

## **The effect of randomized versus nonrandomized data on accounting students' academic performance**

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### **ABSTRACT**

The purpose of this study is to examine the effect of randomized versus nonrandomized data using an Excel case study project to measure students' academic performance. Specifically, the study examines whether randomized data strengthens students' analytical, problem-solving, and Excel skills while manipulating and analyzing accounting data. The participants in the study are 149 undergraduate accounting students enrolled in four intermediate accounting courses over two semesters and taught by the same professor. The students are partitioned into randomized and nonrandomized groups and complete The Case of the Grizzly Sports Highlighted, Inc.: analyzing accounting data using Excel. Students assume the role of an external accountant hired to analyze, record and adjust financial data stored in Excel spreadsheets to prepare year-end financial reports in accordance with generally accepted accounting principles (GAAP). The t-test results show significant differences between the randomized versus nonrandomized groups. Students in the randomized group spent more hours completing the project, scored higher on the post-assignment Excel quiz, had a better understanding of accounting as a whole system versus a set of unconnected parts, and experienced greater satisfaction completing the project. Students in the nonrandomized group scored higher on analyzing the data and spending less time completing the project. The implications of this study can benefit accounting faculty to better prepare accounting graduates with the required skills to enter the competitive 21<sup>st</sup> century workforce.

Keywords: Intermediate Accounting; randomization data, non-randomization data; Excel; experiential learning.

## INTRODUCTION

Over the past decade, business managerial decisions have become more dependent on big data analyses to reduce inefficiency and optimize data. To ensure that business graduates have the Excel skills to enter the workforce, corporate recruiters and employers are requesting that business schools implement more data analysis assignments involving Excel in the accounting curricula (Parks and Ellis, 2018). The role of accountants is continuously adapting to a technology driven economy. William, Frank, and Hansen (2018) note that while new technologies evolve frequently, Excel remains one of the key technologies that accounting firms and employers expect accountants to use. In April 2018, the generic spreadsheet on the CPA exam was replaced with Microsoft Excel. CPA exam candidates are required to answer several questions on the CPA exam which require candidates to demonstrate knowledge of Excel. In addition to Excel skills, accountants need to have decision-making and problem solving skills. Therefore, it is essential that accounting faculty incorporate assignments into accounting courses to ensure accounting graduates have the required skills to enter the workforce and be able to obtain accounting certifications. Also, businesses are currently operating in a global environment which requires the same basic accounting skills across different countries. For example, Excel analysis was found to be one of the most important technology skills for management accountants in New Zealand since the role of management accountants has shifted from capturing and recording transactions to analyzing business issues (Sprakman, O'Grady, Askarany, and Akroyd, 2015).

This study is motivated by the lack of accounting students' proficiency in Excel, a required skill for employment in the accounting profession. According to the results of a survey by Rackliffe and Ragland (2016), 245 faculty from 100 schools who included Excel in their classes reported that students were not fully proficient. The purpose of this study is to examine the effect of randomized versus nonrandomized data using an Excel case study project to measure students' academic performance. Specifically, the study examines whether randomized data strengthens students' analytical, problem-solving, and Excel skills while analyzing and manipulating accounting data. Students completed The Case of Grizzly Sports Highlighted, Inc.: analyzing accounting data using Excel. This case required students to manipulate and analyze accounting data and prepare financial reports using Excel. The participants in the study are 149 undergraduate accounting students enrolled in traditional intermediate accounting courses over two semesters and taught by the same professor. To complete the project, students were randomly partitioned into two groups using randomized versus nonrandomized data.

T-tests were used to analyze the data. The results showed significant differences between students who used randomized versus nonrandomized data. Students in the randomized group spent more hours completing the project, scored higher on the post-assignment Excel quiz, and had a more enhanced understanding of accounting as a whole system versus unconnected parts, and had greater satisfaction completing the assignment. Students in the nonrandomized group scored higher on data analysis and generated more correct answers analyzing the data in the general ledger accounts. Overall, the results indicate that Excel projects using randomized data require more effort by students, enhance their Excel, problem-solving, and analytical skills, and students perceive more satisfaction completing the project.

