

**Remediation of Knowledge Gaps for Underrepresented Minority Students:
Insights from a Natural Experiment in Financial Accounting**

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ABSTRACT

A curriculum change from the traditional two semesters of accounting (one financial covering the accounting cycle, one managerial) down to a one semester survey course (combining financial and managerial with no detailed accounting cycle or debits and credits coverage) leading to intermediate financial accounting provided a natural experimental setting to examine the efficacy of several methods of alleviating a significant gap in knowledge created by the change. During the transition period, students were given three options to satisfy prerequisites and enroll in Intermediate Accounting I: 1) Self-study and demonstrated ability by passing a multiple choice "gateway" examination; 2) a self-paced adaptive learning software, and demonstrated ability by passing a proctored computer examination within the same software, or 3) opting into a "bridge" course combining the adaptive learning software, in-class lecture and exercises, homework exercises, and proctored exams with demonstrated ability requiring a grade of C or above. Our results suggest that the latter method combining the adaptive learning tool with traditional classroom instruction resulted in no significant differences in assessed performance between underrepresented minority students and the broader student population. However, the adaptive learning tool alone resulted in significantly lower scores on assessed performance for the underrepresented minority students in this study.

I. INTRODUCTION

In a natural experiment created by a business school core curriculum change at a large university in the Southwest Region (as defined by the American Accounting Association), a significant gap in knowledge was created in the intermediate financial accounting sequence for many students during the transition period. As detailed in Brockbank et al. (2021), the curriculum change reduced the core accounting requirement for all business majors from the traditional two-semester model of a full semester of principles of financial accounting followed by a full semester of managerial accounting as prerequisites to Intermediate Financial Accounting I (Intermediate I hereafter). As a result of the reduction, a new single-semester Survey of Accounting course replaced the two principles courses. This course was designed to satisfy the needs of non-accounting majors in the school of business with a structure similar to an MBA accounting class. That is, it combines financial and managerial concepts with no emphasis on the accounting cycle or debit/credit dual-entry accounting. During a catalog change, students are often grandfathered into the catalog requirements and prerequisites in place at enrollment with the option of taking the new courses and/or adopting the course plan under the new catalog. Brockbank et al. (2021) find that assessed performance was superior for students that enrolled in and passed (C or higher) a newly created "bridge" course that combined an adaptive learning software (ALS hereafter) along with traditional coursework and proctored on-paper exams over students who demonstrated the ability to enroll in Intermediate I by passing a "gateway" exam or by utilizing the ALS and a proctored computer-based exam within the ALS. However, it is not clear that all students will perform similarly given the different routes to Intermediate I, particularly underrepresented minority (URM hereafter) students.¹

The purpose of this study is to utilize a natural experimental setting which created a knowledge gap in the financial accounting series in order to investigate if different remediation efforts affect URM students differentially. Brockbank et al. (2021) demonstrate the best practice for a particular situation

¹ For the purposes of this study, URM is defined as African-, Hispanic-, and/or Native-American. Our measurement of URM students is from self-identification on enrollment documents in the registrar system and discussed further below.

related to curriculum change, but their result is based on the cross-sectional finding for all students. The path in their study leading to Intermediate I included three options: 1) Self-study and demonstrated ability by passing a "gateway" examination; 2) a self-paced ALS, and demonstrated ability by passing a proctored computer-based examination within the ALS, or 3) opting into a "bridge" course combining the ALS, in-class lecture and exercises, homework exercises, and proctored exams with demonstrated ability requiring a grade of C or above (and at least a D average on exams). While the latter appears to be the superior method, creating bridge courses is costly and may only apply to particular situations. That said, insights can be drawn from the different pathways to Intermediate I from their study. In particular, by investigating each remediation pathway by comparing URM students to other students, we can gain insights into components of remediation that may be particularly important determinants of success (or failure) for URM students. Prior education research lends insight into the fact that each strategy may affect URM students in different ways, and our analysis allows us to test these findings within the confines of financial accounting.

