest of the control group of 6.6 was slightly lower than the mean

difference of the experimental group of 7.8. None of the differences reported were statistically significant at the .05 confidence level.

The mean scores on the posttest, summarized by question content, are also presented in table 2. The experimental group had a significantly higher mean score, at the .05 level, on the ten questions that covered the terminology of the accounting cycle. Otherwise, the differences between the mean scores of the control and experimental groups were not statistically significant at the .05 level.

Overall conclusions about student performance were based on differences between pretest and part one of the posttest scores and differences in posttest scores summarized by question content. These results support the acceptance of H₁. Consistent with the expectations of the researcher, the performance of students using GLS (the experimental group) was at least as high as that of students who did not use GLS (the control group).

Multiple regression results also support the acceptance of H₁. The variables examined include: group, gender, age, student status (full or part-time), work status (full or part-time), pretest score, credit hours earned and recent academic performance (as measured by the student's grade point average at this institution). With the exception of group assignment and pretest scores,

Table 2

<i>Mean Scores on Post-Test (by type of question)</i>	<i>Control Group</i>	<i>Experimental Group</i>	<i>Difference</i>
Accounting cycle terminology (10 questions)	6.8	7.7	(0.9)*
Subsidiary ledgers & special-purpose journals (11 questions)	7.8	7.9	(0.1)
Manual versus automated accounting systems (4 questions)	3.3	3.1	0.2
<i>Score on part one of the posttest (Same 25 questions as on pretest)</i>	17.8	18.6	(0.8)
Adjusting journal entries (4 questions)	2.4	2.6	(0.2)
Preparation of classified balance sheet (3 questions)	2.4	2.5	(0.1)
Preparation of merchandiser's income statement (4 questions)	1.9	2.0	(0.1)
Closing entries (4 questions)	2.4	2.5	(0.1)
<i>Total posttest score (questions 1 - 40)</i>	26.8	28.2	(1.4)

Significant at the .05 level.

these variables were self-reported by students. Two of the variables in the model, group assignment and recent academic performance, contribute significantly to an explanation of the variance in student performance as measured by posttest scores ($R^2 = 0.222$, $F = 9.13$, $p > .0003$). The standard betas were .317 for the group assignment and .308 for academic performance. As such, a combination of the experimental treatment (i.e., use of the GLS) and recent academic performance are considerably more explanatory than the other variables in terms of student performance. In other words, 22% of the change in student performance in this study can be explained by the effect of the treatment and recent academic performance. Students in the study who had been performing well in college continued to do so (as would be expected), and students using the GLS increased their performance.

Time Spent (Effort Expended)

H₂ - No significant differences exist in the total amount of time spent completing the selected problems by students using general ledger software versus those who do not.

As discussed above, each student self-reported the time spent completing each assignment at the time the assignment was submitted. The mean amounts of time spent (measured in hours) by students on each of the four assigned problems are presented in table 3. The experimental group actually spent a little less time completing the first assignment than the control group. This was unexpected because students in the experimental group had to become familiar with the GLS as they completed the first assign-

ment. As such, the amount of start-up time was lower than expected. The experimental group spent significantly less time completing the other three assignments than the control group. And, in total, the experimental group spent significantly less time completing all four of the assignments than the control group.

These results support the rejection of H₂. Consistent with the expectations of the researcher, students using the GLS spent less total time completing the assigned end-of-chapter problems than students completing the problems manually.

Student Attitudes

H₃ - No significant differences exist in the attitudes of students using general ledger software versus those who do not.

As discussed above, a survey was distributed after the posttest was returned to the students. The survey results are summarized in table 4. Both groups felt that the four assignments were representative of the work that they would expect to be performed by an accountant (question 10). Students in the experimental group felt more strongly that completing the assignments was an interesting and enjoyable learning experience (question 11). On the other hand, students in the control group felt more strongly that completing the assignments was a difficult task (question 13). Although students in the experimental group appear to feel more strongly that completing these assignments increased their desire to become an accounting major (questions 12), the difference between their responses and those of students in the control group is not sta-

Table 3

Time Spent (in hours)	Control Group	Experimental Group	Difference
Problem 2-5	1.5	1.4	0.1
Problem 3-5	2.3	1.4	(0.9)
Problem 4-5A	2.7	1.1	(1.6)
Ch. 6 Mini-Case	5.6	3.2	(2.4)
Total	12.0	7.1	(4.9)

* Significant at the .05 level.

tistically significant at the .05 level.

Students in the control group felt more strongly than those in the experimental group that completing these assignments adequately prepared them for the posttest (i.e., the exam on chapters 1 – 6) (question 14). As such, students in both groups felt that they would have been better prepared for the posttest if they had manually completed the assignments. It is reasonable to expect that the students in the experimental group would not feel as well prepared because, as reported above, these students spent 4.9 less hours completing the assignments than those in the control group. However, it is interesting to note that the mean score of students in the experimental group was 28.2 on the posttest compared to a mean score of 26.8 for students in the control group. Student perceptions of preparation did not correspond to actual performance in this regard.

