"Evaluating pedagogy in educating business majors: an empirical analysis of teaching accounting without debits and credits"

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EVALUATING PEDAGOGY IN EDUCATING BUSINESS MAJORS: AN EMPIRICAL ANALYSIS OF TEACHING ACCOUNTING WITHOUT DEBITS AND CREDITS

Abstract

An upper-level intermediate accounting course taught at two large mid-west universities in the United States provides a natural experimental setting to examine whether teaching debits/credits in the introductory financial accounting course matters. Students in the upper-level course fall into two groups: those who learned debits/credits in the introductory course and those who weren't. The performance of both groups is evaluated during the semester while they take the upper level accounting course. Regression results show that the prior knowledge of debits/credits offers only a mild advantage in the first mid-term exam, but not thereafter. Results also indicate that grade point average (standardized tests like ACT scores) are a good (not a good) predictor of the performance in the upper-level accounting class. These results suggest that teaching debits and credits in the introductory accounting course does not provide any advantage in learning the material of upper-level accounting course.

Keywords learning skills, accounting equation, debits/credits, accounting pedagogy, curriculum

JEL Classification A22, B40, M41

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INTRODUCTION

In the USA and the USA inspired curricula, introductory accounting students are introduced to the convention of recording increases and decreases in various accounts via the double-entry system of accounting. Historically, this was taught using the debit/credit approach, which we label as the "traditional approach" to teaching the introductory accounting course. The argument for using the traditional approach for teaching accounting is that it makes adjustments very straight-forward and facilitates interpretation of accounting policies that require such adjustments. The traditional approach has been taught with the assumption that those who know how to utilize debits/credits are far better at interpretation of accounting choices made.

More recently, an alternate approach has emerged that teaches the entire introductory accounting course without the use of debits and credits (henceforth the "alternate approach"). Rather than the debit/credit convention, the alternate approach discusses increases/decreases in various accounts. The purpose of this study is to provide evidence on whether the alternate approach is somehow deleterious to the performance of accounting majors in intermediate accounting. That is, are students who didn't learn debits and credits early in their introduction to accounting disadvantaged in learning the underlying skills to interpret higher level accounting choices?

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Several reasons, almost all anecdotal, can be found for the emergence of the alternate approach. The main argument espoused by proponents of the alternate approach is that the majority of students in introductory accounting are from other business majors (future users of financial accounting information), and not just the accounting majors (future preparers of financial accounting information). Thus, the argument holds that teaching debits and credits at this level is unnecessary for most students. This argument is based on several implied assumptions. First, it assumes that a user-oriented approach is better than a preparer-oriented approach at the introductory level. Second, it assumes that teaching debits and credits is not necessary unless a student is planning to be a preparer of financial information. In other words, the understanding of fundamental concepts of financial accounting for the general business major is sufficient without knowledge of debits and credits. Third, the traditional approach is somehow more onerous or hinders the learning of the necessary fundamental concepts for students and should not be imposed on students at the introductory level.

Indeed, if teaching debits and credits doesn't adversely affect the learning of fundamental accounting concepts by students, then a strong case can be made for using alternate approach. In fact, the alternate approach may remove an obstacle to learning these fundamental concepts for the non-accounting majors who have no vested interest in learning debit and credit conventions. If the alternate approach is superior to the traditional approach, then by switching to the alternate approach students will benefit. Even if there are no pedagogical differences in the learning effectiveness of the two approaches, then the use of the alternate approach is still more efficient in terms of the use of class time. By not spending class time on teaching debit and credit conventions, the time saved can be used several ways to improve and enhance classroom delivery. On the other hand, if the alternate approach is pedagogically inferior for accounting majors, then educational institutes should be discouraged to use this approach or create separate introductory accounting courses for accounting and other business majors (a Pandora's box to be sure).

Thus, an understating of whether a student learns fundamental accounting concepts differently under these two methods is important for students, instructors, and administrators alike. A research question that naturally arises is whether the alternate approach is different than the traditional approach from a student's learning perspective. An empirical examination of this question is important to accounting academics for it may lead to more efficient course design and improved pedagogy. Many universities in the past fifteen years or so switched from the traditional approach to the alternate approach. Several of these institutions subsequently reverted back to using the traditional approach, apparently judging that the alternate approach was inadequate. However, it is unlikely that such decisions were based on an empirical investigation comparing the two approaches because the extant literature has only scant empirical evidence that compares the two approaches. The only available empirical examination of this question in the accounting education research literature (Bernardi & Bean, 1999) concluded that the two approaches were not different in students' learning outcomes, using student performance in intermediate accounting as a proxy. Thus, the decision to continue or switch from one approach to the other is likely to be based on intuition, anecdotal evidence, or preference for one versus the other. A rigorous empirical examination of these two approaches can be very useful to academics making curriculum choices for the introductory accounting course.

