1. Gateway to Gains: Improved Grades, Passing and DFW rates in Gateway Courses Taught by ACUE Faculty at the University of Southern Mississippi, July 2021

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GATEWAY TO GAINS:

Improved Grades, Passing and DFW rates in Gateway Courses Taught by ACUE Faculty at the University of Southern Mississippi

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EXECUTIVE SUMMARY

The impact of the Association of College and University Educators (ACUE) credential on student course outcomes has been examined in several previous evaluations (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner & Snow, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019; Pippins, Hartigan et al., 2021; Pippins, Lawner et al., 2021). All prior evaluations have examined the impact on ACUE faculty who take the ACUE course in effective teaching practices on student outcomes, typically taken over a full academic year, with positive impacts found concurrently while faculty were earning their ACUE credential (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner & Snow, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019) and after faculty earned their ACUE credential (Hecht, 2019; Lawner & Snow, 2019b, Lawner & Snow, 2020; Pippins, Hartigan et al., 2021; Pippins, Lawner et al., 2021). However, ACUE also offers microcredential courses, which split up the modules from the course in effective teaching practices into multiple shorter courses taken over separate semesters. Like those who take the ACUE course in effective teaching practices, faculty who complete 25 modules through the ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction. Given the recent expansion of ACUE microcredential course offerings across partnering institutions, it is important to understand the impact of the courses on faculty effectiveness, as measured by student course outcomes.

This is the first evaluation to examine the impact of ACUE faculty who take ACUE microcredential courses. We focus on faculty and students at the University of Southern Mississippi (USM), which was one of the earliest partnering institutions to offer ACUE microcredential courses to faculty. USM is a public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer microcredential courses that allowed faculty to phase in to taking courses over time; therefore, there are no distinct cohorts of ACUE faculty at USM. From fall 2016 to spring 2020, 117 faculty at USM were taking and/or had completed at least one ACUE microcredential course. This evaluation focuses on the 18 faculty who took
ACUE microcredential courses over this time span and who taught gateway courses. Specifically, the changes in course outcomes for students taught in gateway course sections by ACUE faculty are compared to the changes in course outcomes for students taught in gateway course sections by non-ACUE faculty.

The evaluation found significant impacts of ACUE faculty on students’ course grades, passing rates, and DFW rates. Relative to the pre-ACUE period, there were significant improvements for students of ACUE faculty in course grades, passing rates, and DFW rates in the during-ACUE period, controlling for changes in student outcomes in course sections taught by non-ACUE faculty. Similarly, relative to the pre-ACUE period, there were significant improvements for students of ACUE faculty in passing rates and DFW rates in the post-ACUE period, controlling for changes in student outcomes in course sections taught by non-ACUE faculty. There is also evidence of heterogeneous effects by race/ethnicity and by class standing.

ABOUT ACUE

The Association of College and University Educators’ (ACUE) mission is to ensure student success and equity through quality instruction. In partnership with colleges, universities, higher education systems, and associations, ACUE prepares and credentials faculty in the evidence-based teaching practices that improve student achievement and close equity gaps. Numerous and independently validated studies confirm that students are more engaged, learn more, and complete courses in greater numbers—more equitably with their peers—when taught by ACUE-credentialed faculty. ACUE’s online, cohort-based credentialing programs are delivered through institutional partnerships and open-enrollment courses endorsed by the American Council on Education.¹

INTRODUCTION

To connect the dots between faculty development designed to improve instructional practices and the consequent impact on student outcomes, the Association of College and University Educators (ACUE) developed and

¹ To learn more visit acue.org.
offers courses in effective teaching practices based on the Effective Practice Framework—a consensus statement of the teaching skills and knowledge that every college educator should possess to teach effectively, regardless of discipline (Association of College and University Educators, 2016). ACUE also developed an accountability framework to conduct evaluations of its partnerships with colleges and universities. This accountability framework has six levels of evaluation: (1) faculty engagement, (2) faculty learning, (3) faculty implementation, (4) student engagement, (5) course-level student outcomes, and (6) institutional outcomes (see MacCormack et al., 2018). The current evaluation examines the impact of the ACUE-certified faculty on level 5.

The impact of ACUE faculty on student course outcomes has been examined in several previous evaluations, which found evidence of positive effects of ACUE faculty on student completion rates (Lawner, Snow, MacCormack, and Waltje, 2019), success rates (Hecht, 2019; Lawner & Snow, 2018), passing rates (Lawner & Snow, 2020), and average grades (Hecht, 2019; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019). However, all prior evaluations have examined the impact on ACUE faculty who take the ACUE course in effective teaching practices. ACUE also offers microcredential courses. Like those who take the ACUE “full” course, faculty who take ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction, but only after completing at least 25 modules. Given the recent expansion of ACUE microcredential course offerings across partnering institutions, this paper aims to understand the impact of the courses on faculty effectiveness, as measured by student course outcomes.

This evaluation uses student-level data to examine the impact that faculty at the University of Southern Mississippi (USM) who took ACUE microcredential courses have on student course outcomes. USM is a public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer microcredential courses that allowed faculty to phase in to taking courses over time. From fall 2016 to spring 2020, 117 faculty at USM were taking and/or had completed at least one ACUE microcredential course. This evaluation focuses on the 18 faculty who took ACUE microcredential courses over this

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2 Success rates as measured by earning grades A–C or a P (Pass) in courses.
time span and who taught gateway courses. Importantly, we restrict to gateway courses because they are a precursor to numerous academic programs at USM. This leads to several benefits: (a) most students are required to take at least one gateway course, (b) several sections of gateway courses are taught in any given semester, typically by multiple faculty, and (c) we can examine student performance in subsequent courses in the same field of study. To measure the impact of ACUE faculty on student performance in gateway courses, this evaluation uses a difference-in-differences approach that compares the changes in outcomes over time for students who were taught by an ACUE faculty member to the changes in outcomes over time of students taught by non-ACUE faculty members.

DATA AND SETTING

ACUE Faculty at USM

The data for these analyses came from USM’s Office of Institutional Research, which collects, archives, and maintains institutional data for the purpose of analyzing, distributing, and presenting summary information. Faculty at USM first began taking ACUE microcredential courses in fall 2016. Twenty-one faculty at USM took an ACUE microcredential course in fall 2016, with an additional 10 to 20 faculty phased in to taking ACUE microcredential courses in each subsequent semester. By spring 2020, 117 faculty at USM were taking and/or had completed at least one ACUE microcredential course. Of these 117 ACUE faculty, 18 taught a subset of gateway course sections between fall 2015 and spring 2020 (see Appendix Table 1 for a list of the gateway course titles and names).

The ACUE microcredential courses in effective teaching practices differed from the ACUE “full” course evaluated in prior studies in that faculty must have taken a series of three microcredential courses over three semesters to receive the ACUE Certificate in Effective College Instruction. Faculty at USM were able to take the ACUE microcredential courses in either the fall, spring, or summer term; however, they could only take one microcredential course per term to meet

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3 See Pippins, Chasteen et al. (2021).
4 In this paper, we use “faculty” to refer to a variety of non-students who were employed by USM and had teaching responsibilities. This nomenclature included tenure-track professors, adjunct professors, visiting professors, and other instructors.
the three-course requirement for the ACUE certificate. Most but not all faculty took their courses in three consecutive terms.

While taking the ACUE microcredential course, faculty were exposed to the Effective Practice Framework’s five major units of study: (1) Designing an Effective Course and Class, (2) Establishing a Productive Learning Environment, (3) Using Active Learning Techniques, (4) Promoting Higher Order Thinking, and (5) Assessing to Inform Instruction and Promote Learning. To satisfy course requirements, faculty actively engaged with content, were required to implement evidence-based practices, and wrote rubric-aligned reflections on their implementation, including citing changes in student behaviors (MacCormack et al., 2018).

Construction of Analytic Sample

The administrative data provided by USM’s Office of Institutional Research spanned from fall 2015 to spring 2020. The data included a faculty-level file that contained faculty characteristics (gender, hire date, rank) and a student-by-course-section-level file that contained course-section characteristics (course name, number, department, and type; term offered), student characteristics (gender, race/ethnicity, intended major, ACT scores), and student course outcomes (final grade). These files were merged to a list of ACUE faculty names that included the terms in which faculty took ACUE microcredential courses. Given the time span of the data and the phase-in of faculty to taking ACUE microcredential courses, we could identify the semesters before, while, and after faculty take an ACUE microcredential course. Although we were interested in the impact of faculty taking ACUE microcredential courses, we kept both ACUE and non-ACUE faculty in the sample to implement a difference-in-differences estimator, which we discuss in the Methods section.

After identifying ACUE and non-ACUE faculty, we excluded gateway courses taught by graduate students, graduate student course outcomes, courses taught in summer terms, labs that accompany gateway courses, and co-instructed courses, as well as courses with fewer than 10 students enrolled. We further limited our sample to first-time enrollments in gateway courses to reduce the possibility of systematic sorting of students who may drop, fail, or
withdraw from a course after their initial experience with a specific type of faculty. A common way to deal with students sorting is to restrict analyses to the first-time enrollments in gateway courses of freshman students. Although we believed there was minimal potential for students to sort based on ACUE faculty status—given the phase-in of faculty over time to taking ACUE microcredential courses—we restricted to freshmen in alternative analyses.

To determine the impact of ACUE courses on faculty effectiveness (henceforth referred to as the impact of ACUE faculty), we measured several student outcomes: course grades, completion rates, passing rates, and DFW rates. Course grades were converted from an alphabetic scale to a numeric equivalent (A = 4, B = 3, C = 2, D = 1, F = 0). Students who withdrew from a course before receiving a final grade or had grades that could not be converted to a numeric scale (e.g., P) were not included in analyses when course grades were used as an outcome. At USM, passing grades included “A,” “B,” “C,” “D,” “Z,” and “P,” and DFW grades included “D,” “F,” “W,” and NP. Students who received course grades of “NA,” “AUD,” or “I” were excluded from all analyses.

Summary Statistics

Table 1 shows that the final analytic sample contained 35,241 student-by-course-section-level observations, representing 18,021 non-unique student enrollments in 237 gateway course sections taught among 18 ACUE faculty and 17,220 non-unique student enrollments in 270 gateway course sections taught among 68 non-ACUE faculty between fall 2015 and spring 2020. Because non-ACUE faculty served as a control group for the ACUE faculty, we tested for covariate balance on a set of faculty covariates and presented the results in Table 1. Chi-square tests revealed no significant difference between ACUE and non-ACUE faculty in gender, $\chi^2(1, N = 86) = 1.09, p = .297$, years working at USM, $F(1, 84) = 1.19, p = .278$, tenure status, $\chi^2(1, N = 86) = .26, p = .611$, or rank, $\chi^2(3, N = 86) = 2.90, p = .408$. 
Table 1

*Characteristics by ACUE Status*

<table>
<thead>
<tr>
<th>Variable</th>
<th>ACUE</th>
<th>Non-ACUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>33.33</td>
<td>47.06</td>
</tr>
<tr>
<td>Years at university</td>
<td>4.60</td>
<td>6.28</td>
</tr>
<tr>
<td>Tenure (%)</td>
<td>0.61</td>
<td>0.54</td>
</tr>
<tr>
<td>Assistant professor (%)</td>
<td>38.89</td>
<td>29.41</td>
</tr>
<tr>
<td>Associate professor (%)</td>
<td>22.22</td>
<td>14.71</td>
</tr>
<tr>
<td>Professor (%)</td>
<td>0.00</td>
<td>10.29</td>
</tr>
<tr>
<td>Instructor (%)</td>
<td>38.89</td>
<td>45.59</td>
</tr>
<tr>
<td>Course sections taught</td>
<td>237</td>
<td>270</td>
</tr>
<tr>
<td>Student enrollments</td>
<td>18,021</td>
<td>17,220</td>
</tr>
<tr>
<td>N</td>
<td>18</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 2 presents sample means at the student-by-course-section level.\(^5\) The sample comprised 69% female students, 51% Pell recipients, and 34% first-generation students. By race/ethnicity, more than half the sample comprised White students (54%), followed by Black students (35%), then students categorized as “Other” (10%).\(^6\) Enrollments also comprised 40% freshmen, 35% sophomores, 15% juniors, and 10% seniors. Average ACT scores in English (22.85) and math (20.50) were slightly above the

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\(^5\) Because the means were taken over the entire sample, in which students appear multiple times if they took more than one gateway course title, the sample means might have diverged slightly from actual enrollments at USM.

