

## **Intermediate accounting students' reaction to Excel® homework assignments with a feedback (self-check answer) function**

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### **ABSTRACT**

This study extends the work of Park and Ellis (2020) with its use of randomized data in Excel® assignments by incorporating a feedback feature that allows students to check their work before submitting it for grading. Three groups of intermediate accounting students complete identical assignments that vary only in the mode of data delivery. One group receives a set of static data so that each student has the same information to complete the assignment. A second group receives data through a randomized number generating function facilitated by an Excel® macro. The third group's data is randomized but the Excel® file also includes a self-check answer function that they can use prior to submitting the assignment for grading. The results indicate that the third group scores the highest and has the greatest satisfaction with the assignment. The study provides evidence that accounting instructors will serve their students better when their Excel® assignments provide randomized data and a self-check answer feedback feature. It also re-enforces the practice of enabling the check answer feature often found in online homework management systems.

**Keywords:** Intermediate Accounting; Excel® spreadsheet assignment; randomization data, feedback, self-grading function; experiential learning.

## INTRODUCTION

To provide accounting students with the requisite Excel® skills for employment and/or to pass the CPA exam, many accounting instructors have incorporated Excel®-based assignments into their coursework. Many write their own Excel® problems while others use publisher-supplied Excel® problems for students. As is the case in mathematics feedback to students when solving problems is key to understanding the concepts presented in the problem. The more immediate the feedback the better. We developed a three-part Excel®-based intermediate accounting assignment and differentiate between students in the mode of data delivery. We seek to improve the quality of computer-based homework assignments by examining students' differential performance and satisfaction in assignments when an automatic feedback device in the form of a self-check answer function has been built into the Microsoft Excel® data file.

Three groups of students in intermediate accounting classes are assigned identical Excel® spreadsheet projects. In the first group, all the students work with the same static data set. The second group has data delivered within Excel® using randomized numbers such that each student has different numbers. The third group receives randomized numbers with an additional feedback device, a self-check answer function. The results indicate that students in the third group scored the highest and expressed the greatest satisfaction with the assignment among the three groups. The results imply that students exert more effort when data is randomized in the assignment and are satisfied more when they can check the accuracy of their answers before submitting the assignments for grading.

The remainder of the paper is organized as follows: the next section provides a brief background of the Excel® assignments. The third section provides a discussion of the methodology. The fourth section discusses results and data analyses. The last section provides a conclusion, and avenues for future research.

## PRIOR RESEARCH

In response to employers' requests for accounting graduates to have more data analysis skills prior studies have reported success incorporating Excel®-based cases in introductory managerial accounting (Convery & Swaney (2012)) as well as in more advanced applications such as hedging (Wann & Long (2018)). Park and Ellis (2019) use an Excel®-based case in intermediate accounting and subsequently (Park and Ellis (2020)) demonstrate the usefulness of providing data by a randomized function within the Excel® file. We extend that study by also installing a feedback mechanism within the Excel® data file in the form of a self-check answer function using Excel® macros.

Other research highlights the importance of feedback to increase understanding. Hattie & Timperley (2007) maintain that "feedback . . . is a consequence of performance." They add that feedback can help students become better at detecting errors which may assist them in reaching goals. Habala (2021) supports the importance of feedback to students in a problem-solving, math-based class. Additionally, the provision of extensive feedback can result in greater student engagement and higher achievement (Hattie & Timperley (2007)). While the feedback is provided through the Excel® program rather than coming directly from the instructor, it is immediate and helps develop the student's independent thinking. As accounting instructors, we want our graduates to be better problem-solvers in general and to develop superior Excel®

functionality specifically to aid in solving accounting problems. Enabling students' ability to develop error detection provides them a greater skill set and improves their overall marketability.

## **BACKGROUND OF THE EXCEL® SPREADSHEET ASSIGNMENTS**

Each assignment is presented in a Microsoft Excel® spreadsheet. Their common learning objectives are:

1. Students manipulate accounting data via the use of Excel®.
2. Students perform the end of the accounting period procedures in the accounting cycle.
3. Students prepare financial statements.

The assignments have the following components:

Assignment A: Adjusting entries and an accounting worksheet. Students are required to make adjusting entries and complete a simple income statement and balance sheet using an eight-column accounting worksheet within Excel®.

Assignment B: Formal income statement preparation. Given the list of the company's accounts, students prepare a well-organized multiple step income statement.

Assignment C: Formal balance sheet preparation. Given the list of the company's accounts, students prepare a properly classified balance sheet.