In this paper, we conduct an empirical examination of the differences in learning outcomes between the traditional approach (i.e., debits and credits) and the alternate approach (i.e., increases and decreases) for an introductory accounting course required for all business majors in a post-secondary institution. The proxy for the learning outcome is the performance of the student in a subsequent upper-level accounting course required for accounting majors. We were able to conduct this examination in a natural experimental setting that arose in two medium sized public universities in the mid-west region (henceforth "Universities") of the United States of America. Universities offer

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bachelor's and master's degrees in accounting and switched from using the traditional approach to the alternate approach around 2001 and have been using the alternate approach ever since for the introductory course. Some of the students select accounting as their major and subsequently take Intermediate Financial Accounting I (henceforth Intermediate-I), a required course to continue as an accounting major that covers the accounting cycle and advanced topics primarily related to the asset side of the balance. Universities introduce debits and credits in the Intermediate-I course (i.e., there is no "bridge" course or separate course for accounting majors). Universities have articulation agreements to automatically accept transfer students from the community college system which includes credit for introductory accounting.[1] Thus, a student who has successfully completed the introductory financial accounting course elsewhere need not repeat the same course.[2] As a result, the Intermediate-I course in Universities typically consists of about half transfer students and half students from the home university.

The natural experiment results in the fact that a clear majority of these transfer students learned introductory accounting with a traditional debit and credit approach. This means that the Intermediate-I course taught at Universities has two groups of students, one that studied the introductory course in the traditional approach and knows debits/credits, and the other group that was taught the introductory course using the alternate approach and hasn't yet learned debits and credits. As a result, the Intermediate-I course introduces the use of debits and credits and assumes no prior knowledge of it. Debits and credits are introduced in the first few weeks of a sixteen- week semester and then other topics are covered. In this natural setting, we were able to examine the differences between the learning outcomes of students who had prior knowledge of debits and credits and those who didn't. We tracked the performance of these two groups over the first mid-term examination, the second mid-term examination, and the final examination. We conducted regression analyses using a dummy variable for traditional versus alternate approach, after controlling for factors like overall grade point average (GPA) and college entrance exams (e.g. ACT scores) that could generally explain the scholastic performance of students.

Our main findings indicate that prior knowledge of debits and credits does not affect the learning outcomes of students in the intermediate accounting course. This is true whether the exam is early in the semester, i.e., the mid-term exams, or, towards the end of the semester on the final exam. Our findings make an important contribution to the accounting education literature by suggesting that teaching debits and credits in an introductory level accounting course is not as important as believed by the academic community. This finding puts empirical evidence to a problem that has largely been argued on an anecdotal basis.

We acknowledge a few limitations of our study. We are constrained by the natural experiment research design of our paper. Neither university where the research was conducted requires an assessment test of transfer students. Thus, we are unable to ensure that students in the traditional group had retained their knowledge of debits/credit or had received effective knowledge of this approach.

The rest of the paper is organized as follows. Section II describes the main difference between the traditional approach and the alternate approach. Section III develops research hypotheses. Data, research design, and results are discussed in Section IV. Section V interprets results, provides suggestions for future research and concludes the paper.

1 Transfer credits for students from other institutions are handled on a case by case basis but credit is usually granted for introductory accounting courses completed at other institutions.

2 Most of the students who complete the introductory course elsewhere complete it at a two-year college where accounting is taught using the traditional double-entry (debit/credit) method. Some transfer students are from four-year college/universities. The choice to start the post-secondary education at a two-year college or a four-year college depends on several factors including the financial cost to study, ability, and the distance from the home of a student. We acknowledge that such choices may indirectly affect the results of our study; however, it was beyond the scope of our study at this time.

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1. LITERATURE REVIEW: TRADITIONAL VERSUS ALTERNATE APPROACH OF TEACHING ACCOUNTING

1.1. Accounting Pedagogy

Effective delivery of accounting education has been very important to the faculty and researchers alike. Significant literature exists that examines accounting pedagogy. One source of motivation for accounting pedagogy research is changes in the professional certification requirements, like the change to 150-hour rule for Certified Public Accountant (CPA) license also inspires research in pedagogy as accounting programs adapt to the changing professional landscape. Knechel and Rand (1994) noted that the increase in American Institute of Certified Public Accountants (AICPA) credit-hour requirement to 150-hours for granting CPA certification, made a drastic impact in accounting pedagogy.