Early studies on remediation were generally focused on examining the different methods of remedial instruction to determine which were most effective. In a summary of 30 years of remedial instruction studies, Boylan and Saxon (ND, the latest cited study was 1999) summarize that effective should be integrated with the curriculum, use mastery of learning techniques, and utilize variety in approach and method. As Brockbank et al. (2021) report, the bridge course is clearly the superior method for the overall population of students in their study and this is not surprising. The bridge course allows for adaptive learning, requires self-motivation to pass exams, and includes in-context and integrated instruction adopted into the curriculum rather than as an option (once the transition period had passed). The question this study addresses is whether URM students are equally successful in the different methods during the transitions period. URM students may be affected differently by 1) the self-study nature of the gateway exam, 2) the adaptive learning but out-of-context nature of the ALS, or 3) the integrated and structured nature of the bridge course. Insights from this natural experiment and any differential affect on URM students is an empirical question difficult to answer in laboratory settings.

We find that the bridge course is the superior method of remediation for this particular knowledge gap for all students. That is, URM and all other students show much higher performance on assessments in Intermediate I when taking the bridge course. Importantly, there is no significant difference in performance *between* URM and all other students who utilized the bridge course to prepare for Intermediate I. Said another way, the bridge course is an equitable solution for remediation of the knowledge gap created during the transition period of this particular curriculum change. We believe this result lends insights to the design of equitable remediation efforts in general. Also important is our finding for those students that chose a path other than the bridge course. It appears from our results that sending students to learn via ALS is an inequitable remediation solution. That is, URM students who chose the ALS performed significantly worse on assessments in Intermediate I. We further explore the results and potential explanations for these results below.

The remainder of the paper proceeds as follows. Section II summarizes the curriculum change and the transition period that created the natural experimental setting. Section III presents a literature review of the relevant education research related URM students with regard to remediation or accounting leading to our hypotheses. Section IV details our sample selection and descriptive statistics. Section V presents the research design and results. Section VI briefly summarizes and concludes.

II. CURRICULUM CHANGE AND TRANSITION PERIOD

The change in curricula detailed here resulted from an overhaul of the undergraduate core curriculum in the college of business. This redesign made two primary modifications. First, additional professional development courses were added at both the lower- and upper-division (placing stress on the number of courses required for business degrees). Second, faculty was charged with redesigning core courses to utilize active learning strategies and pare down to the minimum common set of knowledge required for all business majors. In accounting, this change resulted in a single survey course integrating financial and managerial accounting, focusing on the needs of preparers, and eliminating technical tools (such as debits and credits) specific to the accounting function.

Prior to this change, all business majors were required to complete two accounting courses

successfully: the first focused on principles of financial accounting, followed by the second focused on principles of managerial accounting. As is the case at many institutions, faculty routinely observed that students entered the next sequence of coursework (beginning with Intermediate Accounting I) with varying levels of preparation. Those differences in preparation were primarily attributed to two causes: 1) introductory coursework taken elsewhere (possibly covering debits/credits, possibly utilizing the plus/minus accounting equation framework, and varying with respect to rigor) and 2) the time lag between completion of introductory accounting and Intermediate Accounting I (typically at least 8 months). In an effort to remedy this problem, in 2009 the Accounting Gateway Exam ("gateway") was introduced. The intent of this exam was to evaluate whether students had retained sufficient knowledge of introductory accounting to proceed with upper-division coursework. Additionally, the gateway was intended to serve as a review before students began those junior- and senior-level courses. Initially this multiple-choice exam covered both financial and managerial topics, but in 2015 was modified to include only financial accounting topics in order to allow students to enroll in Intermediate I concurrently with introductory managerial accounting, thus reducing the time lag. In practical application, however, very few students chose this option.²

While the change in the business core was designed to benefit all majors via enhanced professional development, it created a problem for the accounting program. In particular, the preparer approach, the debit and credit framework, complete knowledge of the accounting cycle, and additional technical accounting skills would not be covered in the survey course but are necessary skills for accounting majors/minors. Two primary corrective actions were considered: (1) add a second introductory, blended course, capturing the topics not covered in the new survey course, and continue to require the gateway exam, or (2) add a new, upper-division "bridge" course focused on technical financial

² In fact, many students begin taking the gateway immediately following completion of the introductory financial accounting course yet still enrolled in Intermediate I following introductory managerial accounting. Unfortunately, this choice nullified the purpose of the gateway as a review tool for Intermediate I. Throughout the multiple-choice exam iterations, students were provided with study material, practice exams, live and recorded study sessions, and a free online textbook, all self-paced.

accounting. The former would cause confusion as an introductory/core course, but only for part of the business school and the latter was deemed as the preferred option to be handled in the school of accounting.

