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Manual vs. Computerized Practice Set: Which Achieves Learning Objectives the Best?

Kurt Fanning

Grand Valley State University

Rita Grant

Grand Valley State University

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Kurt Fanning

Grand Valley State University, fanningk@gvsu.edu

Rita Grant

Grand Valley State University, grantr@gvsu.edu

ABSTRACT

A major issue for accounting departments is how to adopt a user's approach to teaching the Principles level courses and still have the accounting majors adequately prepared for upper level courses. One approach is to employ a practice set within the curriculum. However, the use of a manual practice set presents several problems. The use of a computerized practice set may solve many of these issues. This paper examines this issue by testing the student's retention of information about accounting processes and procedures. The test results indicate similar outcomes from using a computerized practice set where students manually post the transactions to those students using a manual practice set. Thus, students can gain the necessary knowledge while using a computerized practice set when they post transactions. However, the test results indicate students have inferior results when using a computerized practice set that automatically posts the transactions. This suggests that student involvement in the transaction is important.

Given the computerized practice set's advantages in decreasing the time and energy expended by the accounting faculty grading practice sets and the faculty's ability to help the students remotely, a strong argument can be made for using the computerized practice set when students post the transactions. Thus, accounting departments can be more confident, in certain circumstances, to choose to use computerized practice sets.

Keywords

Manual / Computerized Practice Sets, System Understand Aid, SUA

Data Availability: In accordance with the corresponding author's affiliation policy, the data (students' tests) for this study were destroyed and are not available. The test instrument will be made available upon proof of academic standing.

INTRODUCTION

The release of the Accounting Education Change Commission's (AEEC) Position Statement No. 1, *Objectives of Education for Accountants* in September 1990 helped change the emphasis of the first course in accounting. The AEEC recognized that while the majority of students in the first accounting course did not intend to become accountants, all the students would be users of financial information. Given this perspective, the Commission argued that the first accounting course should be oriented towards providing for all students rather than focusing on the needs of accounting majors. Their recommendation changed the orientation of most school's first accounting course with faculty now placing a greater emphasis in the principles courses on the user's understanding of accounting. At the same time, the faculty deemphasized much of the procedural aspects of accounting. This decrease in teaching the procedural aspects of the accounting system left some faculty feeling there was also a decrease in rigor regarding the fundamentals of accounting. This helped lead to the perception by some faculty members that accounting majors were entering Intermediate Accounting and Accounting Information Systems (AIS) lacking a firm grasp of the accounting cycle and other fundamental accounting concepts.

To remedy this perceived deficiency, many schools added a manual practice set to Intermediate Accounting or the AIS course. This practice set, largely the Systems Understanding Aid (SUA), included specialized journals, subsidiary ledgers, source documents and document flowcharts. The premise was that the practice set would provide the accounting students with the additional knowledge they lacked about accounting processes and procedures. This knowledge then would help them in the later accounting courses.

However, over time there were several problems with using the manual practice set within our curriculum. First, our Intermediate course was limited in available time due to the number of topics in the course. Second, students needed to complete the practice set before they reached the chapter covering the accounting cycle, which is very early in most texts. Thus, the accounting students needed to complete it within the first three weeks of the course. This early finish left little incubation time for those with weak backgrounds. In addition, there was no time to completely explain all the issues and topics within the manual practice set to the students. Students rushed through the assignment, skipping valuable learning material. Thus, they were missing important knowledge regarding accounting processes and procedures. Third, when offered within the AIS course, many students had already taken Intermediate, defeating the purpose of the practice set. In fact, many students took the AIS course in their last semester completely undermining the purpose of the SUA.

In an attempt to solve these problems, our school created a one-credit bridge course that students would take between the Principles of Financial Accounting course and the Intermediate and AIS courses. The purpose of the one-credit bridge courses was to help accounting majors make the transition to Intermediate Accounting. It also positioned the practice set within the student's curriculum where it would provide the most benefit since it is taken before both the Intermediate and AIS courses.