This research is also propelled by recent accreditation needs of educational institutions, where the accreditation organizations ask the institute to demonstrate effective delivery of education, measurable outcomes, as well as efficacy of teaching methods being used. Colon, Badua and Torres (2015) discuss the "loop-closing" activities implemented by accounting programs in assurance of learning, a goal that accreditation organizations consider very important. Abott and Palatnik (2018) document students' perceptions of their first accounting class. They find, through a focus group, that students wish to know how the first accounting course connects to the business world and their other courses. Students were unsure of how they used critical thinking in the accounting course. Research has also documented efficacy of various class room techniques. Sugahara and Boland (2007) examined the effectiveness of using PowerPoint in an accounting class. Using a survey method and linking the preference for PowerPoint with exam scores, authors concluded that incorporating multi-media into the accounting classroom does not necessarily improve the effectiveness of students' learning outcomes. Knechel and Rand (1994) also noted the impact of accreditation process on accounting pedagogy. With shift towards online instructions all over the world, Basioudis and Lange (2009) examined the effectiveness of technology on accounting education. They used a survey response from students and concluded that design features of Blackboard like availability of lecture notes, online assessments, model answers and online chat were useful for student satisfaction. Alwis et al. (2014) examined the impact of teaching double entry system using Pacioli's methods in a newly designed introductory accounting course and found that using this technique the students' ability to understand and record accounting transactions improved beyond expectations. However, their results are questionable for lack of controls in the research design. Abeyskera (2015) examined students' preferences for instructional methods conditioned upon whether the course content was algorithmic or not. Teaching methods and course content also affect anxiety level of students in an accounting course. Buckhaults and Fisher (2011) examine this issue and find the pedagogy affects student anxiety level.

1.2. Traditional approach

Questions about how to improve preliminary accounting education were raised around the time the accreditation and the professional licensing landscape for accounting majors was changing. Baldwin and Ingram (1991) questioned the fundamental nature of elementary accounting education. Albrecht and Sack (2001) also questioned the state of accounting education at that time. The shift was away from traditional book-keeping and towards using accounting information for decision making purposes. In the first few weeks of an introductory accounting course using the traditional approach, students are first introduced to basic accounting concepts, principles, and assumptions, for example, the entity concept, conservatism, and the going concern assumption, to name a few. This is followed by the definition of financial statement elements like assets, liabilities, owners' equity, etc. Then students are introduced to financial statements like the income statement, balance sheet, etc. This is followed by an introduction to the basic accounting equation (*Assets = Liabilities + Owners' Equity*) and a gradual introduction to recording accounting transactions. The use of the journal entry, T-accounts, ledgers, and the debit-credit convention to record an increase and decrease in various accounts are usually introduced at this point. The accrual basis of accounting is introduced next and students are

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taught to make adjusting entries to record end-of-the-period balances in various accounts. Finally, students are taught the complete accounting cycle for a period, how to close accounts and to prepare financial statements. These topics are covered over about one-third of the semester, (five-to-six weeks of a 16-week semester). The amount of time spent on each topic described above, the depth covered, emphasis on each topic and indeed their sequence in the course outline varied only a little bit over many decades of teaching an introductory accounting course using the traditional approach. Such differences, if any, were primarily driven by individual instructor's teaching style and personal preferences.

1.3. Alternate approach

In the alternate approach, the focus is on the basic accounting equation and how accounting transactions affect this equation. Each transaction affects (increase or decrease) at least two accounts in the equation.[3] Debits and credits, T-Accounts, and the journal entry are not taught at all. Instead, the entire accounting cycle is taught using the basic accounting equation and increases and decreases in the equation. Rather than an expansion of the equation for the concept of revenues and expenses (also dividends), these are couched as increases or decreases in owners' equity. While discussing dual effects of transactions, this is done without the necessary time spent learning the debit and credit framework and conventions. The journal entry is not shown when discussing a transaction; instead, the pedagogy focuses on discussing the changes in elements of accounting equation as a result of a transaction. The accounting cycle coverage is minimal but does include recording adjusting and closing entries at the end of the accounting period again housing many changes under owners' equity.

1.4. A comparison of the two approaches

A comparison of the two approaches shows that in the traditional approach, students learn debits and credits by writing a journal entry into a general journal format (date, debit on the left column, credit indented, etc.) and posting of journal entry into the general ledger or T-accounts. In the alternate approach, this convention is not used, and the accounting equation effects are shown instead. For example, a sale on credit would be shown as a debit to accounts receivable and a credit to sales revenue under the traditional approach. Under the alternate approach, this would be shown as an increase in assets (Accounts Receivable) and an increase in owners' equity (Revenue). The related change in Retained Earnings is somewhat deemphasized in this approach.

Vangermeersch (1997) recommends that educational institutions should continue with the traditional approach, an approach that has worked for five centuries and withstood changes in accounting profession during the 19th and the early 20th centuries. He argued that the alternate approach (what he called the "plus and minus" approach, focuses on balance sheet accounts and ignores other accounts like revenue and expenses. Ingram (1997) counter-argues that the traditional approach provides no link to financial statements and further argues that the implied difference between the two approaches is just semantics:

It is neither easier nor more precise to say "debit cash and credit sales" than to say "increase cash and increase sales." The latter can be understood by most while the former is understood by those who have been trained in the rules of debits and credits. Otherwise, the two statements mean the same thing. (Ingram, 1977, p. 411).