As is the case with many universities, articulation agreements require that certain courses be accepted from other universities. The articulation agreements at issue here do not cover upper-division courses. Accounting courses taken under these articulation agreements can pose problems for students continuing in upper-division accounting courses for two reasons. First, some universities offer these courses primarily for other audiences and the courses themselves may lack certain skills required for Intermediate I (e.g., the debit/credit framework and/or full coverage of the accounting cycle). Second, there is often a substantial time delay, possibly years, between introductory courses and Intermediate I for many transfer students. Lags are often observable when students take introductory accounting as a non-traditional or part-time student, as part of a concurrent enrollment program during high school, or other paths to Intermediate I. As such, requiring the bridge course as a strict prerequisite to Intermediate I for all home and transfer students allows better control of the content, rigor, and timing of concepts critical for success in Intermediate I.

In designing this bridge course, the decision was made to focus on the early material—typically taught as a review—in the Intermediate I textbook. From the survey course, students gain a basic understanding of the way financial accounting works and are familiar with the financial statements and how they relate to one another. In the bridge course, the students are provided with the opportunity to build on that foundational knowledge by obtaining the underlying technical skills (debits and credits) required in financial accounting and by applying those technical skills in more complex situations than are covered in the survey course. By covering this content thoroughly in the bridge course and requiring a passing grade of C in the course Intermediate I no longer includes a review of the accounting cycle and

financial statements typically covered in the first few weeks.³ This provided an additional benefit of shifting other topics, allowing more time to cover highly technical material in Intermediate I and II.

The transition to this new set of course requirements, however, presented a problem. Specifically, students on older degree sheets would not be required to complete the new bridge course and could, instead, take the old path that included two introductory courses and the gateway exam.⁴ Those students would, however, be taking the new version of Intermediate I (without an introductory review) and with students who had the benefit of the bridge course. Consequently, to provide a better leveling of the students entering Intermediate I, the decision was made to replace the multiple-choice gateway with the successful completion of a financial accounting program using an Adaptive Learning Software (ALS). The ALS is an assessment system that utilizes artificial intelligence to guide students through a selection of topics considering their individual knowledge of the material. By utilizing the ALS—rather than assessment only—the intention was to provide students with the opportunity to fully correct any deficiencies in their introductory financial accounting knowledge before entering Intermediate I. This new option the gateway went into effect during the semester the bridge course was first offered (Spring 2019).

Figure 1 depicts the change from the “old” program to the “new” sequence, which utilizes the bridge course. This figure also provides summary information about the financial accounting content covered in each related course, as well as the form, content, and requirements of the iterations of the gateway exam.

Figure 2 depicts the timing differences experienced by model “on-track” students across the old and new sequences. While this is just one example of student progress under each sequence, it illustrates one possible best-case scenario in terms of time delay between introductory financial accounting coverage and Intermediate I. In reality, students often took the gateway immediately after completion of introductory financial accounting, leading to frequent time lags of eight or more months between any

³ The course grade policy also sets a boundary condition on the proctored exams in the course in which the course grade cannot exceed the exam average by more than one letter grade. This effectively requires at least a D average on exams and enough overall points for a C course grade.

⁴ Students are allowed up to six years to complete the requirements outlined in a given degree plan.

review of that material and the start of Intermediate I. However, even under the new curriculum integrating and requiring the bridge course, the typical on-track student will still experience a 1- (winter break) to 3- (summer break) month lag between the end of the bridge course and beginning of Intermediate I.⁵

III. RELEVANT EDUCATION LITERATURE RELATED TO URM_s AND REMEDIATION

Workshop participants: This is a particular area where we kindly ask assistance in identifying relevant literature. While we are working on this currently, please send any suggested cites to Craig.Sisneros@okstate.edu or please bring up in the workshop. Any assistance is greatly appreciated!

Accordingly, we state the following hypotheses in the null form:

H1a/b/c: URM students perform no differently on Intermediate I assessment after transition from survey of accounting via a) the bridge course; b) Adaptive Learning Software; or c) self-study for a gateway exam.