The learning objectives of the bridge course include:

- Mastery of the accounting cycle including journalizing, posting, adjusting, closing and financial statement preparation
- Understanding of the use of specialized journals
- Ability to read document flow charts and recognize the flow of information

- Recognizing and understanding the use of internal controls within the accounting system

Within the bridge course, the primary task was the completion of a practice set. Our motivation was the belief that the practice set would provide the required accounting fundamentals necessary to handle the upper level accounting courses. The manual practice set achieved the learning objectives regarding the accounting fundamentals. However, its use came with certain costs to the instructor and students. These costs included:

- Student frustration with the large amount of tedious work involved in posting to the general ledger
- Student frustration when their accounts were not balancing because of careless posting or arithmetic errors
- Time required by faculty to grade the manual practice set by hand
- The potential for cheating if all students had the same transaction set. (The SUA manual system currently has the ability to change key numbers)

Thus, we looked for alternatives to the manual practice set. One alternative was to use a computerized practice set. The vendors of computerized practice sets suggest that their practice sets could alleviate the following issues:

- Student frustration with time involved in posting
- Frustration with math errors
- Time required for faculty grading
- The potential for cheating (some computerized practice sets vary transactions for each students)

Given this potential for a computerized practice set to solve some of the issues involved with using a manual practice set, our school examined several options before adopting a computerized practice set from Ivy Software. Their Seaside Marina financial practice set offered the accounting department several of the desired qualities our accounting department was looking for in a computerized practice set. Specifically, it provides customizable online grading with online distribution of software and manuals. It also offered the advantage of allowing the faculty the ability to examine the student's practice set remotely. A faculty member can open up a student's practice set and see what the student is doing without having to meet with the student. This is a major time saver for both the student who does not have to come in and for the faculty who do not have to set aside a time to meet with the student. Finally, there are several advantages built into the software that help alleviate beginning student's common mistakes. Since it does the calculation of balances, errors within the trial balance from not totaling the account balances correctly are eliminated, reducing student frustration. Thus, our accounting department felt using Seaside Marina would alleviate much of the issues associated with working with a manual practice set. In particular, Seaside Marina solved the problems regarding grading the assignments and students inputting data. However, some faculty members were concerned that, while the computerized system was providing these benefits, it may come at a cost. Specifically, the concern was whether students would gain as complete an understanding of the processes and procedures within the accounting system as they did using the manual practice set. This concern led to our research.

LITERATURE REVIEW

While there were several quasi-practice sets (Patten and Steinmetz 1966) available for learning about accounting in the 1960's and early 1970's, the true practice set started with the System Understanding Aid (SUA). The creation of the System Understanding Aid was a response to the issues facing accounting education in the late 1970's and early 1980's.

There were several studies in this beginning period of the practice set examining whether a practice set provides any benefits to the students. In Abraham et al. (1987), they found that students who used a computerized practice set did have a change in their attitude towards accounting. The students had a greater appreciation for accounting after working the computerized practice set. A year later, Ott et al. (1988) tested the value of using a practice set by testing its effect on exam scores. Specifically, the authors created groups that used a practice set and another group that did not use a practice set. They determined the value of a practice set by comparing the results on the student's performance on the first exam in Intermediate accounting. The results seem to indicate that the practice set made no difference in how the students did on the first Intermediate test.

For several years, there was little research about using practice sets. Then in Savage and Law (2003), the authors advocated for teaching both the manual practice set and a computerized system (Peachtree). By doing these two practice sets, the students not only learned about AIS but also learned the difference between the two. In Jones and Roberts (2005), the authors focused on using a manual practice set as a bridge to their Intermediate class. The authors used surveys and written essays by the students about their experience with the practice set to judge the merits of the practice set. Their results showed that the students became more positively oriented towards accounting after working with the practice sets.

The past literature has focused on advocating for the use of a practice set whether it was manual or computerized. In most cases, the use of a practice set was a beneficial activity for the students over not using a practice set. However, none of these papers answered the question of whether a manual system is superior to a computerized system in providing student understanding of the accounting process. Our research examines this issue.

RESEARCH DEVELOPMENT

Our research involves the question of whether a computerized practice set provides students with the same knowledge about accounting processes and procedures as a manual practice set. There was the assumption that a manual practice set provides a better background since the students spend more time in processing transactions and have to handle more documents than a computerized practice set. The thinking was that this additional involvement in the process of creating accounting transactions should provide the students with a greater understanding of the procedures and processes of accounting. Another assumption was that the students using a computerize practice set may be going through the motions and not be as focused on learning as those using a manual practice set. Therefore, the thinking is the students training using a manual practice set (SUA manual post) would have higher test results than students using a computerized practice set.