Pincus (1997) argues that it is not essential to use the traditional approach. She argues that the developments in accounting software make the understanding of debits and credits and indeed the bookkeeping aspect of accounting less relevant in today's world and that the accounting education model needs to respond to this change. She argues that the traditional approach may perpetuate the wrong image about the accounting profession to students and can repel bright students from choosing accounting careers. Linsmeier (1996) similarly suggests that too much procedural focus in training of accounting majors, as in the traditional approach, can lead to a very narrow point-of-view at the workplace.

3 Debits/credits approach, i.e., the traditional approach is also known as double-entry book keeping system. We have avoided using the 'double-entry' term to describe the traditional approach because the alternative approach of using the accounting equation (Assets = liabilities + Owners' Equity) is also a double-entry system where a transaction affects at least two accounts without any reference to debits and credits.

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2. METHODOLOGY: HYPOTHESIS AND RESEARCH DESIGN

2.1. Hypothesis

Based on the discussion in earlier sections, the natural question that arises is whether different pedagogical approaches used to teach the introductory accounting course affect learning outcomes in the subsequent upper-level financial accounting class. On one hand, the traditional approach provides the knowledge of debits and credits prior to entering an upper-level class which can create a foundation upon which future concepts can be built. On the other hand, the alternate approach, by eschewing debits and credits, the journal entry, and T-accounts may not provide an adequate foundation. If debits and credits are foundational in nature as Vangermeersch (1997) argues, then we should find a difference in performance in the subsequent upper-level course. That is, Intermediate Accounting-I students who were taught the introductory accounting course using the alternate approach should perform poorly relative to students who were taught the previous course using the traditional approach. We should find no such difference if the debit and credit convention is semantic or non-essential as Ingram (1997) and Pincus (1997) argue, respectively. We state this proposition as the following hypothesis, in the null form:

H_0: *There is no significant difference in the learning outcomes of traditional and the alternate approaches of teaching an introductory accounting course.*

In our empirical analyses, we utilize the performance of accounting students at different stages of Intermediate Accounting-I to proxy for learning outcomes.

2.2. Research design

This study was conducted at two mid-west universities each with approximately 14,000 students overall and 3,500 in the business schools at the time the study was conducted. The Intermediate-I classes at each university include a mix of students who have studied the introductory accounting class using either the traditional or the alternate approach. The data for this study was collected over three consecutive semesters (excluding summer), the first two at one and the third at the other university. Due to a voluntary change of employment, the course was taught by the same instructor. Thus, we are able to control for teaching style across both universities. A survey was conducted at the beginning of each semester to record student GPA at the beginning of the semester when Intermediate-I was taken, the pedagogical approach used in the introductory accounting course that the student took, their grade in the introductory accounting class, and self-reported ACT or SAT scores. Neither university requires either the ACT or the SAT score for its admission, so the data for these two variables is not complete. We then measured the performance of all students in Intermediate-I during each semester over two mid-term exams and the final exam of the Intermediate-I course.

To examine the impact of the traditional versus the alternate approach, we estimate the following regressions:

$$Yi = \alpha + \beta_1 \cdot Dummy + \beta_2 \cdot GPA + \\ + \beta_3 \cdot Grade + \beta_4 \cdot Dummy \cdot GPA + \\ + \beta_5 \cdot Dummy \cdot Grade + \varepsilon, \quad (1)$$

$$Yi = \alpha + \beta_1 \cdot Dummy + \beta_2 \cdot GPA + \\ + \beta_3 \cdot ACT + \beta_4 \cdot Dummy \cdot GPA + \\ + \beta_5 \cdot Dummy \cdot ACT + \varepsilon, \quad (2)$$

$$Yi = \alpha + \beta_1 \cdot Dummy + \beta_2 \cdot Grade + \\ + \beta_3 \cdot ACT + \beta_4 \cdot Dummy \cdot Grade + \\ + \beta_5 \cdot Dummy \cdot ACT + \varepsilon, \quad (3)$$

$$Yi = \alpha + \beta_1 \cdot Dummy + \beta_2 \cdot GPA + \\ + \beta_3 \cdot Grade + \beta_4 \cdot ACT + \\ + \beta_5 \cdot Dummy \cdot GPA + \\ + \beta_6 \cdot Dummy \cdot Grade + \\ + \beta_7 \cdot Dummy \cdot ACT + \varepsilon, \quad (4)$$

where, Y – exam score of a student i in Intermediate-I; $Dummy$ = 1 if a student was taught introductory accounting with traditional

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approach, *Dummy* = 0 otherwise; *GPA* – overall Grade point average at the beginning of the semester when Intermediate-I class was taken; *Grade* – Student's grade in the introductory accounting class; *ACT* – Self-reported *ACT* score of a student.[4]

To examine the performance of students in Intermediate-I, we use the following three variables as the dependent variable (*Y*) in equations (1), (2), (3) and (4) and estimate these equations separately for each dependent variable:

EXAM1 = Student's score in the first mid-term exam, out of 100

EXAM2 = Student's score in the second mid-term exam, out of 100

FINAL_EXAM = Student's score in the final exam, out of 200.