\(^6\) The “Other” race/ethnicity category included all students whose race/ethnicity was not identified as White or Black in the USM data. These races/ethnicities included American Indian, Asian, Hispanic, Multiracial, and Pacific Islander, as well as those that were unspecified; they were collapsed due to small sample sizes.
### Table 2

*Summary Statistics of Analytic Sample*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>0.69</td>
<td>0.46</td>
<td>35,241</td>
</tr>
<tr>
<td>Black (%)</td>
<td>0.35</td>
<td>0.48</td>
<td>35,241</td>
</tr>
<tr>
<td>White (%)</td>
<td>0.54</td>
<td>0.50</td>
<td>35,241</td>
</tr>
<tr>
<td>Other (%)</td>
<td>0.10</td>
<td>0.30</td>
<td>35,241</td>
</tr>
<tr>
<td>Freshman (%)</td>
<td>0.40</td>
<td>0.49</td>
<td>35,241</td>
</tr>
<tr>
<td>Sophomore (%)</td>
<td>0.35</td>
<td>0.48</td>
<td>35,241</td>
</tr>
<tr>
<td>Junior (%)</td>
<td>0.15</td>
<td>0.36</td>
<td>35,241</td>
</tr>
<tr>
<td>Senior (%)</td>
<td>0.10</td>
<td>0.30</td>
<td>35,241</td>
</tr>
<tr>
<td>Pell recipient (%)</td>
<td>0.51</td>
<td>0.50</td>
<td>35,241</td>
</tr>
<tr>
<td>First generation (%)</td>
<td>0.34</td>
<td>0.47</td>
<td>35,241</td>
</tr>
<tr>
<td>ACT English score</td>
<td>22.85</td>
<td>5.22</td>
<td>35,241</td>
</tr>
<tr>
<td>ACT math score</td>
<td>20.50</td>
<td>3.93</td>
<td>35,241</td>
</tr>
<tr>
<td>Complete course (%)</td>
<td>0.93</td>
<td>0.26</td>
<td>35,241</td>
</tr>
<tr>
<td>Pass course (%)</td>
<td>0.81</td>
<td>0.39</td>
<td>35,241</td>
</tr>
<tr>
<td>DFW in course (%)</td>
<td>0.28</td>
<td>0.45</td>
<td>35,241</td>
</tr>
<tr>
<td>Grade</td>
<td>2.47</td>
<td>1.31</td>
<td>32,090</td>
</tr>
</tbody>
</table>
state averages of 18.2 and 18.1, respectively. Finally, course completion rates at USM were relatively high over time, averaging 93% (Appendix Table 2 suggests no significant changes between the pre-, during-, and post-periods). Importantly, high completion rates may have created a ceiling effect that reduced the margins for significant improvements. In comparison, passing and DFW rates were 81% and 28%, respectively. The average course grade over time was 2.47. In Appendix Table 2, we restrict to ACUE faculty and show how these sample means change over time.

METHODOLOGY

The primary goal of these analyses was to estimate the impact of ACUE faculty on student gateway course performance. To do so, we exploited the variation in timing in which faculty take ACUE courses and employed a difference-in-differences approach with two-way fixed effects. All analyses were conducted using Stata. In our main specification equation (not shown here), the parameters of interest were difference-in-differences estimators that captured the impact of ACUE faculty while and after taking an ACUE course on their students’ course performance. Analyses also controlled for student characteristics (English and Math ACT scores, class standing, gender, if first generation, if Pell Grant recipient, and race/ethnicity), as well as course and section characteristics (student enrollments, average ACT, and if course is within a student’s intended major).

Following Taylor and Tyler (2012), we made some parameter restrictions to account for collinearity between (a) years relative to faculty taking an ACUE microcredential course, (b) their years of experience, and (c) school year. First, because our outcomes are at the course-section level and course sections change each semester, we included semester fixed effects to control for overall trends in student outcomes that occurred over time in gateway courses at USM. Second, as previously explained, we identified the semesters before, while, and after faculty take the course. We therefore used a set of mutually exclusive dummy variables to parameterize time relative to taking ACUE

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7 State averages were based on 2018 scores. For more information, visit https://nces.ed.gov/programs/digest/d18/tables/dt18_226.60.asp
microcredential courses. Semesters before taking an ACUE course (pre period) were the omitted category for ACUE faculty, and dummy variables took on a value of 1 if faculty were concurrently enrolled in an ACUE course (during period) and/or if faculty had already received an ACUE certificate (post period). Third, we used the number of years since faculty had been hired at USM as a proxy for teaching experience. Although there are limitations to using years at USM in place of total years of teaching experience, we chose to include the former given (a) its availability, (b) the importance of separating the impact of ACUE faculty from the impact of increasing job experience, and (c) the plausibility that there exist returns to the first few years of teaching at a new institution; this might have been particularly important in our analyses given that in our sample ACUE faculty had been at USM for, on average, 4.6 years and non-ACUE for 6.28 years (see Table 1). Nevertheless, to the extent that the number of years at USM is correlated with total years of teaching experience, our estimates should be unbiased.

The set of control variables and fixed effects enabled the use of within-faculty over-time variation, which accounts for unobserved differences in teaching quality as well as nonrandom differences in selection of students to specific faculty. Therefore, our estimates reflect the gains/losses in achievement of students taught in gateway courses by an ACUE faculty before, while, and after taking ACUE courses compared to the gains/losses in achievement of students taught in gateway courses by non-ACUE faculty.

RESULTS

**Course Grades.** The DID estimates for the impact of ACUE faculty on student course grades were significant in the during period, $b = .12, SE = .03, 95\% CI [0.06, 0.18], p < .001$, but not significant in the post period, $b = -.00, SE = .04, 95\% CI [-0.08, 0.07], p = .923$. Specifically, the grades of students taught by ACUE faculty increased, on average, .12 points (on a 4.0 scale) from the pre-ACUE period to the during-ACUE period, controlling for changes among students taught by non-ACUE faculty (Figure 1).
Follow-up analyses restricted to college freshman to minimize bias related to any potential unobserved sorting of students to ACUE faculty over time. Although we believed it was unlikely that students selectively sort into (or out of) courses taught by ACUE faculty in the exact years that faculty begin or complete their ACUE course, the ability to sort would be least likely by freshman students given their relatively limited knowledge about different faculty. We observed 14,158 student-by-course-section-level outcomes when we restricted to college freshmen.

Follow-up analyses that restrict to college freshman reveal that DID estimates were significant in the during period, $b = .17, SE = .05, 95\% CI [0.08, 0.27], p = .001$, but not significant in the post period, $b = .01, SE = .07, 95\% CI [-0.12, 0.14], p = .859$. Specifically, the grades of freshmen taught by ACUE faculty increased, on average, .17 points (on a 4.0 scale) from the pre-ACUE period to the during-ACUE period, controlling for changes among freshmen taught by non-ACUE faculty.

**Passing Rates.** The DID estimates for the impact of ACUE faculty on student passing rates were significant in both the during period, $b = .04, SE = .01, 95\% CI [0.02, 0.06], p < .001$, and the post period, $b = .04, SE = .01, 95\% CI [0.02, 0.06], p = .001$. Specifically, the passing rates of students taught by ACUE faculty increased, on average, 4.3 percentage
points from the pre-ACUE period to the during-ACUE period, controlling for changes among students taught by non-ACUE faculty (Figure 2). Similarly, the passing rates of students taught by ACUE faculty increased, on average, 3.9 percentage points from the pre-ACUE period to the post-ACUE period, controlling for changes among students taught by non-ACUE faculty.

![Figure 2: Passing Rates for Students of ACUE Faculty by Time Period](image)

Note. The outcomes above reflect the regression-adjusted means.

Follow-up analyses that restrict to college freshman reveal that DID estimates were significant in the during period, \( b = .06, SE = .02, 95\% CI [0.03, 0.10], p < .001 \), and in the post period, \( b = .05, SE = .02, 95\% CI [0.01, 0.09], p = .027 \). Specifically, the passing rates of freshmen taught by ACUE faculty increased, on average, 6.4 percentage points from the pre-ACUE period to the during-ACUE period, controlling for changes among freshmen taught by non-ACUE faculty. Similarly, the passing rates of students taught by ACUE faculty increased, on average, 4.7 percentage points from the pre-ACUE period to the post-ACUE period, controlling for changes among students taught by non-ACUE faculty (Figure 3).
DFW Rates. The DID estimates for the impact of ACUE faculty on student DFW rates were significant in both the during period, $b = -0.04$, $SE = 0.01$, 95% CI [−0.06, −0.02], $p < .001$, and the post period, $b = -0.03$, $SE = 0.01$, 95% CI [−0.05, −0.00], $p = .025$. Specifically, the DFW rates of students taught by ACUE faculty decreased, on average, 3.8 percentage points from the pre-ACUE period to the during-ACUE period, controlling for changes among students taught by non-ACUE faculty. Similarly, the DFW rates of students taught by ACUE faculty decreased, on average, 2.9 percentage points from the pre-ACUE period to the post-ACUE period, controlling for changes among students taught by non-ACUE faculty (see Figure 4).
Follow-up analyses that restrict to college freshman reveal that DID estimates were significant in the during period, $b = -0.05$, $SE = .02$, 95% CI $[-0.09, -0.02]$, $p = .002$, but not significant in the post period, $b = -0.03$, $SE = .02$, 95% CI $[-0.08, 0.01]$, $p = .147$. Specifically, the DFW rates of freshmen taught by ACUE faculty decreased, on average, 5.3 percentage points from the pre-ACUE period to the during-ACUE period, controlling for changes among freshmen taught by non-ACUE faculty (see Figure 5).
**Course Completion.** The DID estimates for the impact of ACUE faculty on student course completion were not significant in either the during period, $b = .00, SE = .01, 95\% CI [-0.01, 0.02], p < .580$, or the post period, $b = .01, SE = .01, 95\% CI [-0.00, 0.03], p = .168$. Results therefore provide no evidence of a differential improvement in completion rates over time between ACUE faculty and non-ACUE faculty.

Follow-up analyses that restrict to college freshman also reveal no evidence of an impact of ACUE faculty on student course completion in either the during period, $b = .01, SE = .01, 95\% CI [-0.01, 0.03], p = .485$, or the post period, $b = .02, SE = .01, 95\% CI [-0.01, 0.05], p < .153$.