The remainder of the paper is organized as follows. The next section provides a brief background of the case. The third section provides a discussion of the methodology. The fourth

section discusses the results and data analyses. The last section provides the conclusion, limitations, and avenues for future research.

## **BACKGROUND OF THE CASE OF GRIZZLY SPORTS HIGHLIGHTED, INC.**

In this study, the researchers adopted the Case of Grizzly Sports Highlighted, Inc. (GSH) by Park and Ellis (2018), an accounting Excel case for undergraduate accounting majors. The GSH case is a fictional accounting case that requires students to assume the role of an external accountant who is hired to assist GSH in preparing year-end accounting work, which includes preparing financial reports. GSH is a sports magazine company incorporated in December 2015 and is located in Atlanta, Georgia. The company is owned by Mr. George S. Heinz who also serves as the general manager and has 10 years of experience working in the sports magazine industry; however, he has very little accounting knowledge or accounting experience. The company has only been in business for two years and is not in a financial position to hire a full-time accountant or purchase a computerized accounting information system. Therefore, the company only has a bookkeeper who records all of the accounting transactions in Excel spreadsheets throughout the year.

The case requires students to assume the role of an external accountant who is hired on a temporary basis at year-end to assist GSH in preparing its year-end financial reports according to generally accepted accounting principles (GAAP). Students are required to analyze and update the accounting information in the five Excel spreadsheets. The case is designed to provide students with job readiness skills in preparation for entry-level positions in the accounting profession. Overall the case includes the following five learning objectives:

1. Analyze and manipulate accounting data using Excel functions.
2. Process and record accounting transactions.
3. Prepare year-end adjusting entries.
4. Prepare a multi-step income statement, retained earnings statement, and classified balance sheet.
5. Prepare a formal written business letter.

### **Class Observation and Academic Dishonesty**

The professor observed a variety of reactions by students in class while they were completing the project. The majority of students had a positive attitude toward completing the project and followed the instructions reasonably well. However, some students appeared to experience difficulty starting the project, which was mainly due to their weakness in Excel skills and/or completing spreadsheet analyses.

Although students were allowed to collaborate and discuss the project in small groups, the professor was concerned about the “free-rider” issue and academic dishonesty among students. The professor was more concerned with students in the nonrandomized data group and made a strong effort to emphasize the penalty for academic dishonesty and unethical behavior. According to Convery and Swaney (2012) academic dishonesty may be an issue since spreadsheets can be shared. In their study, they minimize dishonesty by providing students with examples of dishonest acts, referring them to the College of Business Code of Conduct, randomization of data across students, and requiring that students use identifying information in the header and footer of solutions.

## METHODOLOGY

### Participants

The participants are 149 undergraduate accounting students enrolled in a traditional Intermediate Accounting course over two semesters and taught by the same professor. The professor randomly partitioned students into two groups based on randomized versus nonrandomized data. Both groups received the same case information and instructions.

### Worksheet Data

All students in the nonrandomized data group had the same dataset and solutions. Each student in the randomized data group received a different dataset and solutions generated using Excel's random number functions and private macro commands embedded with a "shortcut" tab. When students download the initial project, the spreadsheet looks blank except for the shortcut tab (See Exhibit 1: Panel A). All numbers and information automatically appear in the spreadsheets once students click on the "shortcut" tab.

All students are required to follow the approach below to complete the following Excel worksheets.

(1) Advertisers' Worksheet: Advertisement data include 225 customers with randomly assigned advertisement dates. In addition, approximately 60 percent of the ads have multiple colors and can range in size from 8 to 88 inches. Customers have four months to pay advertisement fees in full once the ad is published in the sports magazines. Therefore, the cash collection dates are randomly generated over a four-month period.

(2) Subscribers' Worksheet: There are 589 magazine subscribers who are required to pay the annual subscription cost in advance before monthly magazines are distributed over a 12 month period. Therefore, students need to determine the amount of unearned revenue at year-end based on the number of magazines paid for in advance that have not been delivered to customers. In addition, 80 percent of 589 subscribers pay regular subscription rates and the remaining subscribers pay a 10%-off coupon rate.