If the traditional approach is superior to the alternate method for preparing students for Intermediate-I, then we should expect to find $\beta_1 > 0$. If prior *GPA*, the grade in the introductory accounting class, and the *ACT* score, combined with prior knowledge of debits and credits enhances student performance in Intermediate-I, then we should find that the interactive terms of *GPA*, *Grade,* and, *ACT* with *Dummy,* all have positive coefficients.[5]

3. RESULTS

Table 1 describes data collection and sample size. Data was collected for 294 students at the two universities. We deleted observations where students did not provide information about the pedagogical approach taken in their introductory accounting course or did not provide information about their grade point average. Panel A of Table 1 shows data collection for estimating equation (1). Using *Exam1* as the dependent variable, we had a sample of 255 students for whom the data on all variables needed to estimate equation (1) are available. Since the universities did not require *ACT* (or SAT) scores, only 148 students provided data on either for estimation of equations (2) through (4). The number of observations for *EXAM2* and *FINAL_EXAM* is lower than those for *EXAM1* highlighting the attrition common to Intermediate-I.

We collected data on student's performance in the first mid-term, given approximately five weeks after the start, and after debits and credits had been taught. We also recorded student performance in the second mid-term examination, given approximately ten weeks after the start, and the final examination, at the end of the semester. The number of total observations for estimation of equation (1) decreases from 255 at the time of the first mid-term to 242 at the time of the second midterm, and to 192 at the time of the final exam. This is entirely due to a student withdrawing from the course during the semester, a typical occurrence in Intermediate-I. The second mid-term examination was given prior to the final withdrawal date listed in on university's calendar, which possibly explains the sharp drop in the number of students who took the final examination. The drop rate, from the first exam to the final exam is 24.7 percent overall, 28.1 percent for one university and 16.9 percent for the other university.

Table 1. Data collection

Panel A: Data for main analyses, using GPA as an independent variable	
Survey Respondents:	
University 1	196
University 2	98
Total respondents:	294
Less: responses with missing data on GPA, Grade or Dummy	(39)
Number of observations for estimating equation (1) using EXAM1 as dependent variable	255
Less: Number of students who dropped the class between the first and the second mid-term exam	(13)
Number of observations for estimating equation (1) using EXAM2 as dependent variable	242
Less: Number of students who dropped the class between the second mid-term exam and the final exam	(50)
Number of observations for estimating equation (1) using FINAL_EXAM as dependent variable	192

4 Students were asked to provide data on their ACT or SAT scores. However, in most of the observations where this information was provided respondents reported their ACT scores. Thus we have decided to use ACT scores rather than SAT scores in the estimation of equation (2).

5 ACT and SAT scores which are often used as a proxy for student's aptitude are high predictors of a student's performance in intermediate accounting courses (Bernardi & Bean, 1999). To overcome the data limitation due to non-requirement of either for admission at the University, we used incoming GPA, as a proxy for a student's aptitude in our main analysis, the regression estimate of equation (1). For sensitivity analysis, we also conduct regressions using ACT score as an independent variable in place of GPA in equation (2), which reduces our sample from 160 to 109. We find that our findings are qualitatively similar when ACT is used instead of GPA.

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Table 1 (cont.). Data collection

Panel B: Data for supplemental analyses, using ACT score as an independent variable	
Total respondents:	294
Less: responses with missing data on ACT score, Grade or Dummy	(146)
Number of observations for estimating equation (2) using EXAM1 as dependent variable	148
Less: Number of students who dropped the class between the first and the second mid-term exam	(10)
Number of observations for estimating equation (2) using EXAM2 as dependent variable	138
Less: Number of students who dropped the class between the second mid-term exam and the final exam	(19)
Number of observations for estimating equation (2) using FINAL_EXAM as dependent variable	119
Notes:	
ACT = Self-reported ACT score of standardized college entrance test	
Dummy= Dummy variable = 1 if student studied debits and credits in his/her introductory accounting class; 0 otherwise	
EXAM1 = Student's score out of 100 in the first mid-term exam of Intermediate Accounting-I course	
EXAM2= Student's score out of 100 in the second mid-term exam of Intermediate Accounting-I course	
FINAL_EXAM = Student's score out of 100 in the final exam of Intermediate Accounting-I course	
GPA = Self-reported cumulative grade point average at the beginning of the semester of Intermediate Accounting-I course	
Grade = Self-reported grade in the introductory accounting class	

Panel B of Table 1 shows data available to estimate equation (2), i.e., responses where students provided *ACT* data. The number of observations available for estimating equation (2) is 149 for the first mid-term exam, declines to 139 for the second mid-term exam, and, to 120 for the final exam.