In our computerized practice set, Seaside Marina, there is an option to let the students post the transaction or let the computer do it for them. Thus, there was the additional question of whether the added responsibility of the students having to post the entry made any difference in the students learning of the accounting systems processes and procedures. If auto-post is left on, students are not posting to the ledger. They record journal entries in the appropriate journal and the software posts to the ledger accounts. In auto-post off, students actually post to the ledger accounts as they do with the SUA. The difference between Seaside with auto post off and SUA is that students do not have to calculate balances with Seaside, eliminating the frustration of an unbalanced trial balance due to adding incorrectly to get ledger balances. With the SUA, students record journal entries, post to the ledger, compute ledger account balances and then create a trial balance. With Seaside (with auto post off) students record the journal entry, post to the ledger account and the software calculates ledger account balances and creates the trial balance.

Thus, our research was to determine whether there is any difference between the student's test scores when their learning was through a manual practice set (SUA manual post), a computerized system with the students posting (Seaside auto-post off) and a computerized practice set where the computer posts the entry (Seaside auto-post on).

EXPERIMENTAL DESIGN

Our one credit bridge course enrolls over 100 students each semester. One of the authors was the faculty member for three consecutive Fall semesters of the bridge course. These sections were for the Fall 2009, 2010 and 2011 semesters. Over these three semesters, we were able to test three different scenarios. The first semester, Fall 2009, 119 students worked with the Seaside Marina computerized practice set with the posting done by the program (Seaside auto-post on). The second semester, Fall 2010, 113 students worked with a manual practice set (SUA Manual post). The third semester, Fall 2011, 112 students worked with the Seaside Marina computerized practice set with the posting done by the students (Seaside auto-post off). Turning off the auto posting in Seaside Marina, requires the students to post manually the transactions but they do not need to add the account balances. At the end of each semester, the students took a multiple-choice exam that tested the following skills:

- Creating journal entries
- Posting to the general ledger
- Preparing the trial balance
- Preparing adjusting and closing entries
- Reading and understanding document flowcharts
- Recognition and understanding internal controls

The students took the test for the first time in 2009. The students took the exam at the end of the semester and the Professor kept the tests. These actions limited any student exchange of information from one semester to the next. This is on top of the fact that the year apart also minimizes any student exchanges since they are a different group of students with little overlap with the previous students. The population of the students taking the course during the three Fall semesters was similar in major, gender and age distribution. They had all completed the Principles of Financial Accounting course and all intended to take Intermediate Accounting

and/or Accounting Information Systems. The vast majority of students were Accounting majors. There were some Finance majors enrolled in the course in preparation for Intermediate Accounting. In addition, the classes had a few Computer Information Systems majors enrolled in preparation for Accounting Information Systems.

Within the practice sets, Seaside has 35 transactions and the SUA has 19 transactions to post. Since there is the additional work of maintaining the trial balance and totals for the accounts, the SUA needs to limit its entries. There is the possibility that having additional transactions in Seaside may help the students perform better on the exam. However, one can make an argument that the ability to process additional transactions within a similar period is a reason for using a computerized practice set. In addition, each practice set has an identical number of flow charts. Seaside has five journals, the general journal, purchase journal, sales journal, cash receipts journal, and cash payments journal. The SUA had six journals, the same five as Seaside and the payroll journal. Seaside has seven documents and the SUA has 20 documents. However, most of the SUA transactions are repetitious such as multiple purchase orders.

The test was designed to examine the students understanding of the accounting cycle and other fundamental accounting concepts. Having no a priori knowledge of the impact a computerized practice set would have on students there was no preconceived creating of questions that might be specific to the research issue. The exam at best should give an indication of the students learning of the accounting cycle and other fundamental concepts.

RESULTS

A test of the homogeneity of variances indicates that the variances are not statistically different. The data was analyzed using one-way ANOVA. The test provides statistically significant evidence ($F = 114.057$, $p = .0001$) to indicate that at least one of the methods has a different mean score from another method. Table 1 Panel A reflects the descriptive statistics of the student performance and Panel B reflects which methods differ based on a Bonferroni correction for multiple comparisons with statistical significance set at an alpha level of 0.05.

At a 0.05 significance level, Seaside auto-post off scores (88.1) is not statistically different from the SUA manual posting score (85.6). Since the means for the two methods were not significantly different, the computerized system is comparable to the SUA manual practice set and could serve as an alternative. In contrast, the Seaside auto post on was statistically different from both the SUA manual posting score and the Seaside auto-post off score at a 0.05 significance level. Since the mean for the test score on the Seaside auto-post off was higher than the Seaside auto post on, the results suggest the computerized practice set should be used where the students post the transactions.