**HETEROGENEITY**

Additional analyses examined the heterogenous impact of ACUE faculty on student course outcomes by race/ethnicity. We employed a fully interacted model whereby indicators for race were interacted with every variable in our main specification equation (c.f., Denning, 2017).

**Course Grades.** Using White students as the comparison, there were no significant interactions between race and the impact of ACUE faculty on course grades for Black students in either the during period, $b = .01, SE = .04, 95\% CI [-0.07, 0.09], p = .776$, or the post period, $b = -.04, SE = .04, 95\% CI [-0.11, 0.03], p = .251$. Similarly, there were no significant interactions between race and the impact of ACUE faculty on course grades for “Other” students in either the during period, $b = .05, SE = .06, 95\% CI [-0.08, 0.17], p = .459$, or the post period, $b = -.01, SE = .06, 95\% CI [-0.12, 0.11], p = .912$. These results therefore provided no evidence that there was a differential impact of ACUE faculty on student course grades for Black or “Other” students compared to White students.

**Passing Rates.** Using White students as the comparison, there was no significant interaction between race and the impact of ACUE faculty on passing rates for Black students in the during period, $b = .02, SE = .01, 95\% CI [-0.01, 0.04], p = .130$; however, there was a significant interaction between race and the impact of ACUE faculty on passing rates for Black students in the post period, $b = -.02, SE = .01, 95\% CI [-0.05, -0.00], p = .025$. Conversely, there were no
significant interactions between race and the impact of ACUE faculty on passing rates for “Other” students in either the during period, $b = .01$, $SE = .02$, 95% CI $[-0.03, 0.05]$, $p = .566$, or the post period, $b = -.01$, $SE = .02$, 95% CI $[-0.05, 0.02]$, $p = .505$. In summary, passing rates increased more for White students (5.1 percentage points) than for Black students (2.5 percentage points) from the pre-ACUE period to the post-ACUE period, controlling for changes among students taught by non-ACUE faculty (see Figure 6).

![Figure 6: Passing Rates for Students of ACUE Faculty by Time Period and Race/Ethnicity](image)

*Note.* The outcomes above reflect the regression-adjusted means.

**DFW Rates.** Using White students as the comparison, there was no significant interaction between race and the impact of ACUE faculty on DFW rates for Black students in the during period, $b = -.01$, $SE = .01$, 95% CI $[-0.04, 0.02]$, $p = .460$; however, there was a significant interaction between race and the impact of ACUE faculty on DFW rates for Black students in the post period, $b = .03$, $SE = .01$, 95% CI $[0.01, 0.05]$, $p = .015$. Conversely, there were no significant interactions between race and the impact of ACUE faculty on DFW rates for “Other” students in either the during period, $b = -.01$, $SE = .02$, 95% CI $[-0.05, 0.03]$, $p = .593$, or the post period, $b = .02$, $SE = .02$, 95% CI $[-0.02, 0.06]$, $p = .338$. In summary, DFW rates decreased more for White students (4.4 percentage points) than for Black students (1.3 percentage points) from the pre-ACUE period to the post-ACUE period, controlling for changes among students taught by non-ACUE faculty (see Figure 7).
Note. The outcomes above reflect the regression-adjusted means.

**Course Completion.** Using White students as the comparison, there were no significant interactions between race and the impact of ACUE faculty on course completion rates for Black students in either the during period, $b = -.00$, $SE = .01$, 95% CI [–0.02, 0.01], $p = .643$, or the post period, $b = -.01$, $SE = .01$, 95% CI [–0.02, 0.01], $p = .343$. Conversely, there was a marginally significant interaction between race and the impact of ACUE faculty on course completion rates for “Other” students in the during period, $b = .02$, $SE = .01$, 95% CI [–0.00, 0.05], $p = .084$; however there was no significant interaction between race and the impact of ACUE faculty on course completion rates for “Other” students in the post period, $b = .00$, $SE = .01$, 95% CI [–0.02, 0.02], $p = .980$.

**College Freshmen.** Like the main analyses, we also examine the heterogenous impact of ACUE faculty by race/ethnicity after restricting to college freshman. Here, we only report significant effects. Using White students as the comparison, there was a significant interaction between race and the impact of ACUE faculty on DFW rates for Black students in the during period, $b = -.06$, $SE = .02$, 95% CI [–0.11, –0.01], $p = .013$. Specifically, DFW rates decreased more for Black students (8.8 percentage points) than for White students (2.8 percentage points) from the pre-ACUE period to the during-ACUE period, controlling for changes among students taught by non-ACUE faculty (see Figure 8).
DISCUSSION

This evaluation provided evidence that student course outcomes improved in gateway courses taught by faculty who took ACUE microcredential courses between fall 2016 and spring 2020. Improvements in average course grades, passing rates, and DFW rates occurred for students in gateway course sections taught by ACUE faculty while faculty were taking ACUE microcredential courses. Improvements in student passing rates and DFW rates also occurred in the years after faculty completed the ACUE microcredential course, demonstrating the sustained impact of receiving an ACUE certificate. Examining interactions with race/ethnicity showed that these sustained impacts of ACUE-certified faculty on student passing rates and DFW rates were larger for White students than for Black students.

Improvements in student passing rates and DFW rates remained apparent after restricting our sample to college freshmen. Although there were only sustained improvements in passing rates in the post period, the magnitudes of estimates in the during period were larger for college freshman than for the full sample, indicating that freshmen may see a particular benefit from ACUE faculty in gateway course sections. Importantly, examining interactions with race/ethnicity showed that the impact on DFW rates was 6 percentage points larger for Black freshmen than for White freshmen.
These results add to prior research finding an impact of ACUE faculty on student course outcomes (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019). However, this study extends the previous research by demonstrating the impact of the ACUE faculty who took the ACUE microcredential course as opposed to the full ACUE course, thus furthering our knowledge on the impact of different types of ACUE course offerings. No previous evaluations have examined the impact of the ACUE microcredential course.

One limitation of the current study is that the analyses do not account for clustering of outcomes, such as within sections, courses, instructors, or individuals. Accounting for clustering of units is common to empirical work as the nonindependence of units can affect the standard errors and thus statistical significance. However, given that some instructors teach multiple gateway course titles and that courses include some sections taught by ACUE faculty and others taught by non-ACUE faculty, it is unclear whether courses should be considered nested within faculty or vice versa. How data should be clustered is additionally complicated by students who are taught by both ACUE faculty and non-ACUE faculty. In these cases, the interdependence of observations makes it more difficult to find significant differences because it means that the observations across clusters—e.g., students across faculty—are correlated. Furthermore, the benefit of the ACUE course on students’ growth mindset, for example, could carry over into those students’ outcomes in their other courses. Therefore, the complicated nature of the data makes for a more conservative test of the ACUE impact in some ways, and a more liberal test in other ways—variations that could balance each other out. However, future research should account for at least one aspect of the clustered nature of the data.

Future research should also explore why improvements in student outcomes were, on one hand, larger for Black freshmen than for White freshmen while faculty were earning their credential and, on the other hand, broadly larger for White students than for Black students in the years after faculty were credentialed. One possible reason is that, while taking an ACUE microcredential course, ACUE faculty at USM have access to interactive resources. For example, USM
held weekly meetings for ACUE faculty. To the extent that these meetings allowed for discussions on fostering racially inclusive environments, they may have been particularly consequential for Black freshmen. Therefore, reduced access to these interactive resources might explain why improvements were not sustained for Black freshman. Conversely, certain structural and curriculum changes might have been adopted that partially explain broader sustained improvements.

REFERENCES


Pippins, T., Hartigan, L., Lawner, E. K., & Snow, M. (2021). Worth the wait: Improved grades in sections taught by ACUE faculty at Purdue University Northwest in the year after they earned their credential. Association of College and University Educators.


**Appendix Table 1**

*Gateway Courses at USM*

<table>
<thead>
<tr>
<th>Course title</th>
<th>Course name</th>
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<tbody>
<tr>
<td>BSC 110</td>
<td>Principals of Biological Science I</td>
</tr>
<tr>
<td>BSC 250</td>
<td>Human Anatomy and Physiology I</td>
</tr>
<tr>
<td>BSC 251</td>
<td>Human Anatomy and Physiology II</td>
</tr>
<tr>
<td>CHE 106</td>
<td>General Chemistry I</td>
</tr>
<tr>
<td>HIS 101</td>
<td>World Civilizations</td>
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<td>MAT 99</td>
<td>Intermediate Algebra</td>
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<td>MAT 100</td>
<td>Quantitative Reasoning</td>
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<td>MAT 101</td>
<td>College Algebra</td>
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<tr>
<td>PSY 110</td>
<td>General Psychology</td>
</tr>
<tr>
<td>SOC 101</td>
<td>Principles of Sociology</td>
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### Appendix Table 2

**Summary Statistics for Students of ACUE Faculty by Time Period**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-mean</th>
<th>SD</th>
<th>Obs</th>
<th>During-mean</th>
<th>SD</th>
<th>Obs</th>
<th>Post-mean</th>
<th>SD</th>
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<td>Female (%)</td>
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<td>Black (%)</td>
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<td>5,289</td>
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<td>White (%)</td>
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<td>5,289</td>
<td>0.52</td>
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<td>Other (%)</td>
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<td>0.11</td>
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<td>Freshman (%)</td>
<td>0.48</td>
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<td>5,289</td>
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<td>Sophomore (%)</td>
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<td>Pell recipient (%)</td>
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<td>Passing (%)</td>
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<td>DFW (%)</td>
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<td>Grade</td>
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<td>4,895</td>
<td>2.38</td>
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</table>
WHAT HAPPENS NEXT?

Better Subsequent Course Grades and DFW Rates After Taking Gateway Courses With ACUE Faculty at the University of Southern Mississippi

Theo Pippins, MS
Amy Chasteen, PhD
Kelly Ferris Lester, MFA

Elizabeth K. Lawner, PhD
Meghan Snow, EdM, MEd
EXECUTIVE SUMMARY

The impact of the Association of College and University Educators (ACUE) credential on student course outcomes has been examined in several previous evaluations (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner, Snow & Burt, 2019; Lawner & Snow, 2020; Lawner, Snow, MacCormack, & Waltje, 2019; Pippins, Hartigan et al., 2021; Pippins, Lawner et al., 2021). Prior evaluations have generally examined the impact on ACUE faculty who take the ACUE course in effective teaching practices on student outcomes, typically taken over a full academic year, with positive impacts found contemporaneously while faculty were earning their ACUE credential (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner & Snow, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019) and after faculty earned their ACUE credential (Hecht, 2019; Lawner & Snow, 2019b, Lawner & Snow, 2020; Pippins, Hartigan et al., 2021; Pippins, Lawner et al., 2021). However, ACUE also offers microcredential courses, which split up the modules from the course in effective teaching practices into multiple shorter courses taken over separate semesters. Like those who take the ACUE course in Effective Teaching Practices, faculty who complete 25 modules through the ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction. Given the recent expansion of ACUE microcredential course offerings across partnering institutions, it is important to understand the impact of the courses on faculty effectiveness, as measured by student course outcomes.