Table 2 provides summary statistics for our main sample, for full sample in Panel A, for the traditional group in Panel B, and for the alternate group in Panel C. Panel A of the table shows that 73 percent of the sample was taught introductory accounting course using a traditional approach, i.e., with debits and credits. The class average of the GPA is 3.03. The average grade for students in their introductory accounting class (*grade)* was 3.46 on a 4.0 scale. It should be noted that the minimum requirement for registering in Intermediate-I at both universities is a grade of C (2.0) in the introductory accounting course. The class average in the first mid-term exam was 67 percent, the second mid-term average was 57 percent and the final exam average was 56 percent.

Table 2. Summary statistics

Variable	N	Mean	Median	Std. Dev
Panel A: Full sample				
Dummy	255	0.73	1.00	0.44
GPA	255	3.03	3.20	0.91
Grade	255	3.46	4.00	0.63
ACT	148	24.54	24.00	3.48
Exam1	255	66.88	68.50	15.69
Exam2	242	56.74	59.00	18.78
Final_Exam	192	111.16	113.50	31.73
Panel B: Traditional group (i.e., students with prior knowledge of debits and credits)				
GPA	187	2.98	3.20	0.94
Grade	187	3.49	4.00	0.63
ACT	109	24.10	24.00	3.31
Exam1	187	65.80	68.00	15.41
Exam2	175	54.76	55.00	18.65
Final_Exam	137	109.83	111.00	32.39
Panel C: Alternate group (i.e., students with no prior knowledge of debits and credits)				
GPA	68	3.17	3.23	0.81
Grade	68	3.37	3.00	0.62
ACT Score	39	25.77	26.00	3.71
Exam1	68	69.86	70.25	16.18
Exam2	67	61.90	65.00	18.27
Final_Exam	55	114.47	120.00	30.04

Note: See Table 1 for variable definitions.

Panels B and C of Table 2 provide data separately for the traditional group and for the alternate group. The traditional group has lower GPA by 0.19 but the difference is not statistically significant.[6] The traditional group had a higher grade in the introductory accounting course by 0.12, although this difference is not significant. *ACT* score for the alternate group is higher by nearly 1.67 points, and this difference is statistically significant at the 1 percent level. The alternate group performed better by more than four percentage points in the first mid-term in comparison to the traditional group. This difference is statistically significant at the 10 percent level. This evidence is inconsistent with the notion that the traditional method of teaching introductory accounting course prepares a student better for upper-level accounting courses. The alternate group performed better than the traditional group in the second mid-term exam as well, by more than seven percentage points. This difference was statistically significant at the 1 percent level. The superior performance of the alter-

6 The significance of differences of means between the two groups is obtained from untabulated results of t-test procedure.

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nate group continued on the final exam as well, where their mean score was higher by 3.2 percent points. However, this difference was not statistically significant. Univariate results of Table 2 do not provide support in favor of the traditional approach. However, it is possible that these results may be driven by differences in control variables like overall GPA, ACT score, or performance in the introductory accounting course. We expect that all of these variables will be positively correlated to the performance in the upper-level course.

To examine the differences in performance of students from the traditional group and from the alternate group, we estimate equations (1) through (4) using the first mid-term score, *Exam1*, as a dependent variable. Table 3 reports regression results for first-mid-term scores. Regression estimates of equation (1) show that the coefficient on the dummy variable is positive and statistically significant at the 5 percent level. This indicates that the understanding of debits-and-credits had a positive impact on the first mid-term performance of students. This is not surprising since a large focus of the first mid-term exam is on the accounting cycle. Other factors that explain the performance in the first mid-term exam include the overall GPA ($p = 0.03$) and the grade in the introductory class ($p < 0.01$). The interaction of the grade with dummy was significantly negative but the coefficient is less than that on *Grade* or *Dummy*, implying a partial offset of the effects of each when combined. Although our paper does not investigate why this happens, these findings are consistent with observations of Linsmeier (1996), i.e., that too much focus on debits and credits can lead to a very narrow focus and this is partially detrimental when stepping up to the next level of courses. Based on anecdotal evidence, it is also possible that students who had studied under the traditional approach and performed well in the previous course did not prepare as well for the first mid-term thinking that they already knew the material.

In the remaining three equations, (2) through (4), neither the *Dummy* variable nor its interactions with other variables are significant in explaining the variation in the first midterm exam scores. In equations (2), (3) and (4), *ACT* was the most significant variable in explaining the performance of students in the first mid-term exam. Adding *ACT* as an explanatory variable reduces the number of observations, however, it dramatically improves the model's power to explain the variation in data, as measured by adjusted-R^2. This measure is nearly twice as high in equations (2) through (4) in comparison to equation (1). Thus, it appears that prior knowledge of debits and credits is nearly meaningless once aptitude is controlled for as measured by ACT scores.