Clearly, the users of the computerized practice set (Seaside auto-post on) did not retain the same amount of information as those using a manual practice set (SUA manual post) or the computerized practice set where they were required to post the transactions. This low result for users of the Seaside auto-post on may be partially explained by the mechanics of posting. While it does free students from errors in their trial balances due to any additional posting errors, they do miss the complete information flow from a journal entry to the financial statements. Auto-posting seems to encourage more unbalanced entries, the software did not give an error message for unbalanced entries, and resulted in less understanding when it came to adjusting entries for those using the auto-posting method.

Table 1 Results of Student Test Performance after Completing a Practice Set

Panel A: Descriptive Statistic

Semester / Manipulation*	N	Min / Max	Mean (Std. Dev)
Fall 09 / Seaside with Auto Posting On	119	8 / 100	70.6 (10.5)
Fall 10 / Systems Understanding Aid (SUA) with Manual Posting	113	52 / 100	85.6 (9.8)
Fall 11 / Seaside with Auto Posting Off	112	52 / 100	88.1 (8.4)

Panel B: Results of Follow-up Bonferroni Multiple Comparisons of Means of Student Test Performance

Manipulation	Compared to	Mean Difference	Significance (p-value)
Fall 09 / Seaside with Auto Posting On			
	Fall 10 / Systems Understanding Aid (SUA) with Manual Posting	15.0	.000
	Fall 11 / Seaside with Auto Posting Off	17.5	.000
Fall 10 / Systems Understanding Aid (SUA) with Manual Posting			
	Fall 09 / Seaside with Auto Posting On	15.0	.000
	Fall 11 / Seaside with Auto Posting Off	2.5	.151
Fall 11 / Seaside with Auto Posting Off			
	Fall 09 / Seaside with Auto Posting On	17.5	.000
	Fall 10 / Systems Understanding Aid (SUA) with Manual Posting	2.5	.151

* Students completed one of three practice set manipulations: 1) computerized practice set (Seaside) with the posting done automatically, 2) manual practice set (SUA) with manual posting of transactions or 3) computerized practice set (Seaside) with manual posting of transactions.

In summary, users of Seaside who posted their transactions were able to achieve results similar to those using the SUA. While users of Seaside who did not post the transactions did worse than those using the SUA or Seaside users who posted their transactions.

CONCLUSION

Our major research question was whether students gain adequate skill level and comprehension of accounting fundamentals when they use a computerized practice set to learn the basics of accounting principles. With manual practice sets requiring additional time and effort for faculty and students when compared to computerized practice sets, any answer indicating that a computerized practice set offered comparable results would argue for their use in class. Our study and results are important since faculty members may currently be reluctant to use a computerized practice set. They worry that they may be sacrificing a student's mastery of the accounting cycle and fundamentals by not working with a manual practice set. Our results show that students posting the entries in a computerized practice set acquire similar knowledge to those completing a manual practice set.

An additional benefit of moving to a computerized practice set is the reduction in the risk that students are copying each other's work. Since computerized sets such as Seaside Marina can vary data for each individual student, the entire class can have their own data (the computerized grading makes this a viable alternative). Another advantage is the student's time involved is less with a computerized practice set since they do not have to calculate balances for the general ledger accounts – the program does the adding and subtracting after posting. In addition, the elimination of the possibility of arithmetic mistakes leading to an unbalanced trial balance also reduces student's frustration with the practice set. Students still have the opportunity to record unbalanced entries and post incorrectly with the computerized practice set (Seaside auto-posting off) just as they do with a manual practice set but perhaps learning from these errors may be a desirable occurrence.

Our study indicates that using a computerized practice set that also posts the transaction is not beneficial to the student's retention of the knowledge about the accounting process. It would seem that putting the computer totally in charge of the transactions causes students not to retain the desired information. It may be that students do not retain knowledge about the information flow in the accounting system when they are just pressing keys. Since the project takes less time for those with auto posting on, the students may not be as vested in the process as those who have to post the transactions. It may also be that the lack of posting causes students to disregard what they were doing as soon as they finish typing in the data.

Our results indicate that if time and effort of the faculty and students are important criteria in selecting a practice set, then instructors should not be afraid of using a computerized practice set. The best scenarios appears to be choosing the option for having students post the transactions. While all aspects of the decision of which practice set to use should be important, the evidence provided suggests that student comprehension is similar when certain options are chosen within a computerized practice set and a manual practice set with the computerized practice set offering the advantages of grading and calculations.

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