In a previous evaluation (Pippins, Chasteen et al., 2021), we examined the impact of ACUE faculty who took ACUE microcredential courses on their students’ contemporaneous gateway course outcomes. In this follow-up, we focused exclusively on those students who took a gateway course with ACUE and non-ACUE faculty then subsequently enrolled in another course in the same field. In other words, we examined the impact of ACUE faculty on students’ subsequent course outcomes. Our analyses used faculty and student data from the University of Southern Mississippi (USM), which was one of the earliest partnering institutions to offer ACUE microcredential courses to faculty. USM is a
public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer microcredential courses that allowed faculty to phase in to taking courses over time; therefore, there are no distinct cohorts of ACUE faculty at USM. From fall 2016 to spring 2020, 117 faculty at USM were taking and/or had completed at least one ACUE microcredential course. This evaluation focuses on the students of the 18 faculty who took ACUE microcredential courses and taught gateway courses between fall 2016 and fall 2019. Specifically, the subsequent course outcomes of students taught in gateway course sections by ACUE faculty are compared to the subsequent course outcomes of students taught in gateway course sections by non-ACUE faculty.

The evaluation found significantly better subsequent course grades and DFW rates for students who took gateway courses with ACUE faculty when compared to students who took gateway courses with non-ACUE faculty. There was no evidence of differences by race/ethnicity.

ABOUT ACUE

The Association of College and University Educators’ (ACUE) mission is to ensure student success and equity through quality instruction. In partnership with colleges, universities, higher education systems, and associations, ACUE prepares and credentials faculty in the evidence-based teaching practices that improve student achievement and close equity gaps. Numerous and independently validated studies confirm that students are more engaged, learn more, and complete courses in greater numbers—more equitably with their peers—when taught by ACUE-credentialed faculty. ACUE’s online, cohort-based credentialing programs are delivered through institutional partnerships and open-enrollment courses endorsed by the American Council on Education.8

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8 To learn more visit acue.org.
INTRODUCTION

Although decades of scholarship on teaching and learning have identified specific evidence-based teaching practices that improve student outcomes (e.g., Freeman et al., 2011), higher education faculty rarely receive formal, comprehensive training in those practices. To connect the dots between faculty development designed to improve instructional practices and the consequent impact on student outcomes, ACUE developed and offers courses in effective teaching practices. These ACUE courses are based on the Effective Practice Framework—a consensus statement of the teaching skills and knowledge that every college educator should possess to teach effectively, regardless of discipline (Association of College and University Educators, 2016). ACUE also developed an accountability framework to conduct evaluations of its partnerships with colleges and universities. This accountability framework has six levels of evaluation: (1) faculty engagement, (2) faculty learning, (3) faculty implementation, (4) student engagement, (5) course-level student outcomes, and (6) institutional outcomes (see MacCormack et al., 2018). The current evaluation examines the impact of the ACUE faculty on level 5.

The impact of ACUE faculty on student course outcomes has been examined in several previous evaluations, which found evidence of positive effects of ACUE faculty on student completion rates (Lawner, Snow, MacCormack et al., 2019), success rates (Hecht, 2019; Lawner & Snow, 2018), passing rates (Lawner & Snow, 2020), and average grades (Hecht, 2019; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019). However, this evaluation is distinct from prior evaluations in two main ways. First, this evaluation examines the impact of ACUE faculty who take microcredential courses. All prior evaluations have examined the impact on ACUE faculty who take the ACUE course in effective teaching practices. ACUE also offers microcredential courses. Like those who take the ACUE “full” course, faculty who take ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction, but only after completing at least 25 modules. Given the recent expansion of ACUE microcredential course offerings across partnering institutions, this

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9 Success rates as measured by earning grades A–C or a P (Pass) in courses.
paper aims to understand the impact of ACUE faculty who take microcredential courses. Second, the outcome measures in this evaluation are students’ subsequent course outcomes in a field of study. Prior evaluations have examined outcomes for students who were contemporaneously enrolled in courses taught by ACUE faculty; therefore, they have been unable to isolate any positive impacts attributable to improved instructional quality from changes in grading practices or rigor. Conversely, subsequent course outcomes reveal whether taking gateway courses taught by ACUE faculty had a continued impact on achievement in the same field of study. A growing body of research has identified subsequent performance as an important measure of student learning (see, e.g., Carrell & West, 2010).

To examine the impact of ACUE faculty on students’ subsequent course outcomes, this evaluation used student-level data from the University of Southern Mississippi (USM). USM is a public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer microcredential courses that allowed faculty to phase in to taking courses over time. From fall 2016 to spring 2020, 117 faculty at USM were taking and/or had completed at least one ACUE microcredential course. We focus on the students of the 18 faculty at USM who took ACUE microcredential courses and taught gateway courses between fall 2016 and fall 2019. These students took subsequent courses in their gateway courses’ field of study between spring 2017 and spring 2020.

Methodologically, this evaluation relied on a three-way fixed-effects approach to compare the subsequent course outcomes of students taught in gateway course sections by ACUE faculty to the subsequent course outcomes of students taught in gateway course sections by non-ACUE faculty. The evaluation found that subsequent course grades were higher by .06 grade points (on a 4.0 scale) and DFW rates were lower by .03 percentage points for students who

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10 Importantly, we examine subsequent courses to gateway courses instead of any course subject because gateway courses are a precursor to numerous academic programs at USM. There is also considerable variation across gateway courses given that (a) most students are required to take at least one gateway course and (b) several sections of gateway courses are taught in any given semester, typically by multiple faculty.
took gateway courses with ACUE faculty compared to students who took gateway courses with non-ACUE faculty. There was no evidence of differences by race/ethnicity.

DATA AND SETTING

ACUE Faculty at USM

The data for these analyses came from USM’s Office of Institutional Research, which collects, archives, and maintains institutional data for the purpose of analyzing, distributing, and presenting summary information. Faculty at USM first began taking ACUE microcredential courses in fall 2016. The ACUE microcredential courses in effective teaching practices differed from the ACUE “full” course evaluated in prior studies in that faculty must have taken a series of three microcredential courses over three semesters to receive the ACUE Certificate in Effective College Instruction. Faculty at USM were able to take the ACUE microcredential courses in either fall, spring, or summer term; however, they could take only one microcredential course per term to meet the three-course requirement for the ACUE certificate. Most but not all faculty took their courses in three consecutive terms. While taking the ACUE microcredential course, faculty were exposed to the Effective Practice Framework’s five major units of study: (1) Designing an Effective Course and Class, (2) Establishing a Productive Learning Environment, (3) Using Active Learning Techniques, (4) Promoting Higher Order Thinking, and (5) Assessing to Inform Instruction and Promote Learning. To satisfy course requirements, faculty actively engaged with content, were required to implement evidence-based practices, and wrote rubric-aligned reflections on their implementation, including citing changes in student behaviors (MacCormack et al., 2018).

Twenty-one faculty at USM took an ACUE microcredential course in fall 2016, with an additional 10 to 20 faculty phased in to taking ACUE microcredential courses in each subsequent semester. By spring 2020, there were 117 faculty at USM who were taking and/or had completed at least one ACUE microcredential course. Of these 117 ACUE faculty, 18

11 In this paper, we use “faculty” to refer to a variety of non-students who were employed by USM and had teaching responsibilities. This nomenclature includes tenure-track professors, adjunct professors, visiting professors, and other instructors.
taught a subset of gateway course sections between fall 2015 and spring 2020 (see Appendix Table 1 for a list of the gateway course titles and names). After taking a gateway course, a subset of students proceeded to take a subsequent course in the same field of study. These analyses focused on students who took a gateway course between fall 2016 and fall 2019 and later enrolled in a subsequent course in the same field of study between spring 2017 and spring 2020.

Construction of Analytic Sample

The administrative data provided by USM’s Office of Institutional Research spanned from fall 2015 to spring 2020. The data included a faculty-level file that contained faculty characteristics (gender, hire date, rank) and a student-by-course-section-level file that contained course-section characteristics (course name, number, department, and type; term offered), student characteristics (gender, race/ethnicity, intended major, ACT scores), and student course outcomes (final grade). These files were merged to a list of ACUE faculty names that included the terms in which faculty took ACUE microcredential courses. Given the time span of the data and the phase-in of faculty to taking ACUE microcredential courses, we could identify the semesters before, while, and after faculty take an ACUE microcredential course. Because we are interested in the impact of taking a gateway course with ACUE faculty versus non-ACUE faculty on subsequent course outcomes, we excluded the semesters before any faculty at USM began taking ACUE courses, namely fall 2015 and spring 2016.

We next excluded graduate students, gateway courses taught by graduate students, courses taught in summer terms, labs that accompany courses, and co-instructed courses, as well as courses with fewer than ten students enrolled. We then identified the first gateway course that each student took in a field of study, keeping only the earliest gateway course for any student who repeated a course after having originally withdrawn or failed. After identifying the first gateway course for each student, we identified their subsequent course in the same field of study. A subsequent course is defined as a distinct course in the same field of study as the gateway course that was taken after and in a

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12 To minimize selection bias related to students’ systematic sorting into courses taught by certain faculty, it is common in related research to also limit the sample to courses taken by students in their first semester at a college or university. We did not make this limitation in our preferred analytic sample given our relatively small sample size. In an unreported robustness check, limiting to college freshman reduced our already small sample size even more and resulted in statistically imprecise estimates. Importantly, we include student fixed effects in our specification model to limit the possibility of selection bias.
subsequent term to the gateway course. Based on the restrictions applied when identifying students’ initial gateway
courses, the subsequent course for some students may not have been taken in the term that immediately follows the
gateway course. Additionally, some students had multiple options of subsequent courses because they took multiple
courses in the same field of study as, and in the same term after taking, their gateway course. For these students, we
used the course with the lowest course number. For example, if a student simultaneously takes Biology 300 and Biology
310 after having taken Biology 250, we use Biology 300 as the subsequent course. Importantly, results were not
sensitive to randomizing our choice of subsequent course. We therefore chose subsequent courses with the lowest
course number for ease of replicability and consistency.

To determine the impact of ACUE gateway courses on student subsequent course performance (henceforth
referred to as the impact of ACUE faculty), we measured several student subsequent course outcomes: grades,
completion rates, passing rates, and DFW rates. Subsequent course grades were converted from an alphabetic scale to a
numeric equivalent (A = 4, B = 3, C = 2, D = 1, F = 0). Students who withdrew from a course before receiving a final grade
or had grades that could not be converted to a numeric scale (e.g., P) were not included in analyses when subsequent
course grades were used as an outcome. At USM, subsequent course passing grades included “A,” “B,” “C,” “D,” “Z,” and
“P,” and subsequent course DFW grades included “D,” “F,” “W,” and NP. Students who received course grades of “NA,”
“AUD,” or “I” were excluded from all analyses.