IV. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

In order to obtain IRB approval, we rely on the dean's office to collect, aggregate, and anonymize all of the data used in this study. The data included in this study is from the assessment of learning data performed at the beginning of each semester for Fall of 2019 and Spring of 2020.⁶

V. RESEARCH DESIGN AND EMPIRICAL RESULTS

Research Design

⁵ This lag may still be longer if the student does not enroll in these courses in successive semesters. In regression tests, we include lag variables to control for this effect on assessment results and discuss below.

⁶ The collection of the data precludes any impact of the COVID-19 pandemic as all classes were fully functioning in-person at the beginning of 2020.

In the primary empirical portion of our analysis, we examine the following empirical model for the overall sample of students:

$$\begin{aligned}
 \text{Score} = & \beta_0 + \beta_1 \mathbf{Bridge} + \beta_2 \mathbf{URM} + \beta_3 \mathbf{Bridge*URM} + \beta_4 \text{Avg ACCT Grade} + \beta_5 \text{Female} \\
 & + \beta_6 \text{ACCT Major} + \beta_7 \text{Age} + \beta_8 \text{GPA} + \beta_9 \text{Credits Earned} + \beta_{10} \# \text{Intro Fin Attempts} \\
 & + \beta_{11} \text{ACT/SAT Percentile} + \beta_{12} \text{Days Since Fin ACCT Exam} + \varepsilon
 \end{aligned} \tag{1}$$

where:

Bridge = an indicator variable equal to 1 if the student had enrolled in and passed the bridge course prior to enrollment in Intermediate I, and zero otherwise;
URM = an indicator variable equal to 1 if the student self-identified as African-, Hispanic-, or Native American on enrollment documents, and zero otherwise;

All other variables are control variables and defined in Appendix 2.

To test the difference between URM and other students performance for those students that chose a path other than the bridge course, we estimate the following empirical model:

$$\begin{aligned}
 \text{Score} = & \beta_0 + \beta_1 \mathbf{ALS} + \beta_2 \mathbf{URM} + \beta_3 \mathbf{ALS*URM} + \beta_4 \text{Avg ACCT Grade} + \beta_5 \text{Female} \\
 & + \beta_6 \text{ACCT Major} + \beta_7 \text{Age} + \beta_8 \text{GPA} + \beta_9 \text{Credits Earned} + \beta_{10} \# \text{Intro Fin Attempts} \\
 & + \beta_{11} \text{Days Since Gateway Exam} + \beta_{12} \# \text{Gateway Attempts} + \beta_{13} \text{Gateway Score} \\
 & + \beta_{14} \text{ACT/SAT Percentile} + \varepsilon
 \end{aligned} \tag{2}$$

where:

ALS = an indicator variable equal to 1 if the student had passed the gateway exam via the ALS, and zero otherwise;

All other variables as previously defined or defined in Appendix 2.

Empirical Results

Summary Statistics

Our estimates of Equation (1)

Our estimates of Equation (2)

VI. CONCLUSION

We present evidence that remediation of a gap in knowledge should be handled carefully, especially for underrepresented minority students. In a natural experiment created by a curriculum change, this gap in knowledge was created for all students during the transition period from one catalog to the revised catalog. Students were given options to prepare for Intermediate Financial Accounting I that included a new bridge course or the options of a self-study period to prepare for a gateway exam or an adaptive learning software to prepare for a computer-based exam within the same software. Brockbank et al. 2021 showed clearly that the bridge course is the optimal tool to bridge this particular gap. Our results show that this method is equally effective for all students, particularly showing no significant differences between URM students and those not in the URM classifications we describe above. However, for those students who chose not to enroll in the bridge course, our evidence shows that URM students were particularly worse off when relying on the ALS. We believe there are several reasons including lack of integration to the curriculum as well as lack of context in explaining these critical concepts. We believe our results can be of use to educators in designing remediation programs that are equitable for all students.

While creating a bridge course was an opportunity provided by a change in the business school core, this is a very costly solution in terms of time, effort, and faculty support that may not be feasible absent the turmoil of a curriculum change. However, the clearly superior performance for all students demonstrated in Brockbank et al. 2021 coupled with the equitable results for URM students in this study provide evidence of the components of an effective remediation program. Particularly, the ALS combined with hands-on exercises and assessment tools works equally well for all students. Classroom exercises allow for both a give and take which is also provided by the ALS, but also allows the instructor to add context to exercises and concepts and explain the importance of those concepts for future courses. While instructor access and tutoring was available to students not taking the bridge course, those resources were rarely if ever utilized by students taking the gateway exam using either method. This "on your own" and for no credit other than entrance into Intermediate I method was harmful to all students, but particularly

harmful to URM students using the ALS method. When designing a remediation solution, our recommendation from these results is to make it personal, hands-on, and with clear assessment of milestones along the way as much as is feasible. That is, to ensure success for all students and equitability for potentially fragile URM students, try to make all remediation efforts mimic the classroom setting of a preparatory course.