Table 3. Regression results with the first mid-term exam scores (EXAM1) as the dependent variable

Estimated equation	(1)	(2)	(3)	(4)
Intercept	10.59	6.75	6.93	0.67
Dummy	31.05**	7.87	0.30	4.59
GPA	5.25**	5.30*	–	4.17
Grade	12.64***	–	6.45*	4.49
ACT Score	–	1.94***	1.75***	1.72***
Dummy · GPA	–3.33	–1.12	–	–0.88
Dummy · Grade	–7.37**	–	–0.92	–0.43
Dummy · ACT Score	–	–0.30	–0.08	–0.16
Number of observations	255	148	148	148
F-test	10.89***	14.67***	13.98***	11.62***
Adjusted R-Square	16.30%	31.74%	30.60%	33.58%

Notes: See Table 1 for variable definitions; *, ** and *** indicate statistical significance at 10%, 5% and 1% level respectively.

Next, we use the second midterm (variable *Exam2)* as a dependent variable in equations (1) through (4). Results of these regression estimates are provided in Table 4. Estimates of these equations show that by the time students took the second mid-term exam, any advantage that the traditional approach had over the alternate approach had disappeared. The coefficient on the dummy variable is not significant in any of the four equations reported in Table 4. When ACT is included as an explanatory variable, the coefficient on *Dummy* actually turns negative. In equation (1), the interaction term of *Dummy* and *Grade* has a negative coefficient and is again less than the coefficients on the individual terms suggesting a partial offset in the combination of having studied introductory accounting using the traditional approach and achieving a higher grade.

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Table 4. Regression results with the second midterm exam scores (EXAM2) as the dependent variable

Estimated equation	(1)	(2)	(3)	(4)
Intercept	4.88	25.33	25.07	15.89
Dummy	21.89	–23.13	–22.11	–19.83
GPA	5.65**	7.98**	–	6.27
Grade	11.58***	–	9.74*	6.74
ACT Score	–	0.60	0.32	0.27
Dummy x GPA	0.55	–0.19	–	0.56
Dummy x Grade	–8.96**	–	–3.59	–3.65
Dummy x ACT Score	–	0.63	1.00	0.89
Number of observations	243	139	139	139
F-test	10.72***	7.55***	5.69***	5.77***
Adjusted R-Square	16.72%	19.17%	14.53%	19.48%

Notes: See Table 1 for variable definitions; *, ** and *** indicate statistical significance at 10%, 5% and 1% level respectively.

Table 5. Regression results with the final exam scores (FINAL_EXAM) as the dependent variable

Estimated equation	(1)	(2)	(3)	(4)
Intercept	–5.84	–0.69	40.21	–2.97
Dummy	58.88	–11.11	–54.41	–16.20
GPA	19.96*	20.90**	–	19.47*
Grade	15.32**	–	9.61	0.73
ACT Score	–	1.93	1.82	0.20
Dummy x GPA	–15.53	–15.68	–	0.20
Dummy x Grade	–3.23	–	–3.31	0.91
Dummy x ACT Score	–	2.46	2.45	0.15
Number of observations	192	119	119	119
F-test	5.75***	7.28***	6.47***	5.26***
Adjusted R-Square	11.05%	21.02%	18.82%	11.05%

Notes: See Table 1 for variable definitions; *, ** and *** indicate statistical significance at 10%, 5%, and 1% level respectively.

Although the effect of ACT score disappears by the time students take the second midterm exam, *GPA* and a student's grade in the prior accounting class have positive and significant coefficients in the estimation of equations (2) and (3) respectively. Both have incremental information in explaining the performance of students in the second mid-term, as both are positive and significant in the estimation of equation (1): the coefficient on *GPA*.is significant at 5 percent level, while that on *Grade* is significant at 1 percent level. Results of Table 4 do not provide any evidence that the traditional approach of teaching accounting at lower level courses results in superior performance by students in upper-level courses once the course moves beyond what would be at least partially review material for those students having experienced the traditional approach in introductory accounting. That is, any advantage of the traditional approach disappears once the material covered moves past the basics of financial statements and the accounting cycle.

In Table 5, we provide results for the final exam. Like in Table 3 and Table 4, we estimate equations (1) through (4), but this time we use *FINAL_EXAM* as the dependent variable in each equation. In all cases, the coefficient on the *Dummy* variable is statistically insignificant. Coefficients on interactive terms of *Dummy* with other explanatory variables (*GPA, Grade,* and ACT) are also not significant. The coefficient on *GPA* is positive and significant in all three equations where it is used as an explanatory variable: at the 10 percent level in equation (1), at the 5 percent level in equation (2) and at the 10 percent level in equation (4). The coefficient of *Grade* in the prior accounting class is positive and statistically significant at the 5 percent level in equation (1) but is not significant in other equations where it is used. The coefficient on *ACT* is not significant in any of the equations, but the adjusted R-square is higher in each of the equations where it is used. Again, any superiority of using the traditional approach in teaching introductory level accounting course is not seen after the first exam.