Summary Statistics

Table 1 reports the average faculty characteristics of ACUE and non-ACUE faculty in our final analytic sample.
Seventeen ACUE faculty taught students in gateway courses who went on to take a subsequent course in the field of
study. In comparison, 56 non-ACUE faculty taught students in gateway courses who went on to take a subsequent
course in the field of study. In terms of demographics, balance tests revealed no significant differences between ACUE
and non-ACUE faculty in gender, $\chi^2(1, N = 71) = 0.66, p = .418$; tenure status, $\chi^2(1, N = 71) = 0.01, p = .917$; or years
working at USM, $F(1, 71) = 0.30, p = .583$. However, because we used student-by-course-section-level outcomes, in which students were unequally weighted in their assignments to faculty, we included faculty characteristics as control variables in our specification model.

| Table 1. Faculty Characteristics by ACUE Status, fall 2016–fall 2019 |
|--------------------------|-----------|-----------|
| Variable                 | ACUE      | Non-ACUE  |
| Female (%)               | .65       | .54       |
| Tenure (%)               | .64       | .66       |
| Years at university      | 5.52      | 6.01      |
| Course sections taught   | 103       | 194       |
| Student enrollments      | 2,306     | 2,562     |
| N                        | 17        | 56        |

Table 2 presents summary statistics for student characteristics. Because our main outcomes of interest are subsequent course performance, we first examined whether students who take gateway courses with ACUE faculty are more or less likely to enroll in a subsequent course in the same field of study. We found no significant difference in the probability of subsequent course enrollment between the two groups of students, $b = –.001, SE = .008, 95\% CI [–0.027, 0.014], p = .481$. Importantly, the demographics of students who enrolled in subsequent courses were also nearly identical between students who took gateway courses with ACUE and non-ACUE faculty, providing no observable evidence of bias between the two groups of students.

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13 To calculate the likelihood of enrolling in a subsequent course, we started with the analytic sample used in Pippins, Chasteen et al. (2021) and restricted to the subsample of students who took a gateway course between fall 2016 and fall 2019. We then applied the same methodology, replacing the outcome with a dichotomous variable that equaled 1 if a student enrolled in a subsequent course in a field of study between spring 2017 and spring 2020, and 0 otherwise.
Table 2. Summary Statistics by ACUE Status, fall 2016–fall 2019

<table>
<thead>
<tr>
<th>Variable</th>
<th>ACUE</th>
<th>Non-ACUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled in subsequent course (%)</td>
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Notes: The “other” race/ethnicity category included all students whose race/ethnicity was not identified as White or Black in the USM data. These races/ethnicities included American Indian, Asian, Hispanic, Multiracial, and Pacific Islander, as well as those who were unspecified; they were collapsed due to small sample sizes. The averages for the variable “Enrolled in subsequent course” comes from a larger sample of data in which we have all students who took a gateway course between fall 2016 and fall 2019. The outcome was coded 1 if a student enrolled in a subsequent course in a field of study between spring 2017 and spring 2020; it was coded 0 otherwise.

METHODOLOGY

To examine the extent to which taking a gateway course with an ACUE faculty impacts subsequent course performance, we conducted descriptive analyses using a three-way fixed-effects approach (cf. Xu & Solanki, 2020). The key explanatory variable is a dichotomous variable coded to 0 (the reference group) if a student took the gateway
course section with non-ACUE faculty and to 1 if they took the gateway course section with ACUE faculty. Because ACUE faculty may begin and complete the ACUE microcredential course at different times, they are defined as ACUE faculty in both the years *while* and the years *after* they complete the course. Otherwise, faculty are defined as non-ACUE faculty in the years prior to taking the ACUE course or if they never began an ACUE course during the sample period.

Fixed effects included student fixed effects, term fixed effects, and next-course fixed effects. Student fixed effects controlled for observed and unobserved, time-invariant student characteristics. Excluding student fixed effects could lead to biased estimates if students sort into (or away from) courses taught by ACUE faculty based on faculty reputation. For example, students who are willing to work harder (i.e., are academically motivated) may select into courses taught by ACUE faculty if these faculty tend to have broadly better reputations in their fields and students desire recommendations. We therefore included student fixed effects to minimize the possibility of selection bias. Term fixed effects controlled for overall variation in students’ subsequent course outcomes and faculty composition that occurs across terms at USM. Finally, next-course fixed effects controlled for selection into students’ subsequent course. For example, students who had a negative experience in a gateway course taught by ACUE faculty (e.g., almost fails course) might have intentionally chosen to take their subsequent course with non-ACUE faculty. We therefore included next-course fixed effects, a combination of course section and term, to control for the additional potential for selection. As a result, the variation from our estimation strategy comes from students who took exactly the same subsequent course section in a field of study in which some students took their gateway course with ACUE faculty and others with non-ACUE faculty.14

Additional controls in our model included course-section characteristics (enrollment count), faculty characteristics (gender, experience, whether tenure-track) and time-varying student characteristics (class standing, Pell recipient, whether taking a course in their intended major). We clustered standard errors at the student and subject

14 Notably, we did not include gateway course fixed effects in our preferred model. This is primarily because, of the ten gateway courses, only six were in a duplicate field of study—three courses in biology and three in math (see Appendix Table 1). However, estimates are largely unchanged when we add gateway course fixed effects.
level to control for correlations between courses taken by the same student and for correlations between classes within the same subject area.

RESULTS

**Course Grades.** There was a marginally significant difference in subsequent course grades between students who took gateway courses with ACUE faculty and students who took gateway courses with non-ACUE faculty, $b = .064$, $SE = .027$, 95% CI $[-0.006, 0.134]$, $p = .067$. Specifically, students who took gateway courses with ACUE faculty earned subsequent course grades that were on average .06 points higher (on a 4.0 scale) than students who took gateway courses with non-ACUE faculty (see Figure 1).

![Figure 1: Subsequent Course Grades by Gateway Course Instructor Status](image)

*Note.* The outcomes above reflect the regression-adjusted means.

**Passing Rates.** There was no significant difference in subsequent course passing rates between students who took gateway courses with ACUE faculty and students who took gateway courses with non-ACUE faculty, $b = .004$, $SE = .011$, 95% CI $[-0.024, 0.032]$, $p = .726$.

**DFW Rates.** There was a significant difference in subsequent course DFW rates between students who took gateway courses with ACUE faculty and students who took gateway courses with non-ACUE faculty, $b = -.030$, $SE = .010$, 95% CI $[-0.057, -0.003]$, $p = .035$. Specifically, DFW rates in subsequent courses were 3 percentage points lower for
students who took gateway courses with ACUE faculty compared to students who took gateway courses with non-ACUE faculty (see Figure 2).

![Figure 2: Subsequent Course DFW Rates by Gateway Course Instructor Status](image)

Note. The outcomes above reflect the regression-adjusted means.

**Course Completion.** There was no significant difference in subsequent course completion rates between students who took gateway courses with ACUE faculty and students who took gateway courses with non-ACUE faculty, $b = -.001$, $SE = .005$, 95% CI $[-0.013, 0.011]$, $p = .790$.

**HETEROGENEITY**

In this section, we report on additional analyses that examined whether the impact on subsequent course outcomes from taking gateway courses with ACUE versus non-ACUE faculty differed by race/ethnicity. The results are largely null, indicating that the overall effects presented above were not masking heterogeneous effects across racial/ethnic groups. Whereas in previous papers we examined effect heterogeneity using interactions between race/ethnicity and our main variable(s) of interest, here we chose to perform subgroup analyses given our reliance on student fixed effects.

**Course Grades.** There was no significant difference in subsequent course grades between taking a gateway course with ACUE faculty and taking a gateway course with non-ACUE faculty when restricting to Black students, $b =$
ACUE

.039, SE = .061, 95% CI [–0.118, 0.196], p = .547; White students, b = .071, SE = .039, 95% CI [–0.028, 0.170], p = .124; or other-raced students, b = .266, SE = .137, 95% CI [–0.086, 0.617], p = .110. Therefore, there is no evidence to suggest that the marginally significant positive association between ACUE faculty and subsequent course grades is primarily driven by any particular racial or ethnic group(s).

Passing Rates. There was no significant difference in subsequent course passing rates between taking a gateway course with ACUE faculty and taking a gateway course with non-ACUE faculty when restricting to Black students, b = .014, SE = .023, 95% CI [–0.045, 0.073], p = .580 or White students, b = .014, SE = .012, 95% CI [–0.018, 0.046], p = .308. Although there was a significant difference in subsequent course passing rates between taking a gateway course with ACUE faculty and taking a gateway course with non-ACUE faculty when restricting to other-raced students, b = .056, SE = .021, 95% CI [0.003, 0.109], p = .042, the sample of other-raced students is small (n = 210) and we cannot reject equality across groups. Therefore, we cannot conclude that the null finding between ACUE faculty and subsequent course grades masks heterogeneity by race or ethnicity.

DFW Rates. There was no significant difference in subsequent course DFW rates between taking a gateway course with ACUE faculty and taking a gateway course with non-ACUE faculty when restricting to Black students, b = -.054, SE = .031, 95% CI [–0.134, 0.026], p = .144; White students, b = -.023, SE = .014, 95% CI [–0.060, 0.015], p = .179, or other-raced students, b = -.035, SE = .042, 95% CI [–0.143, 0.074], p = .499. Therefore, there is no evidence to suggest that the significant negative association between ACUE faculty and subsequent course DFW rates is primarily driven by any particular racial or ethnic group(s).

Course Completion. There was no significant difference in subsequent course completion rates between taking a gateway course with ACUE faculty and taking a gateway course with non-ACUE faculty when restricting to Black students, b = .015, SE = .013, 95% CI [–0.019, 0.048], p = .310; White students, b = -.006, SE = .009, 95% CI [–0.028, 0.016]; or other-raced students, b = .007, SE = .010, 95% CI [–0.019, 0.034], p = .510. Therefore, we cannot conclude that the null finding between ACUE faculty and subsequent course completion rates masks heterogeneity by race or ethnicity.
DISCUSSION

This evaluation found evidence that ACUE faculty at USM had lasting positive impacts on student learning in the same field of study. Specifically, students who took gateway courses with ACUE faculty received marginally better grades and significantly fewer DFW grades in subsequent courses compared to students who took gateway courses with non-ACUE faculty. Examining heterogeneity also suggested that the impacts are constant across race/ethnicity.

These results most directly complement our previous evaluation, Pippins, Chasteen et al. (2021), which found that course grades, passing rates, and DFW rates improved for students of ACUE faculty in the years while and after faculty took the ACUE microcredential course. Relative to the pre-ACUE period, there were significant improvements for students of ACUE faculty in course grades, passing rates, and DFW rates in the during-ACUE period, controlling for changes in student outcomes in course sections taught by non-ACUE faculty. Similarly, relative to the pre-ACUE period, there were significant improvements for students of ACUE faculty in passing rates and DFW rates in the post-ACUE period, controlling for changes in student outcomes in course sections taught by non-ACUE faculty. Our results also add to other prior research finding an impact of ACUE faculty on student course outcomes (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019).

However, this study extends all previous research by demonstrating the impact of the ACUE faculty who took the ACUE microcredential course (as opposed to the full ACUE course) on students’ subsequent course performance. Therefore, not only do ACUE faculty improve student performance over time within their own gateway courses, but they also have a lasting impact on their students’ performance; that is, their students tend to outperform their peers in subsequent courses in a field of study.

Given a relatively small sample size, analyses examining heterogeneity produced statistically imprecise estimates. Future research should continue to explore whether effects may vary by race/ethnicity. Additionally, because we look at multiple outcomes, future analyses should account for multiple hypothesis testing. Multiple hypothesis
testing can lead to potential problems if results that appear to be statistically significant are purely by chance.

Finally, future research should consider the mechanisms through which students of ACUE faculty tend to outperform students of non-ACUE faculty in subsequent courses. Some possible mechanisms include broadly better instructional quality and improved student engagement in gateway courses taught by ACUE faculty leading those students to better learn the material in the gateway course, making it easier to build upon that knowledge in the subsequent course.