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Appendix 1

Financial Accounting Assessment Questions

1. Consider the following list of accounts:

- Accounts Payable
- Cash
- Prepaid Rent
- Common Stock
- Salaries Payable
- Equipment
- Supplies
- Rent Expense

How many of these accounts have a normal credit balance?

- A) Three
- B) Five
- C) Two
- D) Four

2. Given the information in the table below, calculate the company's net income:

Sales revenue	\$350,000
Ending inventory	\$230,000
Advertising Expense	\$5,000
Unearned Revenue	\$45,000
Utilities Expense	\$3,000
Income Tax Expense	\$50,000
Sales returns	\$30,000
Cost of goods sold	\$180,000
Sales discount	\$20,000
Gain on sale of equipment	\$10,000

- A) \$72,000
- B) \$157,000
- C) \$62,000
- D) \$112,000

3. When a company makes an end-of-period adjusting entry that includes a credit to Prepaid Rent, the debit is usually made to:

- A) Rent Expense
- B) Rent Receivable
- C) Cash
- D) Rent Payable

4. Consider the adjustment process at the end of the accounting period.
 1. Record the adjusting entries in the journal.
 2. Prepare an adjusted trial balance to check the equality of the debits and credits.
 3. Determine the accounts requiring adjustment, using the unadjusted trial balance.
 4. Post the adjusting entries to the general ledger.

Place the items in the proper order.

- A) 3, 4, 2, 1
- B) 3, 1, 4, 2
- C) 1, 2, 4, 3
- D) 1, 4, 3, 2

5. Which of the following would **NOT** typically be used as an adjusting entry?

- A. Rent Expense
 Prepaid Rent
- B. Cash
 Deferred Revenue
- C. Interest Expense
 Interest Payable
- D. Deferred Revenue
 Service Revenue

6. The financial statement that represents the accounting equation is the:

- A) Balance Sheet
- B) Statement of Cash Flows
- C) Statement of Stockholders' Equity
- D) Income Statement

7. The primary purpose of closing entries is to:

- A) Ensure that all assets and liabilities are recognized in the appropriate period.
- B) Assure that adjusting entries balance.
- C) Prove the equality of the debit and credit entries in the general journal.
- D) Update the balance of Retained Earnings and prepare revenue, expense, and dividend accounts for next period's transactions.

8. Below is the company's Cash T-account.

Cash	
1,200	
5,200	3,100
3,300	

The \$5,200 amount could represent which of the following?

- A) Payment for salaries.
- B) Purchase of supplies on account.
- C) Collection from customers.
- D) Ending balance of cash.

9. How many of the following accounts will appear on the balance sheet?

- Equipment
- Service Revenue
- Deferred Revenue
- Salaries Expense
- Utilities Payable
- Prepaid Rent
- Common Stock
- Dividends

- A) 4
- B) 3
- C) 5
- D) 7

10. Below are amounts for the first three years of operations:

	Revenues	Cash Inflows	Expenses	Cash Outflows	Dividends
Year 1	\$10,000	\$8,000	\$8,000	\$5,000	\$1,000
Year 2	\$15,000	\$18,000	\$10,000	\$11,000	\$2,000
Year 3	\$20,000	\$17,000	\$14,000	\$15,000	\$3,000
Total	\$45,000	\$43,000	\$32,000	\$31,000	\$6,000

What is the balance of retained earnings at the end of the third year?