(3) Other Information Worksheet: This worksheet includes accrual and adjusting transactions to update various accounts at year-end. Randomized data are included in this section as well. For example, to record depreciation expense, all depreciable assets are set at random multiples of useful life to avoid rounding errors when depreciation expense is computed. The January 1, 2017 Trial Balance shows the beginning of the year account balances. Students are required to record all transactions in the adjustment columns of the trial balance sheet which generates the account balances as of December 31, 2017.

(4) Financial Reports Worksheet: Students are required to prepare a multi-step income statement, retained earnings statement, and classified balance sheet using the year-end trial balance as of December 31, 2017.

(5) Letter to the Manager: Students are required to prepare a formal written letter to the manager explaining any difference between year-end net income and the cash balance on the balance sheet.

## Post-project Excel quiz and a Post-project Survey

A post-project Excel quiz was administered to assess students' Excel function skills at the completion of the project. A post-survey was also administered to examine students' overall satisfaction with the project.

### Statistical Test

Several t-tests were used to analyze the data. The first t-test was conducted at the beginning of the study to determine whether there was a significant difference between the academic performance of the students in the randomized versus nonrandomized groups. The next test was used to determine whether there was a significant difference between the performance of the randomized versus nonrandomized group on the five case assignments. The final tests were used for the post-project Excel quiz and post-survey.

## RESULTS

Table 1 shows the results of the students' performance in the case assignments. Panel A of the Table 1 reports the students' course grade before starting the project and the number of hours students spent completing the project. Panel B reports the students' grades on the five project assignments with a maximum score of five points for each assignment. Panel C reports the results of the post-project Excel quiz with a maximum score of four points.

Panel A of the Table 1 shows that there is no significant difference between the students' course scores in the randomized data group versus the nonrandomized data group before starting the project. However, we did find a significant difference at the 99% confidence level ( $t$ -value = 2.37) between the groups self-reported time to complete the project. The randomized data group spent more time (14.207 hours) to complete the project than the nonrandomized data group (9.351 hours). An explanation for the difference may be that students in the randomized group were not able to verify any information with their classmates since the data and solutions were different for each student. However, students in the nonrandomized group had the same data and answers and could easily verify and discuss their answers with each other.

Panel B of Table 1 summarizes students' performance on five assignments. The results show a significant difference at 99% confidence level ( $t$ -value= -3.58) for analyses of advertising revenue and accounts receivable. The nonrandomized group scored higher with a mean of 4.387 while the randomized group had a mean of 3.919. Also, the results show a significant difference at the 99% confidence level ( $t$ -value= -5.49) for analyses of both customer subscription revenues and unearned revenues. The nonrandomized group scored higher with a mean of 4.080 versus the randomized group with a mean of 3.338. In addition, the results show a significant difference at the 90% confidence level between the two groups in preparing adjusting entries. The nonrandomized group mean score was higher at 4.053 while the mean score for the randomized group was 3.824. A plausible explanation why the nonrandomized group scored higher on the three assignments above may be that all students in the group had the same data. This may have enabled them to collaborate and gain a quicker understanding of how to analyze the data.

Panel C of the Table 1 reports the results from the post-project Excel quiz. The results show a significant difference at the 99% confidence level ( $t$ -value=2.87) between the two groups. The mean score for the nonrandomized group was 3.338 and the mean score for the random

group was 2.920 out of a maximum score of four. The results indicate that the students in the randomized data group demonstrated more knowledge of Excel functions than the students in the nonrandomized data group. In summary, the results indicate randomization of data may lead to a better understanding of Excel functions.

Table 2 shows the results of the post-project survey which includes eight statements about students' perceptions of the project. Only three of the eight statements (5, 6, and 8) show a significant difference between the perceptions of the students in the randomized versus nonrandomized data groups.

The results of Statement 5 show a significant difference at the 90% confidence level ( $t$ -test = 1.78) with the randomized group mean score of 4.662 and the nonrandomized group mean score of 4.476. The results indicate that the randomized group perceived that the project enhanced their ability to better understand financial data as a whole versus a collection of unconnected parts.