Students in the control group felt more strongly that they would have preferred to complete the assignments using the GLS package. Students in the experimental group felt less strongly that they would have preferred to complete the assignments manually. (See both versions of question 15). As such, students in both groups prefer the use of GLS to manual completion of the assignments. Students were first made aware of the research study *after* submitting their questionnaires. Students in the control group were not pleased when they learned that they could have used GLS to complete the assignments; students in the experimental group were pleased that they were able to use the GLS.

As discussed above, there were expectations in this study that accounting students would prefer software use to manual completion of assigned problems, find the experience more enjoyable as a result, and, accordingly, be more open to accounting as a potential career choice. In general, the results of this survey (especially the responses to questions 11, 12, 13 and 15) support the rejection of H_3 . Consistent with the

expectations of the researcher, students in both groups preferred the use of the GLS over manual completion, students in the experimental group reported that the assignments were more interesting and enjoyable, and students in the control group reported that the assignments were more difficult to complete. In addition, although the difference between their responses and those of students in the control group are not statistically significant at the .05 level, students in the experimental group did feel more strongly that completing these assignments increased their desire to become an accounting major.

Conclusions

When students use GLS to complete selected assignments, much of the computational and summative effort of the accounting cycle is performed by the computer rather than the student. However, this study provides evidence that student performance (or learning) may not be negatively affected when GLS is used by students to complete selected assignments in Principles of Accounting I. On the other hand, this study also provides evidence that the time spent (or effort expended) and attitudes may be positively affected when GLS is used by students to complete these assignments.

Students who used the GLS to complete the assignments (the GLS students) performed as well as the students who manually completed those same assignments (the manual students) on multiple-choice questions covering basic accounting cycle concepts. Notably, the GLS students expended significantly less effort, measured by self-reported completion times, than the manual students. The GLS students also agreed more strongly than the manual students that the problems were interesting and enjoyable, and disagreed more strongly that completion of the problems was a difficult task. Although the difference in the replies was not statistically significant, the GLS students did agree somewhat more strongly that the task increased their desire to be an accounting major.

Table 4

Question	Control Group ¹	Experimental Group ¹	Difference
Completing these four homework problems (i.e., Problems 2-5, 3-5, 4-5A and the Chapter 6 Mini-Case) increased my understanding of:			
1. the chart of accounts.	3.8	3.6	0.2
2. journal entries.	4.2	4.1	0.1
3. adjusting journal entries.	3.8	3.7	0.1
4. the trial balance.	3.9	3.3	0.6*
5. the income statement.	4.0	3.4	0.6*
6. the balance sheet.	3.8	3.5	0.3
7. closing entries.	3.9	3.4	0.5
8. the post-closing trial balance.	3.6	3.3	0.3
9. the entire general ledger accounting cycle.	4.0	3.8	0.2
10. These four homework problems were representative of the work I would expect to be performed by an accountant.	3.8	3.8	0.0
11. Completing these four homework problems was an interesting and enjoyable learning experience.	2.6	3.5	(0.9)*
12. Completing these four homework problems increased my desire to be an accounting major.	2.3	2.8	(0.5)
13. Completing these four homework problems was a difficult task.	3.8	2.9	0.9*
14. Completing these four homework problems, in and of themselves, adequately prepared me for the exam on chapters 1 - 6.	3.5	2.8	0.7*
15. I would have preferred to complete the homework problems using computer software rather than manually.	3.6		
15. I would have preferred to complete the homework manually rather than using the general software (GLS).		2.1	1.5*
16. I would have been better prepared for the exam on chapters 1 through 6 if I had completed the homework problems using computer software rather than manually.	2.7		
16. I would have been better prepared for the exam on chapters 1 through 6 if I had completed the homework problems manually rather than using the GLS.		3.0	(0.3)
17. Graded homework problems such as these should be collected and graded for each of the nine chapters.	2.6	3.0	(0.4)
18. Graded homework problems such as these should be used in other accounting classes (i.e., 152 and 153).	3.3	3.5	(0.2)

¹ Means of scores on a five-point scale ranging from strongly disagree (1) to strongly agree (5).

* Significant at the .05 level.

Based on the results of this study, a learning methodology that includes GLS use by students in Principles of Accounting I is at least as effective as one that requires only manual completion of assigned problems. Because that learning methodology is also the much more efficient of the two, students in introductory financial accounting courses should use GLS to complete selected end-of-chapter problems. Student attitudes may also be positively affected.

Suggestions for Future Research

The pretest and posttest used in this study were designed to measure student understanding of concepts relating to the accounting cycles of service companies and merchandisers as set forth in the first six chapters of the textbook. The researcher designed both tests in accordance with her expectations of students enrolled in the first course in the Principles of Ac-

counting sequence at the large community college at which these tests were administered. There is no reason to believe that this instructor's expectations of students enrolled in the first course in the Principles of Accounting sequence are significantly different than those of other instructors of such students at this institution. In addition, there is no reason to believe that the students participating in this study were different from students enrolled in the first course of a Principles of Accounting sequence at other large Midwestern community colleges. Similar research should be conducted at other community colleges and baccalaureate-granting institutions to see if the results are the same.

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