- A) \$6,000
- B) \$3,000
- C) \$7,000
- D) \$19,000

Appendix 2

Definition of Control Variables

Avg ACCT Grade

Female

ACCT Major

Age

GPA

Credits Earned

Intro Fin Attempts

ACT/SAT Percentile

Days Since Fin ACCT Exam

Figure 1: Overview of Financial Knowledge Gap During Transition: On-Track Student Example

Before Change	Intro Financial	➔	Intro Managerial	➔	MC Gateway	➔	Intermediate I
	<ul style="list-style-type: none"> • Preparer approach • Dr/Cr Framework • Accounting Cycle • Financial statement overview • Asset overview • Liability overview • Equity overview 				<ul style="list-style-type: none"> • Self-study tools • 70% or above required to pass 		<ul style="list-style-type: none"> • Brief Accounting Cycle Review • Financial Statements • Asset Accounting
Transition Period		➔		➔		➔	
		➔		➔	ALS	➔	Intermediate I
After Change	Survey of Accounting	➔		Bridge Course	➔		
	<ul style="list-style-type: none"> • User approach • Account increases and decreases • Simplified accounting cycle • Financial statement overview 	➔		<ul style="list-style-type: none"> • Full accounting cycle • Dr/Cr framework • 80% or above required 	➔		<ul style="list-style-type: none"> • New Revenue Recognition Standard • Asset Accounting

This figure depicts the change in financial accounting curriculum described within this paper.

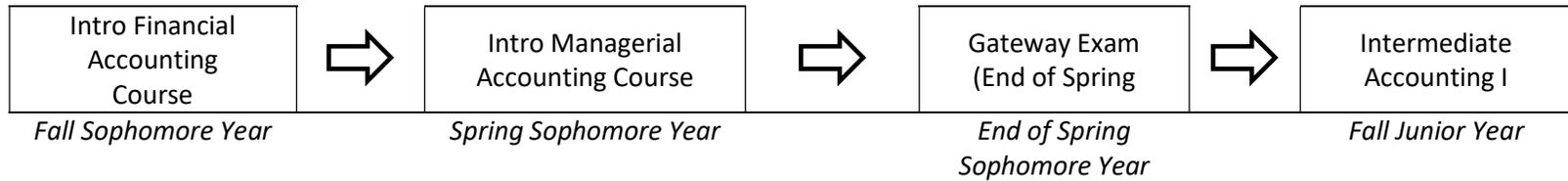
Progress in the baseline “before change” period is captured by the squares shaded in black. During that period, students completed a traditional financial and managerial introductory sequence and were required to pass a multiple choice (MC) gateway exam before beginning Intermediate I. For the sake of brevity, the content of the introductory managerial course is not discussed as it does not necessarily relate to success in the Intermediate I course as that course is purely financial.

Progress in the “transition period” is captured by the squares shaded in gray. During this period, students had three options to progress to Intermediate I. Students on old degree plans could either take the old introductory sequence (financial and managerial) or opt for the new survey of accounting course. Either group of students could opt to take the bridge course. Students not taking the bridge course were required to take the gateway exam. Students who had taken the gateway exam prior to the change in the program were able to enter Intermediate I utilizing passing scores from the multiple choice version of the exam. Students testing during the transition period were required to take the gateway exam administered in ALEKS. For the sake of brevity, the managerial accounting content in the survey course is not discussed as it does not necessarily relate to success in the Intermediate I course as that course is purely financial.

Progress in the post implementation, “after change” period is captured by the squares shaded in green. During this period, students take the survey course and bridge course before enrolling in Intermediate I. While it is possible that students on older degree sheets will petition to take the gateway rather than the bridge course, we have partnered with advising to help students understand why this path would have a lower likelihood of success relative to completion of the bridge course.

Figure 2: Overview of Timing Lag Across Sequence Change: On-Track Student Example

Old Sequence



New Sequence

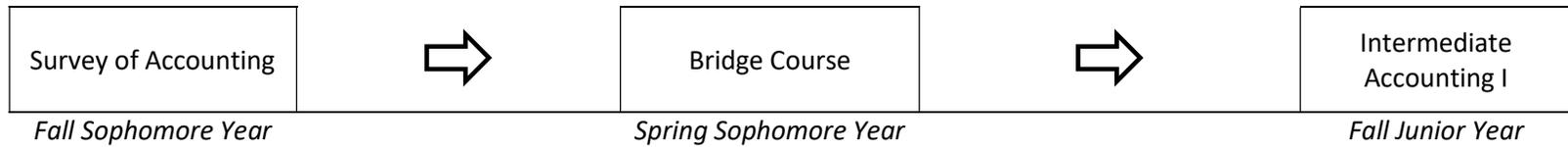


Table 1: Sample Selection

	Observations Lost	Total Number of Observations
Students taking the financial assessment during Fall 2019 and Spring 2020 semesters		300
Students with no available data for prior accounting courses ⁷	4	296
Students with missing ACT and/or SAT scores	50	246

⁷ Of these four students, two are students with majors outside of the business college and grades from previous courses were not available. The other two students are transfer students where financial accounting courses did not transfer for credit.