The results of Statement 6 show a significant difference at the 95% confidence level ( $t$ -test = 2.13) with the randomized group mean score of 4.338) versus nonrandomized group mean score of 4.041). The results indicate that the randomized group perceived that the authentic nature of the project was more motivating since it was the first time many of them had encountered a project of this type.

The results of Statement 8 show a significant difference at the 90% confidence level ( $t$ -test = 1.67) with the randomized group mean score of 4.500 versus nonrandomized group mean score of 4.297. The results indicate that the randomized students had a better perception of the use of Excel to link assumptions and data to financial statements which enhanced their insight into model building for future assignments.

## **CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH**

As technology continues to advance, data analyses will continue to become more important in the business world. Therefore, it is important that accounting faculty implement data analyses assignments in the accounting curriculum. This study examined the effect of randomized versus nonrandomized data on student's academic performance using an Excel accounting project. Specifically, the study examines whether randomized data strengthens students' analytical, problem-solving, and Excel skills while manipulating and analyzing accounting data. Participants in the study are 149 undergraduate students enrolled in a traditional Intermediate course. Students are partitioned into two groups: one group received randomized data and the other group received nonrandomized data. Students in both groups were allowed to discuss the project with their peers.

The results show significant differences between students in the randomized versus nonrandomized data groups. First, students in the nonrandomized group spent less time completing the project than students in the randomized group. Second, students in the nonrandomized group scored higher on analyzing revenues and preparing adjusting entries than students in the randomized group. Third, the results of the post-project Excel quiz show that students in the randomized data group scored higher than students in the nonrandomized data group. The results of the post-project survey on students' perceptions of the project show that students in the randomized group versus students in the nonrandomized group perceived that the case strengthened their ability to understand financial data as a whole system versus unconnected parts. Furthermore, the students in the randomized group found the authentic nature of the

assignment to be very motivating and positive. Overall, the results indicate that an Excel project using randomized data requires more effort by students, strengthens their Excel, problem-solving, and analytical skills, enhances their ability to better understand accounting as a whole information system versus a collection of unconnected parts, and students perceive more satisfaction completing the project.

There are two specific limitations worth noting in this study. First, the generalizability of the results may be limited since the data was collected from students at one college. Second, only students' Excel, problem-solving and data analyses skills were examined in this study. The two limitations open up many avenues for future research. First, there is a need to examine students' proficiency in manipulating and analyzing data using other skills such as tableau and pivot tables. Second, future research can examine the effect of data manipulation on students' soft skills such communication and critical thinking.