3.1. Sensitivity analyses

We calculated the correlation between independent variables to examine whether any of the variables had a high correlation. The main variable of interest, *Dummy,* had low correlation with other independent variables. For other variables, the highest correlation was between *GPA* and *Grade* (0.31) and between *GPA* and *ACT* (0.21). As a precaution, we conducted our analyses by estimating equations by removing one of the high correlation variables one at a time. Our results were qualitatively similar to those reported earlier. We also used scores in *EXAM1* as an explanatory variable for estimating equations in Table 4, but our results and conclusions remained qualitatively the same. We also used both *EXAM1* and *EXAM2* as independent variables in estimating equations in Table 5 and found similar results. Finally, we used a dummy variable to identify the university where the survey was conducted. This dummy variable will control for different demographics as well as other university's culture-related factors. The regression

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results for all three exams were similar with or without the university dummy.

The research design itself introduces a conservative bias to our findings. Students in the traditional approach group had two shots at learnings accounting concepts with debits and credits, once in the introductory course, and the second time in the first part of the intermediate accounting course. In contrast, the alternate approach group had only one shot at debits and credits, in the first part of intermediate accounting course. Cumulatively, the first group had one full semester of learning accounting concepts using debits and credits that the second group did not have. Despite this advantage, the first group did not outperform the second group even in the first mid-term (after controlling for grade point average and SAT/ACT scores) where the first group was likely to have the most differential advantage over the second group. Throughout the semester, the first group had at least as much understanding (if not better) of the double-entry book keeping system as the second group, but this advantage did not translate into better understanding of upper level accounting concepts.

Readers must be cautioned not to over-interpret our conclusions. We are unable to control for retention of knowledge in our study. If students who had prior knowledge of debits/credits before taking Intermediate-I did not retain that knowledge, then our results would not be surprising. We can only speculate that such students, even with lack of retaining prior knowledge, would recover it quickly as this would be review. This would still argue in favor of an advantage or knowledge gap over the second group. Secondly, we can't be sure that the debit and credit conventions were taught effectively in the introductory course to the first group. Neither university gives an assessment test to transfer students which would allow for measuring the efficacy of prior learning. Ineffective prior learning would also explain our results. That said, the advantage on *Exam1* argues against this phenomenon.

CONCLUSION

Accounting academics have debated whether the use of debits and credits in an introductory financial accounting class is necessary for successful pedagogy. We were able to carry out a study in a natural setting where students in Intermediate-I consisted of two groups, one that had been taught debits and credits in their introductory financial accounting class and the other group that was taught using the alternate method. Measuring performance throughout the semester of the Intermediate Accounting class, we find that after controlling for students' overall *GPA*, their grade in the introductory accounting class, and their *ACT* score, there was no difference in the performance of students who had studied debits and credits earlier versus those who had not. Only early in the semester, in the first mid-term exam, where the accounting cycle is covered did students with prior knowledge of debits and credits show any superior performance. Even at this early stage, when *ACT* score was included in the regression, the debit-credit difference was not significant. Later in the semester, in the second midterm exam and in the final exam, the prior knowledge of debits and credits did not result in superior performance by students.

Overall, our results do not support the notion that students are ill-served if the introductory accounting class is taught using the alternate method. These findings support the notion that teaching debits/credits in an introductory class is a matter of teaching style rather than a pedagogical necessity. Our empirical results refute the claim of Vangermeerch (1997) and provide support to claims of Pincus (1997) and Ingram (1998). Our findings also provide support to conclusions of Bernardi and Bean (1999), i.e., that prior knowledge of debits-and-credits is not useful to students entering an intermediate accounting course. We also find that ACT score is a useful predictor of a student's performance in the first mid-term exam, but not in the later exams. These results refine findings of Bernardi and Bean (1999) with respect to SAT scores, by providing a temporal context to the usefulness of standardized scholastic tests like *ACT*. We also found that the overall *GPA* and the grade in the introductory accounting class were useful predictors of a student's performance in the upper-level course, but partially mitigated when interacted.

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In short, there is little evidence to support the need for teaching debits and credits at the introductory level other than the argument that this is the way it has been done in the past. If non-accounting majors do not need this information, and may, in fact, be worse off or biased by it, and accounting majors can easily learn this necessary information at the upper-level, then why bother teaching debits and credits in introductory accounting? The time saved not teaching this input language could then be used to give all students a broader understanding of the usefulness of accounting information and may attract more bright students.

Other factors unmeasured but anecdotally suggested like lack of effort or the narrow focus on book-keeping procedures are beyond the scope of our study. The nature of our research design also prevents us from controlling for retention and effectiveness of prior knowledge of debits/credits in the group of students who learned the introductory accounting course through traditional approach. Finally, the effectiveness of the two approaches is important not just for Intermediate-I course, but for graduation as accounting major and also obtaining the CPA license. These are left for future research.

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