REFERENCES


Pippins, T., Hartigan, L., Lawner, E. K., & Snow, M. (2021). *Worth the wait: Improved grades in sections taught by ACUE faculty at Purdue University Northwest in the year after they earned their credential.* Association of College and University Educators.

APPENDIX

<table>
<thead>
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<th>Appendix Table 1. Gateway Courses at USM</th>
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Cumulative Academic Impact of Students Having Multiple Course Experiences With Instructors Who Have Completed One or More ACUE Microcredential Courses

Elizabeth K. Lawner, PhD
Amy Chasteen, PhD
Kelly Ferris Lester, MFA
Theo Pippins, MS
Meghan Snow, EdM, MEd
EXECUTIVE SUMMARY

Numerous studies in the past several years have examined the impact of the Association of College and University Educators (ACUE) Certificate in Effective College Instruction on student course outcomes (e.g., Hecht, 2019; Lawner & Snow, 2018). However, the focus of those studies has been on the course section as the level of impact, and no research conducted to date has examined how those impacts on students’ academic outcomes may accumulate across multiple course experiences with ACUE faculty. Based on the research showing that students perform better in courses taught by ACUE instructors (e.g., Hecht, 2019), it follows that effects should be additive such that students who take more courses with ACUE instructors will have higher GPAs and complete and succeed in more of their courses. Additionally, several of the practices and broad themes promoted in the ACUE courses may influence students in ways that transfer to their other courses. Furthermore, the emphasis throughout several modules in the ACUE courses on helping students develop a growth mindset may result in the cumulative impacts of taking courses with multiple ACUE instructors being more pronounced among minoritized students.

The current study examines the potential for cumulative impacts using a data set of all courses taken between fall 2015 and spring 2020 by the 24,277 students at the University of Southern Mississippi (USM) who took at least one course during that time period with an instructor who completed their ACUE credential by summer 2019 or one of the identified match instructors. ACUE “dosage” was calculated for each student based on the number of courses they took with ACUE faculty, distinguishing between a course taken with faculty who had started an ACUE microcredential at the time of the course but had not yet finished the full certificate and a course taken with ACUE-credentialed faculty. Analyses found that the higher a student’s ACUE dosage, the higher their GPA and the more courses they completed, passed, and succeeded in. This pattern of results held even when outcomes were restricted to courses taught by instructors who had not yet started any ACUE microcredential course, suggesting that students are influenced by ACUE instructors in ways that are positively related to their engagement, behavior, and performance in all of their courses. In
addition, correlations with passing and success were significantly larger for Black students compared to White students.

ABOUT ACUE

The Association of College and University Educators’ (ACUE) mission is to ensure student success and equity through quality instruction. In partnership with colleges, universities, higher education systems, and associations, ACUE prepares and credentials faculty in the evidence-based teaching practices that improve student achievement and close equity gaps. Numerous and independently validated studies confirm that students are more engaged, learn more, and complete courses in greater numbers—more equitably with their peers—when taught by ACUE-credentialed faculty. ACUE’s online, cohort-based credentialing programs are delivered through institutional partnerships and open-enrollment courses endorsed by the American Council on Education.¹⁵

BACKGROUND

Informed by a mission of ensuring student success and equity through quality instruction, ACUE developed an evaluation framework to connect faculty development interventions, including ACUE’s courses, to improved student outcomes (MacCormack et al., 2018). Based on this evaluation framework, numerous studies in the past several years have examined the impact of ACUE’s course in effective teaching practices on student course outcomes (Hecht, 2019; Lawner & Snow, 2018; Lawner & Snow, 2019; Lawner & Snow, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019). However, several of these studies used course-section-level outcomes (Lawner & Snow 2018; Lawner & Snow, 2019; Lawner, Snow, & Burt, 2019). Even the studies that used student-enrollment-level data (Hecht, 2019; Lawner & Snow, 2020; Lawner, Snow, MacCormack, & Waltje, 2019) examined trends over time in courses taught by ACUE-credentialed instructors compared to courses taught by non-ACUE instructors. In other words, the focus has been on the course as the level of impact, and no research conducted to date has examined how those impacts on students’ academic outcomes may accumulate across multiple course experiences with ACUE faculty.

¹⁵ To learn more visit acue.org.
Based on the research showing that students perform better in courses taught by ACUE instructors (e.g., Hecht, 2019), it follows that these effects should be additive such that students who take more courses with ACUE instructors will have higher GPAs and complete and succeed in more of their courses. For example, getting Bs instead of Cs in two courses will lead to a higher GPA than getting a B instead of a C in only one course. Moreover, the impact of taking multiple courses with ACUE instructors might be more than the sum of its parts. Several of the practices and broad themes promoted in the ACUE courses may influence students in ways that they take with them into their other courses. For example, one of the five competencies in ACUE’s Effective Practice Framework (Association of College and University Educators, 2016) is on promoting higher order thinking and includes practices that faculty can use to teach their students how to take good notes in class and how to figure out how they learn and study best. Students who learn those skills would presumably use them in all of their classes, not just the class in which they learned the skills. Another possible avenue for cumulative impacts is that having multiple courses that use rubrics or other techniques that make assignment expectations clear may prompt students come to expect such clarity and ask for it in their other courses.

In addition, there is a large emphasis throughout several modules in the ACUE courses on helping students develop a growth mindset. Getting that message in multiple courses should be even more influential than if it occurs in a single course. Furthermore, growth mindset has been shown to narrow equity gaps in college courses (Canning et al., 2019), and thus the cumulative impacts of taking courses with multiple ACUE instructors may be more pronounced among minoritized students.

The purpose of this study is to examine the cumulative impact that might occur when students take multiple courses with instructors who have completed one or more of ACUE’s microcredential courses, including how those instructors may influence their students in ways that would impact the students’ outcomes in their other courses, as well as whether impacts may differ by student race. This study specifically focuses on student impacts that occurred as a result of the partnership between the ACUE and the University of Southern Mississippi (USM).
METHODS

Participants and Procedures

USM has been partnering with ACUE since fall 2016 to train their faculty through three microcredential courses that add up to the full Certificate in Effective College Instruction. The microcredential courses are offered each semester at USM, including during the summer, meaning that if faculty take the courses sequentially with no break, they can earn their credential in a year. However, some faculty take breaks between courses, and a small number of faculty at USM take only one or two of the courses and do not earn the full credential.

USM’s Center for Faculty Development identified a match instructor for each instructor at USM who had earned their ACUE credential by summer 2019. The current study uses a data set of all courses taken between fall 2015 and spring 2020 by the 24,277 students at USM who took at least one course during that time period with an instructor who completed their ACUE credential by summer 2019 or one of the identified match instructors. Each student had between one and 113 courses in the data set, with an average of 23.11 (SD = 14.60).

The majority of the students in the sample were female (63.8%), continuing generation college students (62.4%), and were not international students (98.2%). Most students were White (59.5%) or Black (30.5%; see Figure 1 for more detail). The majority of students (52.6%) received a Pell grant for at least one of the semesters they were in the data set, though only 30.1% received a Pell grant during all their semesters in the data set. Students’ ages ranged from 15 to 82 years old at the time that they took the course. Averaging each student’s age across all their courses in the data set, the mean participant age was 23.03 (SD = 6.72). Most commonly, students’ earliest point in the data set is when they were freshmen (33.9%), and their latest is when they were seniors (52.3%). However, some students do not have all four class years in the data set, and there are some graduate students, including some who initially started as undergraduates. See Figure 2 for more detail.
Figure 1
Race/Ethnicity of Students in the Sample

- American Indian: 60%
- Asian: 31%
- Black: 4%
- Hispanic: 4%
- Pacific Islander: 2%
- White: 0%
- Multiracial: 0%
- Did not specify: 3%

Figure 2
Frequencies of Students’ Minimum and Maximum Class Year in the Data Set

Minimum Class Year
- Freshman: 6%
- Sophomore: 19%
- Junior: 27%
- Senior: 34%
- Graduate student: 14%

Maximum Class Year
- Freshman: 10%
- Sophomore: 11%
- Junior: 15%
- Senior: 12%
- Graduate student: 52%
MEASURES

ACUE “dosage” was calculated by first coding each course based on whether the instructor had not taken any of the ACUE microcredential courses at the time (i.e., non-ACUE or pre-ACUE instructor; coded as 0), had started at least one ACUE microcredential course at the time, but had not yet earned the credential (i.e., during ACUE; coded as 1), or had already earned the ACUE credential (i.e., post-ACUE; coded as 2). For co-taught courses, the ACUE dosage of the course was calculated by multiplying the ACUE status of each instructor by their teaching load in the course. Then each student’s ACUE dosage was calculated by summing the ACUE dosage of each of their courses. For example, a student who took one course with an instructor who was in the process of earning their ACUE credential at the time and one course with an instructor who had already earned their ACUE credential when they taught the course would have a dosage of 3. The range of ACUE dosage in the sample was 0 to 35 ($M = 4.04$, $SD = 4.54$).

Academic outcomes were assessed based on course grades on a 4.0 scale, completion, passing, and success. See Table 1 for how each grade is considered for those outcomes. Each course outcome was then averaged to the student level, such that the outcomes represent students’ GPA and the proportion of their courses that they completed, passed, and succeeded in.
### Table 1

*All Possible Grades at USM and Their Use in the Current Study*

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*Note.* For more information on grades at USM, see:

http://catalog.usm.edu/content.php?catoid=19&navoid=1124#Grades. For information on grades during the spring 2020 semester, see: https://www.usm.edu/registrar/grade-options-2020.php
Analytic Plan

Analyses were conducted at the unique student level using hierarchical linear regression, which requires that all categorical variables be dummy coded. All student demographics variables, as well as the number of courses a student had in the data set, were entered in step 1. For demographics that could vary over time, such as age and Pell receipt, the demographics were averaged across a student’s courses in the data set. In order to calculate an average for class year, class year was first converted into a numeric scale, with 1 = freshman, 2 = sophomore, 3 = junior, 4 = senior, and 5 = graduate student. Due to the small proportion of students in the sample who belonged to racial/ethnic categories other than Black or White, race/ethnicity was simplified to Black, White, and all others. White students were used as the reference group because they were the largest of the three groups.

ACUE dosage was entered in step 2, and interactions with race/ethnicity were added in step 3. The analyses used a fully interacted model in which the demographic of interest (race/ethnicity) was interacted with all other control variables, in addition to being interacted with the primary factor of interest (ACUE dosage). When an interaction between race/ethnicity and ACUE dosage was significant, subgroup analyses were conducted to examine the main effect of ACUE dosage among each relevant racial/ethnic group separately.

To distinguish between purely additive effects of having multiple ACUE instructors and effects that occur due to an impact on students’ performance in their other classes, a second set of analyses were conducted that excluded courses taught by during-ACUE or post-ACUE instructors.
RESULTS

Academic Outcomes Including ACUE Courses

Completion

There was a significant main effect of ACUE dosage on the proportion of courses students completed, $b = .002$, $SE < .001$, 95% CI [.002, .003], $\beta = .064$, $p < .001$ (see Figure 3).

![Figure 3](image_url)

Note. Calculations use average values for all control variables.

The interactions between race and ACUE dosage were not significant for Black students, $b = .001$, $SE = .001$, 95% CI [.000, .002], $\beta = .020$, $p = .072$, nor other students, $b = -.001$, $SE = .001$, 95% CI [−.002, .001], $\beta = -.010$, $p = .318$. 
There was a significant main effect of ACUE dosage on the proportion of courses students passed, $b = .006, SE < .001$, 95% CI [.005, .006], $\beta = .106, p < .001$ (see Figure 4).