Table 2: Descriptive Statistics
Panel A: Overall Sample

	N	Mean	Std. Dev.	1 st Quartile	Median	3 rd Quartile
Score	300	75.03	17.38	60.00	80.00	90.00
Avg ACCT Grade	296	3.37	0.72	3.00	3.50	4.00
Female	300	0.39	0.49	0.00	0.00	1.00
ACCT Major	300	0.55	0.50	0.00	1.00	1.00
Age	300	21.19	2.68	20.00	21.00	22.00
GPA	300	3.33	0.50	2.99	3.40	3.75
Credits Earned	300	82.63	22.18	65.00	79.00	98.00
Days Since Fin ACCT Exam	297	113.09	97.06	47.00	112.00	119.00
Num Intro Financial Attempts	300	1.06	0.40	1.00	1.00	1.00
ACT/SAT Percentile	247	0.70	0.10	0.64	0.69	0.78
Bridge	300	0.55	0.50	0.00	1.00	1.00

Panel B: Comparison of Means for Bridge=1 and Bridge=0

	Bridge=1 N=165	Bridge=0 N=135	Difference	t-statistic
Avg ACCT Grade	3.39	3.35	0.04	0.44
Female	0.42	0.34	0.08	1.48
ACCT Major	0.66	0.41	0.25	4.52***
Age	20.65	21.84	-1.18	3.88***
GPA	3.43	3.21	0.22	3.89***
Credits Earned	73.21	94.14	-20.93	9.20***
Days Since Fin ACCT Exam	78.75	157.35	-78.60	7.31***
Num Intro Financial Attempts	1.01	1.13	-0.11	2.47**
ACT/SAT Percentile	0.71 N=147	0.68 N=100	0.03	2.52**

*, **, *** indicate significantly different from zero at the 0.1, 0.05, or 0.01 level, respectively, in a two-tailed test.

Panel C: Additional Descriptive Statistics for Non-Bridge Sample

	N	Mean	Std. Dev.	1 st Quartile	Median	3 rd Quartile
Adaptive Learning Software	133	0.78	0.41	1.00	1.00	1.00
Days Since Gateway	133	159.73	131.18	78.00	130.00	225.00
Num Gateway Attempts	133	1.36	0.72	1.00	1.00	1.00
Gateway Score	133	0.89	0.09	0.84	0.91	0.96

Table 3: Comparison of Assessment Scores**Panel A: Bridge Students Compared to Non-Bridge Students**

	Bridge=1 N=165	Bridge=0 N=135	Difference	t-statistic
Overall Score	81.15	67.56	13.59	7.31***
Adjusting Entry Questions	93.64	85.93	7.71	3.08***
Accounting Cycle Questions	89.55	78.52	11.03	4.78***
Calculation Questions	54.55	35.19	19.36	4.59***
Balance Sheet Questions	79.09	69.26	9.83	2.95***
Debit/Credit Questions	93.03	76.30	16.73	5.73***

*, **, *** indicate significance at the 0.1, 0.05, or 0.01 level, respectively, in a two-tailed test.

Panel B: Non-Bridge Students Compared Based on Prior Accounting Assessment Type

	Adaptive Learning Software N=103	Traditional Multiple Choice N=32	Difference	t-statistic
Overall Score	64.85	76.25	-11.40	3.33***
Adjusting Entry Questions	83.01	95.31	-12.30	2.41**
Accounting Cycle Questions	75.24	89.06	-13.82	3.08***
Calculation Questions	31.07	48.44	-17.37	2.53**
Balance Sheet Questions	68.45	71.88	-3.43	0.53
Debit/Credit Questions	74.27	82.81	-8.54	1.36

*, **, *** indicate significance at the 0.1, 0.05, or 0.01 level, respectively, in a two-tailed test.