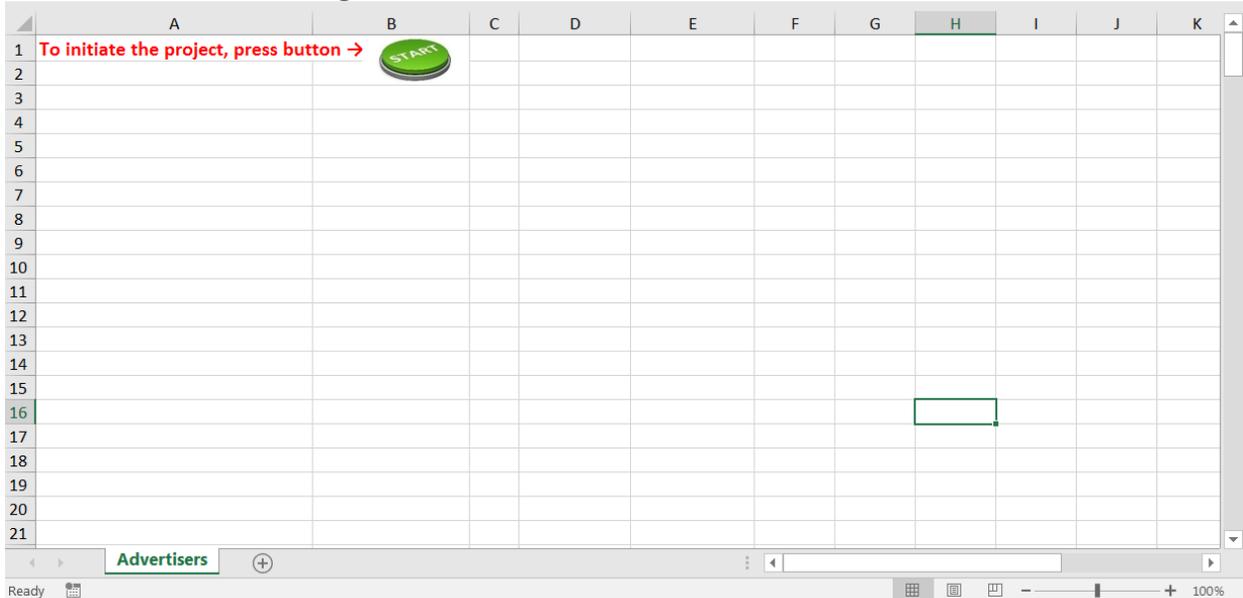
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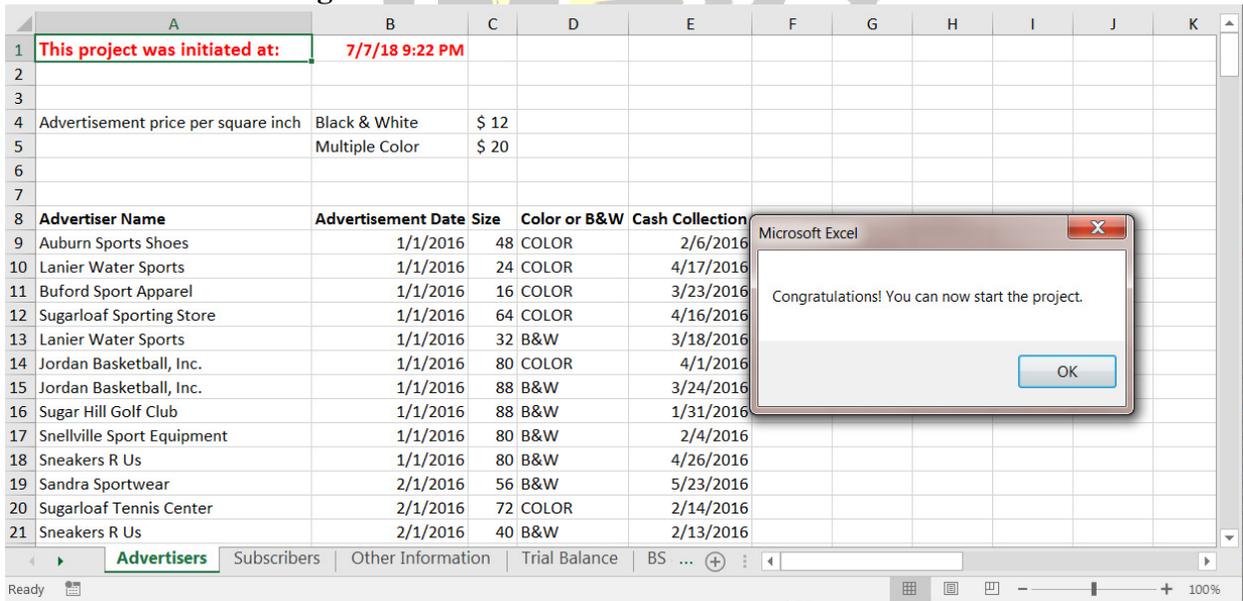
APPENDICES

Exhibit 1: Project assignment

Panel A: Before initiating data



Panel B: After initiating data



Panel A of Exhibit 1 shows the advertiser Excel spreadsheet before initializing data. Panel B of Exhibit 1 shows the advertiser Excel spreadsheet after initializing data. By clicking the “Start” tab, students see the initiated data in Panel B.