**Note.** Calculations use average values for all control variables.
The interaction between Black students and ACUE dosage was significant, $b = .003$, $SE = .001$, 95% CI [.001, .004], $\beta = .032$, $p = .001$, with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 5). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, $b = .008$, $SE = .001$, 95% CI [.006, .009], $\beta = .128$, $p < .001$, and White students, $b = .005$, $SE < .001$, 95% CI [.004, .006], $\beta = .101$, $p < .001$. The interaction between other students and ACUE dosage was not significant, $b = -.001$, $SE = .001$, 95% CI [−.004, .001], $\beta = -.009$, $p = .312$.

**Figure 5**
*Predicted Course Passing at Varying ACUE Dosages for Black and White Students*

Note. Calculations use average values within each subgroup for all control variables.
Success

There was a significant main effect of ACUE dosage on the proportion of courses students succeeded in, \( b = .006, SE < .001, 95\% \text{ CI [.005, .007]}, \beta = .104, p < .001 \) (see Figure 6).

![Figure 6](predicted_course_success_acue_dosage.png)

**Note.** Calculations use average values for all control variables.

The interaction between Black students and ACUE dosage was significant, \( b = .002, SE = .001, 95\% \text{ CI [.000, .003]}, \beta = .021, p = .030 \), with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 7). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, \( b = .008, SE = .001, 95\% \text{ CI [.006, .009]}, \beta = .119, p < .001 \), and White students, \( b = .006, SE < .001, 95\% \text{ CI [.005, .007]}, \beta = .105, p < .001 \). The interaction between other students and ACUE dosage was not significant, \( b = -.002, SE = .001, 95\% \text{ CI [−.005, .001]}, \beta = -.014, p = .118 \).
Figure 7
Predicted Course Success at Varying ACUE Dosages for Black and White Students

Note. Calculations use average values within each subgroup for all control variables.
There was a significant main effect of ACUE dosage on students’ GPA, $b = .022$, $SE = .001$, 95% CI [.019, .025], $\beta = .101$, $p < .001$ (see Figure 8). The interactions between race and ACUE dosage were not significant for Black students, $b = .003$, $SE = .003$, 95% CI [–.003, .009], $\beta = .011$, $p = .257$, nor other students, $b = –.007$, $SE = .005$, 95% CI [–.016, .002], $\beta = –.013$, $p = .135$.

**Figure 8**
*Predicted GPA at Varying ACUE Dosages*

Note. Calculations use average values for all control variables.
Academic Outcomes Excluding ACUE Courses

**Completion**

There was a significant main effect of ACUE dosage on the proportion of courses students completed, \( b = .003, SE < .001, 95\% \text{ CI} [.003, .004], \beta = .092, p < .001 \) (see Figure 9).

**Figure 9**
*Predicted Course Completion in Non-ACUE Courses at Varying ACUE Dosages*

![Predicted Course Completion in Non-ACUE Courses at Varying ACUE Dosages](image)

*Note.* Calculations use average values for all control variables.

The interaction between Black students and ACUE dosage was significant, \( b = .001, SE = .001, 95\% \text{ CI} [.000, .002], \beta = .022, p = .037 \), with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 10). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, \( b = .003, SE < .001, 95\% \text{ CI} [.002, .003], \beta = .088, p < .001 \), and White students, \( b = .002, SE = .001, 95\% \text{ CI} [.001, .003], \beta = .060, p = .005 \). The interaction between other students and ACUE dosage was not significant, \( b = -.001, SE = .001, 95\% \text{ CI} [-.002, .001], \beta = -.010, p = .276 \).
Calculations use average values within each subgroup for all control variables.

**Passing**

There was a significant main effect of ACUE dosage on the proportion of courses students passed, $b = .009$, $SE < .001$, 95% CI [.008, .009], $\beta = .157$, $p < .001$ (see Figure 11).

![Figure 10](image1.png)

**Figure 10**  
*Predicted Course Completion in Non-ACUE Courses at Varying ACUE Dosages for Black and White Students*

![Figure 11](image2.png)

**Figure 11**  
*Predicted Course Passing in Non-ACUE Courses at Varying ACUE Dosages*
The interaction between Black students and ACUE dosage was significant, $b = .004, SE = .001, 95\% CI [.002, .005]$, $\beta = .046, p < .001$, with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 12). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, $b = .011, SE = .001, 95\% CI [0.010, 0.012]$, $\beta = .187, p < .001$, and White students, $b = .008, SE < .001, 95\% CI [.007, .008]$, $\beta = .149, p < .001$. The interaction between other students and ACUE dosage was not significant, $b = –.001, SE = .001, 95\% CI [–.003, .001]$, $\beta = –.010, p = .253$.

**Figure 12**

*Predicted Course Passing in Non-ACUE Courses at Varying ACUE Dosages for Black and White Students*

![Graph showing predicted course passing rates for Black and White students at varying ACUE dosages.](image)

**Note.** Calculations use average values within each subgroup for all control variables.
Success

There was a significant main effect of ACUE dosage on the proportion of courses students succeeded in, $b = .010$, $SE < .001$, 95% CI [.009, .010], $\beta = .162$, $p < .001$ (see Figure 13).

![Figure 13](image)

*Figure 13*  
*Predicted Course Success in Non-ACUE Courses at Varying ACUE Dosages*

Note. Calculations use average values for all control variables.

The interaction between Black students and ACUE dosage was significant, $b = .004$, $SE = .001$, 95% CI [.002, .005], $\beta = .041$, $p < .001$, with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 14). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, $b = .012$, $SE = .001$, 95% CI [.011, .014], $\beta = .192$, $p < .001$, and White students, $b = .009$, $SE < .001$, 95% CI [.008, .010], $\beta = .158$, $p < .001$. The interaction between other students and ACUE dosage was not significant, $b = -.002$, $SE = .001$, 95% CI [−.004, .001], $\beta = -.013$, $p = .125$. 
Note. Calculations use average values within each subgroup for all control variables.

GPA

There was a significant main effect of ACUE dosage on students’ GPA, $b = .036$, $SE = .001$, 95% CI [.033, .038], $\beta = .164$, $p < .001$ (see Figure 15).
The interaction between Black students and ACUE dosage was significant, $b = .008$, $SE = .003$, 95% CI [.003, .014], $\beta = .027$, $p = .003$, with the direction of the effect indicating that the ACUE dosage effect was larger among Black students compared to White students (see Figure 16). Subgroup analyses showed that the ACUE dosage effect was significant among both Black students, $b = .042$, $SE = .002$, 95% CI [.037, .047], $\beta = .189$, $p < .001$, and White students, $b = .034$, $SE = .002$, 95% CI [.030, .037], $\beta = .166$, $p < .001$. The interaction between other students and ACUE dosage was not significant, $b = -.007$, $SE = .004$, 95% CI [−.015, .002], $\beta = -.012$, $p = .138$.

**Figure 16**
*Predicted GPA in Non-ACUE Courses at Varying ACUE Dosages for Black and White Students*

Note. Calculations use average values within each subgroup for all control variables.
DISCUSSION

The results from this study demonstrate the cumulative impact on students’ academic outcomes of taking multiple courses with instructors who have completed, or are currently engaged in, one or more ACUE microcredential courses. The magnitude of effects indicates that a student with an ACUE dosage of 6, from taking three courses with ACUE-credentialed instructors, for example, would on average have a GPA that is 0.132 grade points higher, complete 1.2% more of their courses, and pass and succeed in 3.6% more of their courses compared to a student who did not take any courses with ACUE instructors.

In addition, the cumulative impacts on passing and success were larger for Black students, with the magnitude of effects indicating that a Black student with an ACUE dosage of 6 would, on average, pass and succeed in 4.8% more of their courses compared to a Black student who did not take any courses with an ACUE instructor. This larger effect among Black students suggests that some of the ACUE course content, such as the emphasis on growth mindset, may be particularly beneficial for students who have been marginalized in higher education.

Furthermore, when outcomes were restricted to courses taught by non-ACUE or pre-ACUE instructors to examine how ACUE instructors influence their students’ performance in other courses, the effects were not only still significant, but were actually larger in magnitude. It is not clear why the impacts in non-ACUE courses were larger, but one possibility is that ACUE instructors might hold their students to higher standards.

These results supplement prior research (e.g., Hecht, 2019) finding benefits for student academic outcomes when faculty complete ACUE courses, with larger impacts for Black students (Lawner & Snow, 2020). However, this is one of the first studies to date to explore the impact of ACUE courses with faculty who earned the Certificate in Effective College Instruction through completing microcredential courses. In addition, it is the first study to examine the impact on students’ cumulative GPA and course outcomes, rather than examining impacts at the student-enrollment level, allowing for exploration of how effective instruction impacts students in ways that transfer to their coursework more broadly.
One limitation of the current study is that the design is correlational rather than experimental or quasi-experimental. Thus, we cannot say for certain that ACUE faculty cause their students to perform better in their other classes; we can only assert that experiences with ACUE faculty and positive academic outcomes are correlated. Although there are mechanisms by which faculty could reasonably influence their students in ways that would transfer to their coursework more broadly, such as improving students’ growth mindset and self-efficacy, it is also possible that higher performing students seek out courses with ACUE faculty based on their reputations for being better instructors.

Future research should further explore the skills or mindsets that students are learning when they take courses with ACUE instructors that may prompt them to perform better in their courses in general, including the reasons that the positive relationship between ACUE dosage and students’ academic outcomes was larger when restricted to courses taught by non-ACUE/pre-ACUE instructors. Surveys, interviews, and focus groups with both faculty and students might provide useful insight into the mediators of the positive relationship between number of experiences with ACUE instructors and students’ academic outcomes across their courses.

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FIRST-YEAR AND BEYOND:
Higher Retention Rates Among First-Year Students Taught by ACUE Faculty at the University of Southern Mississippi

Theo Pippins, PhD  Elizabeth K. Lawner, PhD  Meghan Snow, EdM, MEd
EXECUTIVE SUMMARY

In recent years, there has been a growth in literature examining interventions aimed at improving students’ postsecondary performance. While many interventions have targeted students directly, those run by the Association of College and University Educators (ACUE) have targeted college instructors, aiming to improve students’ postsecondary performance through faculty development. Prior evaluations have found positive effects of “ACUE faculty” on various student outcomes (Hecht, 2019; Lawner, Lester et al., 2021; Lawner & Snow, 2018, 2019a, 2019b, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019; Pippins, Chasteen et al., 2021a, 2021b; Pippins, Hartigan et al., 2021)

This evaluation is the first to explore the impact of ACUE faculty on student retention rates. The evaluation uses student-level data from the University of Southern Mississippi (USM). USM is a public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer ACUE microcredential courses. Faculty who take ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction after completing at least 25 modules. Faculty at USM who took ACUE microcredential courses “phased in” to taking the courses over time; that is, they began and ended their ACUE course sequences in a staggered pattern.¹⁶ To measure the impact of ACUE faculty on student retention rates, this evaluation focuses on two cohorts of first-year students at USM in academic years 2017-18 and 2018-19. Specifically, it uses binomial logistic regression to compare the retention probabilities of first-year students who took at least one course with ACUE faculty to those who took no courses with ACUE faculty.