## **METHODOLOGY**

### **Participants**

The participants are students enrolled in an intermediate accounting class at a state-supported undergraduate institution. Each is assigned to one of three groups:

- Group #1: All students have the same data and no self-check answer function
- Group #2: All students have data generated through an Excel® macro function to randomize the numbers so that each student has different numbers. However, the assignments do not include the self-check answer function
- Group #3: Students have assignments with randomized data with the self-check answer function.

Park and Ellis (2019 and 2020) document that students' performance and satisfaction are enhanced when the assignments adopt randomized data. Therefore, we provide randomized data initiated by a hidden random number generator and macro commands within Microsoft Excel® for groups #2 and #3. Also, in test group #3, a self-check answer function is added such that students check their answers and make any necessary corrections by themselves, if they want.

The self-check answer function does not automatically provide correct answers, but it indicates which part of the answer is wrong.

### **Worksheet Assignments**

The format of the first part of assignment A is introduced in Exhibit 1. Panel A illustrates the first page of the assignment with general instructions to students for the group receiving randomized data and the self-check answer feature. The second part of the worksheet as shown in Panel B of Exhibit 1 includes the assignment with data. The “start” tab is available for assignments for groups #2 and #3. The “check answer” tab is provided for group #3 students only. The only differences are that for group #1 identical data is directly provided in the sheet for all students. For group #2, the randomized data is created by clicking the “start” tab at the top of the worksheet. Each student has different data created by the hidden Microsoft Excel® macro commands. Students in group #3 have randomized data and self-check answer function. After completing the assignment, students at group #3 may click the check answer tab to get information on whether some part of answers is incorrect. Students are allowed to check their answers unlimited times until they get correct answers.

### **Post-project survey**

After completing all three projects by students, a post-project survey was administered to review students’ responses to the project.

### **Statistical Tests**

To assess the impact of data randomization and self-check answer function, t-tests are conducted to assess students’ relative performance. Survey responses are compared between the test group #3 (with randomization and self-grading) and the control groups #1 (without randomization and self-check answer function) and #2 (without self-check answer function) based on average grades of submitted project answers and the post-project students’ evaluation on the assignments

## **RESULTS**

The Exhibit presents two panels showing both the instruction page and the data page for assignment A for group 3 (randomized data with feedback). Panel A contains detailed instructions on how to access the data and provides students with procedures to complete the ten-column worksheet.

Panel B contains the spreadsheet students must complete. This example includes the random data generator and the check-answer functions. When students click the **start** tab, the random data is generated in columns B and C such that each student has different numbers. Students are required to complete the remaining eight columns D through M. After completing the project, students may check the accuracy of answers by clicking the yellow tab at the bottom. Assignments 2 and 3 are organized similarly.

Table 1 reports the average grades of each group by assignment part. Each assignment part was graded on a scale of zero to 10. The first column reports the grades on all three parts of the assignment for group #1 with a static, nonrandomized data set and without the self-check answer function. The second column reports the average grades of group #2 students who received the randomized data set such that each student performs the same tasks but there is no incentive for comparing answers since they all have a different data set. When the data is randomized in group #2, the average grade decreases relative to group #1, supporting the result of prior research by Park and Ellis (2020). When the self-check answer function is added for the group #3 students in the third column, the average score increases for all three assignments. The difference in average scores between groups #2 and #3 is statistically significant at a 99% significance level. The result implies that, when students can check their answers before submitting the assignment, they have a chance to review them and correct them. As a result, students in group #3 get higher grades for the combined assignments.

Table 2 reports the results of the post-assignment survey by each group. The survey adopts questions like those of Park and Ellis (2020). Students receive a seven-question survey that requires answers on a Likert scale of 1 to 5 with one being “Strongly Disagree” and five “Strongly Agree.” In addition, students in group #3 have an additional question about their reaction to the self-check answer function. In the survey, columns 1 through 3 report the average response of each group and column 4 reports the t-statistics for the differences between groups #2 and #3. The results indicate a consistent trend in average reactions for the seven common survey questions. Students’ average reaction is highest for group #3 and lowest for group #1 on each of seven questions. However, the difference between groups #2 and #3 is statistically insignificant except for survey question #1. The result may be due to the small sample size of each group as reported in the last column of the table. However, when the scores on all seven questions are aggregated, the average reaction is 4.214 and 4.395 for groups #2 and #3, and the difference is statistically significant at the 99% confidence level (t-value of 3.352). It implies that students are more satisfied with the experience when they are allowed to check their answers before submitting the assignments. The last column reports group #3 students’ level of satisfaction with the self-check answer function. The average score is 4.796 out of the maximum score of five. Overall, results in table 2 document that students show greater satisfaction when data is randomized and even more satisfaction when a self-check answer function is available to them.