Table 4: Regression Results

Panel A: Determinants of Assessment Scores for All Students- Estimate of Model (1):

$$Score = \beta_0 + \beta_1 \mathbf{Bridge} + \beta_2 \mathbf{URM} + \beta_3 \mathbf{Bridge*URM} + \beta_4 \mathbf{Avg ACCT Grade} + \beta_5 \mathbf{Female} + \beta_6 \mathbf{ACCT Major} + \beta_7 \mathbf{Age} + \beta_8 \mathbf{GPA} + \beta_9 \mathbf{Credits Earned} + \beta_{10} \mathbf{\# Intro Fin Attempts} + \beta_{11} \mathbf{ACT/SAT Percentile} + \beta_{12} \mathbf{Days Since Fin ACCT Exam} + \varepsilon \quad (1)$$

Variable	Coefficient (t-statistic)	Coefficient (t-statistic)
Bridge	9.137*** (4.041)	11.570*** (5.381)
URM	-1.447 (-0.407)	-3.709 (-1.063)
Bridge*URM	-3.618 (-0.794)	-1.997 (-0.441)
Avg ACCT Grade	3.488** (2.168)	3.970** (2.571)
Female	-4.227** (-2.115)	-5.249*** (-2.749)
ACCT Major	7.840*** (3.853)	7.952*** (4.012)
Age	-0.712 (-1.092)	-1.231*** (-3.358)
GPA	4.333* (1.652)	4.777* (1.934)
Credits Earned	0.043 (0.788)	0.053 (1.057)
# Intro Fin Attempts	3.341 (1.425)	3.977* (1.657)
Days Since Fin ACCT Exam	-0.007 (-0.745)	0.001 (0.066)
ACT/SAT Percentile	30.169*** (3.136)	
Constant	24.388 (1.396)	50.039*** (4.132)
N	254	296
Adjusted R-squared	0.313	0.302

Table 4 presents results of regressing the overall assessment score on the different student characteristics. Estimated coefficients are presented with t-statistics in the parentheses below. *, **, *** indicate significance at the 0.1, 0.05, or 0.01 level, respectively, in a two-tailed test.

Panel B: Determinants of Assessment Scores for Non-Bridge Students- Estimate of Model (2):

$$\text{Score} = \beta_0 + \beta_1 \text{ALS} + \beta_2 \text{URM} + \beta_3 \text{ALS*URM} + \beta_4 \text{Avg ACCT Grade} + \beta_5 \text{Female} + \beta_6 \text{ACCT Major} + \beta_7 \text{Age} + \beta_8 \text{GPA} + \beta_9 \text{Credits Earned} + \beta_{10} \text{\# Intro Fin Attempts} + \beta_{11} \text{Days Since Gateway Exam} + \beta_{12} \text{\# Gateway Attempts} + \beta_{13} \text{Gateway Score} + \beta_{14} \text{ACT/SAT Percentile} + \varepsilon \quad (2)$$

Variable	Coefficient (t-statistic)	Coefficient (t-statistic)
ALS	-21.091*** (-2.814)	-23.503*** (-3.427)
URM	11.670 (1.293)	10.013 (1.076)
ALS*URM	-18.128* (-1.838)	-17.426* (-1.706)
Avg ACCT Grade	-0.397 (-0.171)	-0.346 (-0.157)
Female	-2.874 (-0.752)	-2.747 (-0.799)
ACCT Major	8.332** (2.208)	8.065** (2.273)
Age	-0.312 (-0.189)	-1.232** (-2.008)
GPA	6.413 (1.573)	5.643 (1.486)
Credits Earned	0.035 (0.339)	0.013 (0.176)
# Intro Fin Attempts	5.397* (1.841)	5.889* (1.954)
Days Since Gateway	-0.025 (-1.329)	-0.028 (-1.550)
# Gateway Attempts	-0.493 (-0.217)	-0.424 (-0.206)
Gateway Score	65.575** (2.249)	56.088** (2.140)
ACT/SAT Percentile	14.005 (0.791)	
Constant	12.024 (0.289)	40.801 (1.575)
N	107	132
Adjusted R-squared	0.151	0.168

Table 4 presents results of regressing the overall assessment score on the different student characteristics. Estimated coefficients are presented with t-statistics in the parentheses below. *, **, *** indicate significance at the 0.1, 0.05, or 0.01 level, respectively, in a two-tailed test.