**Table 1****Students' Performance on the Project****Panel A: General Information on Student Groups**

	Nonrandomized Data Group (n=75)		Randomized Data Group (n=74)		Difference	
	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>t-value</u>
Course Score before the Project	79.751	9.54	79.846	9.56	0.095	0.06
Self-Reported Time to Complete the Project	9.351	5.13	14.207	16.33	4.856	2.37***

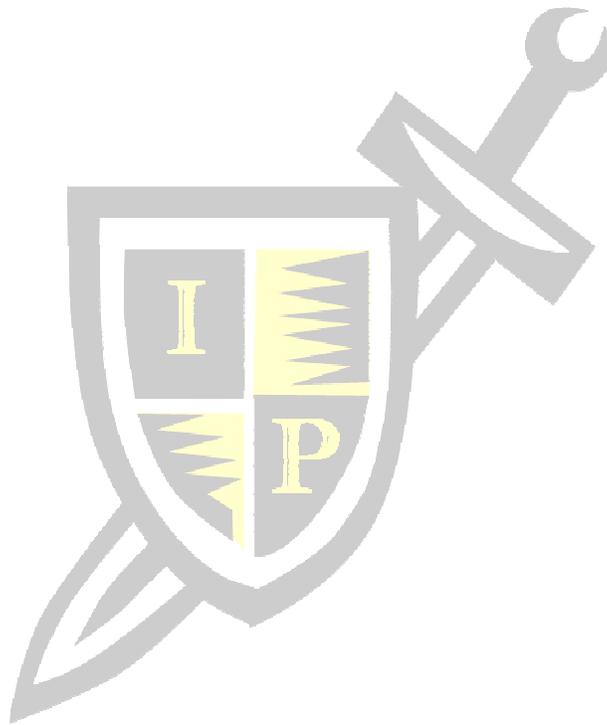
**Panel B: Students' Performance on the Project (Maximum five points each)**

	Nonrandomized Data Group		Randomized Data Group		Difference	
	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>t-value</u>
Analyses of Advertising Revenue and Accounts Receivable	4.387	0.68	3.919	0.90	-0.468	-3.58***
Analyses of Customer Subscriptions and Unearned Revenue	4.080	0.77	3.338	0.88	-0.742	-5.49***
Other Adjusting Entries	4.053	0.70	3.824	0.80	-0.229	-1.86*
Preparation of Financial Statements	4.040	0.86	3.986	0.85	-0.054	-0.38
Formal Letter to the Manager	3.800	1.03	3.878	0.94	0.078	0.49

**Panel C: Students' Performance on the Post-Project Excel Quiz (Maximum four points)**

	Nonrandomized Data Group		Randomized Data Group		Difference	
	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>t-value</u>
Students' Score at the Post-Project Excel Quiz	2.920	0.93	3.338	0.85	0.418	2.87***

\*\*\*(\*) significant at 99% (90%) confidence level



**Table 2**  
**Post-Project Survey: Students' Perceptions on Completing the Project**

<u>Survey Questions</u>	<u>Nonrandomized</u>		<u>Randomized</u>		<u>Difference</u>	
	<u>Data Group</u>		<u>Data Group</u>		<u>Mean</u>	<u>t-value</u>
	<u>Mean</u>	<u>Std Dev</u>	<u>Mean</u>	<u>Std Dev</u>		
1. The project helped me find and fix weaknesses in my understanding of journal entries.	4.149	0.81	4.351	0.71	0.203	1.62
2. The project helped me find and fix weaknesses in my ability to use the adjusted trial balance to create financial statements.	4.297	0.86	4.419	0.60	0.122	1.00
3. The project helped me find and fix weaknesses in my understanding of Advertising Revenue and Accounts Receivable.	4.135	0.83	4.284	0.73	0.149	1.15
4. The project helped me identify and correct weaknesses in my understanding of Subscription revenue and Unearned Revenue.	4.178	0.77	4.311	0.74	0.133	1.06
5. The project encouraged me to look at financial data as a whole system rather than a collection of unconnected parts	4.476	0.76	4.662	0.50	0.189	1.78*
6. The authentic nature of the project was motivating.	4.041	0.99	4.338	0.69	0.297	2.13**
7. The project improved my analytical skills more than an equal amount of time spent on homework type problems.	4.027	1.06	4.189	0.81	0.162	1.05
8. The use of Excel to link the assumptions and data to the financial statements gave me more insight into model building for future assignments.	4.297	0.86	4.500	0.60	0.203	1.67*

Table 2 reports results of the end-of-semester surveys on the project. The survey includes eight questions, with the scale of one for "Strongly Disagree" and five for "Strongly Agree"

\*\* (\*) significant at 95% (90%) confidence level