## CONCLUSION

The study reports that intermediate accounting students perform better and are more satisfied when their Excel<sup>®</sup> assignments include feedback in the form of a self-check answer function. Grades decline between students who receive a static data set and those who receive a randomized data set, but they improve when students receive automatic feedback provided by the self-check answer function. This evidence supports the use of an automatic feedback mechanism within an Excel<sup>®</sup> assignment. Professors who write their own Excel<sup>®</sup>-based problems can install the device using an Excel<sup>®</sup> macro function. Professors who rely on publisher-provided Excel<sup>®</sup>-based problems can select the self-check answer function within their online homework manager software. Regardless students will benefit from having readily available feedback that allows them to correct their answers before submitting them for grading. It not only reinforces their ability to detect and correct errors, but it also increases their level of engagement with the

assignment, thereby, increasing their level of understanding. We believe this provides a deeper level of Excel<sup>®</sup> expertise. It may provide students with more marketable problem-solving skills to assist in their future roles as professional accountants.

In the future the project can be expanded by administering a test/quiz following the completion of the project. This may provide a different basis for assessing transferability of the knowledge between the project and the course work.

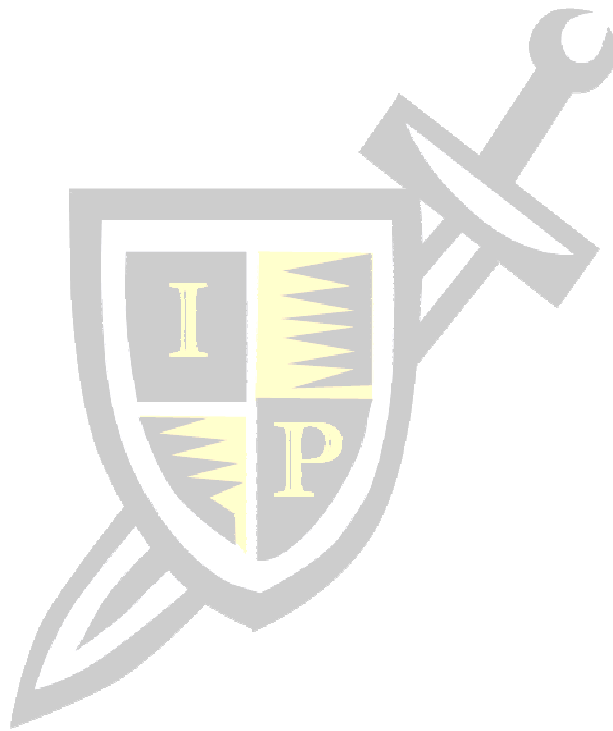


Exhibit: Assignment A with randomized data and check-answer function for group 3

Panel A: Instruction page of the assignment #1

1. The purpose of this homework is to experience the spreadsheet approach which is very popular in real world. Your final output will look very similar to Illustration 3C-1 at page 122 of your textbook. Understand that this is a very highly simplified version of the real-world spreadsheet approach!

2. In the Worksheet , click on the "START" button. You can see a trial balance of a company before adjusting entries in columns B and C.

3. Additional information for adjusting entries is available at cell A40 and below. Make adjusting entries directly in columns D and E. Make sure debit total equals credit total.

4. Complete the adusted trial balance at columns F and G. Again, Debit total equals credit total.

5. In the worksheet, Excel formula should used whenever possible. Try to use Excel formulas, such as "=A1+B1-C1" or "=sum(A1:A10)", instead of using your calculator and typing final numbers.

6. Move income statement accounts into columns I and J, balance sheet items into L and M. At this point, debit and credit totals of each statement do not match.

7. In the bottom of income statement, put Net Income, i.e., total revenue - expense, in the debit (yellow highlighted cell). And put equal amount in the credit side of balance sheet. The Net Income of B/S will eventually added to Retains Earnings. Then, debit and credit match in B/S and I/S.

8. After doing all works on worksheet, click the Check Answer button. If you get a message of "Incorrect Net Income", then check your work again. If you see the message of "Net Income is correct", then you can finish.

9. Your analyses are done. Now please answer to this question: **How many hours did you spend approximately to complete this homework?**   Hours

Then, upload your work on D2L, assignment section... **Thank you.**

Panel B: Data page of the first assignment before initiating data randomization.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<a href="#">Click here to start</a> <b>START</b>	Unadjusted Trial Balance		Adjusting Entries		Adjusted Trial Balance			Income Statement			Balance Sheet	
2		Dr.	Cr.	Dr.	Cr.	Dr.	Cr.		Dr.	Cr.		Dr.	Cr.
3													
4	<b>Permanent Accounts</b>												
5													
6	Cash												
7	Accounts Receivable												
8	Prepaid Insurance												
9	Land												
10	Buildings												
11	Accumulated Depreciation - Buildings												
12	Equipment												
13	Accumulated Depreciation Equipment												
14	Accounts Payable												
15	Salaries Payable												
16	Unearned Rent Revenue												
17	Common Stock												
18	Retained Earnings												
19													
20	<b>Transitory Accounts</b>												
21													
22	Service Revenue												
23	Interest Revenue												
24	Rent Revenue												
25	Salaries Expense												
26	Depreciation Expense												
27	Insurance Expense												
28	Utility Expense												
29	Maintenance Expense												
30													
31	TOTALS	\$	-	\$	-								
32													
33													
34													
35													
36													
37													
38													
39													

**Click here to check your answer**

Table 1: Students' average grades on assignments

Assignments t-value	Group #1 (N=41)	Group #2 (N=49)	Group #3 (N=57)	
A. Prepare adjusting entries and complete accounting spreadsheet.	9.477 (0.698)	9.136 (0.930)	9.771 (0.592)	4.25**
B. Prepare a formal income statement.	9.125 (0.686)	8.907 (0.895)	9.815 (0.646)	6.04**
C. Prepare a formal balance sheet.	9.262 (0.857)	8.946 (1.104)	9.830 (0.481)	5.47**

\*\* significant at 99% confidence level

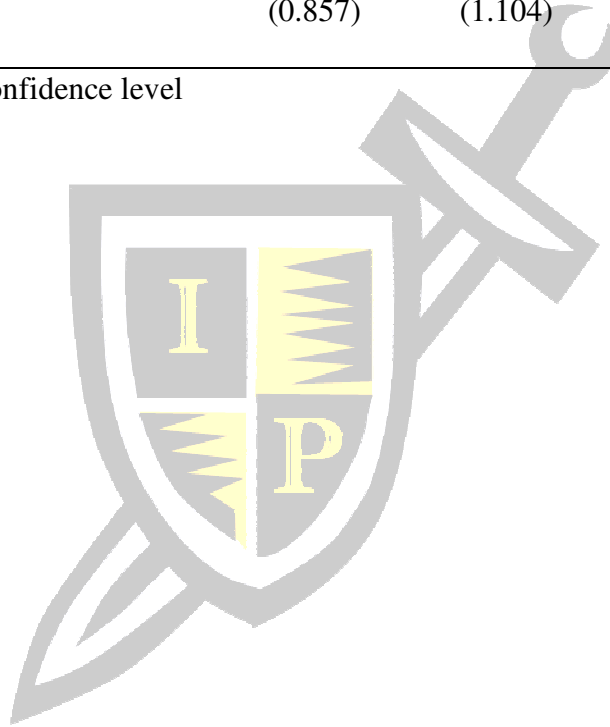




Table 2: Student responses to post-assignment survey

<u>Survey Question</u>	<u>Group #1</u>	<u>Group #2</u>	<u>Group #3</u>	<u>t-value</u>
1. The homework assignments helped me find and fix weaknesses in my understanding of spreadsheet analyses of accounting entries.	4.195 (1.077)	4.196 (0.833)	4.444 (0.572)	1.804*
2. The homework assignments helped me find and fix weaknesses in my ability to use the adjusted trial balance to create financial statements.	4.171 (1.070)	4.196 (0.778)	4.370 (0.563)	1.251
3. The homework assignments encouraged me to practice the preparation of formal Income Statement.	4.317 (1.011)	4.370 (0.711)	4.500 (0.637)	0.992
4. The homework assignments encouraged me to practice the preparation of formal Balance Sheet.	4.244 (1.067)	4.348 (0.640)	4.500 (0.541)	1.321
5. The project encouraged me to look at financial data as a whole system rather than a collection of unconnected parts.	4.073 (1.170)	4.153 (0.788)	4.315 (0.773)	1.066
6. The authentic nature of the project was motivating.	4.049 (1.117)	4.130 (0.806)	4.278 (0.763)	0.961
7. The project improved my professional skills more than an equal amount of time spent on homework type problems	3.537 (1.286)	4.109 (0.948)	4.352 (0.731)	1.482
8. The use of self-grading function (i.e., “Check Answer” tab) helped me complete the assignments more accurately	N/A	N/A	4.796 (0.407)	N/A

\*Significant at 95% confidence level

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