¹⁶ For example, the first cohort of faculty began taking the first in a sequence of three ACUE microcredential courses in fall 2016, with new cohorts beginning in subsequent semesters—in either the fall, spring, or summer term. Faculty could only take one microcredential course per term to meet the three-course requirement for the ACUE certificate. Most, but not all, faculty took their courses in three consecutive terms.
The evaluation found that the retention rate for first-year students who took at least one course taught by ACUE faculty was 3.7 percentage points higher than first-year students who took no courses taught by ACUE faculty. The difference was statistically significant. The estimated probability of being retained for first-year students who took at least one course taught by ACUE faculty was 71.0% compared to 67.3% for first-year students who took no courses taught by ACUE faculty. These findings provide suggestive evidence that faculty development can improve student retention rates and add to the growing evidence of a positive impact of ACUE faculty, particularly, on students’ postsecondary outcomes.

ABOUT ACUE

The Association of College and University Educators’ (ACUE) mission is to ensure student success and equity through quality instruction. In partnership with colleges, universities, higher education systems, and associations, ACUE prepares and credentials faculty in the evidence-based teaching practices that improve student achievement and close equity gaps. Numerous and independently validated studies confirm that students are more engaged, learn more, and complete courses in greater numbers—more equitably with their peers—when taught by ACUE-credentialed faculty. ACUE’s online, cohort-based credentialing programs are delivered through institutional partnerships and open-enrollment courses endorsed by the American Council on Education.17

BACKGROUND

Although research supports that specific evidence-based teaching practices help improve student outcomes (e.g., Freeman et al., 2011), higher education faculty rarely receive formal, comprehensive training in those practices. In response, ACUE developed and offers courses in effective teaching practices based on the Effective Practice Framework

17 To learn more visit acue.org.
to improve instructional practices and the consequent impact on student outcomes. The Effective Practice Framework—a consensus statement of the teaching skills and knowledge that every college educator should possess to teach effectively, regardless of discipline (ACUE, 2016; MacCormack et al., 2018)—has six levels of evaluation: (1) faculty engagement, (2) faculty learning, (3) faculty implementation, (4) student engagement, (5) course-level student outcomes, and (6) institutional outcomes. The current paper evaluates the impact of the ACUE microcredential courses in Effective Teaching Practices on level 6.

Several previous evaluations have found positive impacts of “ACUE faculty”—instructors who engage in the full-year or microcredential ACUE courses in Effective Teaching Practices—on students’ concurrent course outcomes such as completion rates (Lawner & Snow; 2020; Lawner, Snow, MacCormack, & Waltje, 2019), success rates (Hecht, 2019; Lawner & Snow, 2018), passing rates (Lawner & Snow, 2020; Pippins, Chasteen et al., 2021a), and average grades (Hecht, 2019; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019; Pippins, Chasteen et al., 2021a; Pippins, Hartigan et al., 2021; Pippins, Lawner, & Snow, 2021). Positive effects have also been found on students’ subsequent course outcomes (Pippins, Chasteen et al., 2021b) and academic performance across all their courses (Lawner, Lester et al., 2021). No evaluations to date, however, have examined the impact of ACUE faculty on students’ retention rates.

Retention rate, specifically first-year retention, is one of the key performance indicators for measuring student success in higher education (c.f., Hagedorn, 2006). It is the percentage of a school’s first-year undergraduate students who are retained at the school the next academic year. Vincent Tinto (1975, 1993) and John Bean (1990) provide two well-known retention models, the Tinto Student Integration Model and Student Attrition Model, respectively. These models conceptualize the factors that contribute to student success. The Tinto Student Integration Model suggests that students must feel academically and socially integrated into the institutional community to be successful; otherwise, they risk dropping out. In addition to student integration, the Student Attrition Model posits that students’ beliefs,

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18 Success rates as measured by earning grades A–C or a P (Pass) in courses.
which shape their attitudes, are a key predictor of retention. If first-year students choose to return to a given institution based on their experiences and beliefs throughout their initial year, then the faculty with whom they take courses with could influence their decisions.

When considering the ACUE courses in effective teaching practices alongside retention models, we would expect for students who take courses with ACUE faculty to experience higher retention rates for several reasons. For one, previous research has shown positive impacts of being taught by ACUE faculty on students’ academic performance (Hecht, 2019; Lawner, Lester et al., 2021; Lawner & Snow, 2018, 2019a, 2019b, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019; Pippins, Chasteen et al., 2021a, 2021b; Pippins, Hartigan et al., 2021), including specifically among first-year students (Pippins, Chasteen et al., 2021a) and with outcomes extending to courses taught by non-ACUE faculty (Lawner, Lester et al., 2021; Pippins, Chasteen et al., 2021b). These impacts on academic performance should then positively impact students’ academic integration. Furthermore, ACUE courses include strategies to increase student engagement, which should improve students’ academic integration as well.

In addition, faculty interactions are a predictor of social integration in Tinto’s model (1975, 1993). Thus, the emphasis throughout ACUE’s course on supporting students and building relationships with them should promote their social integration, as should the practices that encourage the development of connections with peers and with campus resources. In terms of the student attrition model, growth mindset is one belief that could influence students’ retention decisions. Practices in several ACUE modules aim to help students develop a growth mindset.

This evaluation uses student-level data to examine the impact that faculty at the University of Southern Mississippi (USM) who took ACUE microcredential courses have on student retention rates. USM is a public research university with dual campuses in Hattiesburg and Gulf Park, serving more than 14,000 undergraduate and graduate students. In partnering with ACUE, USM opted to offer ACUE microcredential courses. Faculty who take ACUE microcredential courses receive the ACUE Certificate in Effective College Instruction after completing at least 25
modules. Faculty at USM who took ACUE microcredential courses phased in to taking the courses over time. To measure the impact of ACUE faculty on student retention rates, this evaluation focuses on two cohorts of first-year students at USM in academic years 2017-18 and 2018-19. It further uses binomial logistic regression to compare the retention probabilities of first-year students who took at least one course with ACUE faculty to those who took no courses with ACUE faculty, controlling for a robust set of student characteristics.

METHODS

Participants and Procedures

Faculty at USM first began taking ACUE microcredential courses in fall 2016, with approximately 10 to 20 additional faculty first taking ACUE microcredential courses in each subsequent semester. By spring 2019, 86 faculty at USM were “ACUE faculty”; that is, faculty who were taking and/or had completed at least one ACUE microcredential course. The ACUE microcredential courses in effective teaching practices, as implemented at USM, differed from the ACUE “full” course evaluated in studies at other schools in that the modules were split into three microcredential courses, each taken over a single semester. Faculty who complete the full series of three microcredential courses receive the ACUE Certificate in Effective College Instruction. Faculty at USM were able to take the ACUE microcredential courses in either the fall, spring, or summer term; however, they could only take one microcredential course per term to meet the three-course requirement for the ACUE certificate. Most, but not all, faculty took their courses in three consecutive terms.

While taking the ACUE microcredential course, faculty were exposed to the Effective Practice Framework’s five major units of study: (1) Designing an Effective Course and Class, (2) Establishing a Productive Learning Environment, (3) Using Active Learning Techniques, (4) Promoting Higher Order Thinking, and (5) Assessing to Inform Instruction and

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19 In this paper, we use “faculty” to refer to a variety of non-students who were employed by USM and had teaching responsibilities. This nomenclature included tenure-track professors, adjunct professors, visiting professors, and other instructors.
Promote Learning. To satisfy course requirements, faculty actively engaged with content, were required to implement evidence-based practices, and wrote rubric-aligned reflections on their implementation, including citing changes in student behaviors (MacCormack et al., 2018).

Data

The data for these analyses came from USM’s Office of Institutional Research, which collects, archives, and maintains institutional data for the purpose of analyzing, distributing, and presenting summary information. The administrative data provided by USM’s Office of Institutional Research included detailed records for first-time students who first enrolled in the 2017-18 and 2018-19 academic years. The records contained students’ gender, race/ethnicity, age, ACT score, high school GPA, intended major, number of transfer-in credits, and indicators for students’ in-state or out-of-state status, Pell eligibility, first-generation status, student worker status, and retention outcome. The records also contained students’ first-year experiences such as participation at USM’s Honors College or in the Luckyday Scholars program.20

Using transcript data, we identified the number of credits students attempted, their cumulative GPA, and the number of courses first-year students took taught by ACUE faculty (our parameter of interest).21 We created a dummy variable for our parameter of interest set equal to 1 if a student took one or more courses taught by ACUE faculty and 0 otherwise. Table 1 reports first-year student enrollments by faculty type based on transcript data. Between summer 2017 and spring 2019, there were a total of 3,852 first-year student enrollments in courses taught across 32 ACUE faculty and 36,440 first-year student enrollments in courses taught across 822 non-ACUE faculty. During the 2017-18

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20 The Luckday Scholars program funds scholarships for exemplary Mississippi high school seniors who demonstrate leadership skills, are involved in their communities, and need financial assistance. For more information, visit: https://www.usm.edu/luckyday-scholars/faqs.php

21 Cumulative GPA is calculated by dividing the total number of quality points students earned over their first year by the total number of credits attempted. See, e.g., https://www.usm.edu/registrar/gpa-calculator.php.
academic year, first-year students enrolled in courses taught by 11 ACUE faculty and 606 non-ACUE faculty. During the 2018-19 academic year, first-year students enrolled in courses taught by 31 ACUE faculty and 585 non-ACUE faculty.

### Table 1

**Number of Student Enrollments by Faculty Type and Academic Year**

<table>
<thead>
<tr>
<th>Academic Year(s)</th>
<th>ACUE Non-unique student enrollments</th>
<th>Non-unique student enrollments</th>
<th>Number of faculty</th>
<th>Non-unique student enrollments</th>
<th>Number of faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>967</td>
<td>23,295</td>
<td>11</td>
<td>606</td>
<td></td>
</tr>
<tr>
<td>2018-19</td>
<td>2,885</td>
<td>23,145</td>
<td>31</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>2017-18 and 2018-19</td>
<td>3,852</td>
<td>36,440</td>
<td>32</td>
<td>821</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 reports the descriptive statistics of the sample after extrapolating key variables from transcript records and merging to student demographics records. The final analytic sample contained 3,982 first-year students. Two-thirds of the students were female (67%). Slightly more than half of the students were White (55%) and approximately one-third were Black (34%). Because few students made up each of the remaining racial/ethnic groups, we collapsed them into one group, categorized as “Other.” Thus, demographic groups categorized as “Other” made up the remaining 11% of students. Almost two-third of the sample were in-state students (65%), about half were Pell eligible (56%), and roughly one-quarter were first-generation (24%).
Table 2
Descriptive Statistics for First-Year Students (AY 2017-18 and 2018-19)
(N = 3,982)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>.67</td>
<td>.47</td>
</tr>
<tr>
<td>Black (%)</td>
<td>.34</td>
<td>.47</td>
</tr>
<tr>
<td>White (%)</td>
<td>.55</td>
<td>.50</td>
</tr>
<tr>
<td>Other (%)</td>
<td>.11</td>
<td>.31</td>
</tr>
<tr>
<td>Age</td>
<td>18.08</td>
<td>.94</td>
</tr>
<tr>
<td>Pell eligible (%)</td>
<td>.56</td>
<td>.50</td>
</tr>
<tr>
<td>First generation (%)</td>
<td>.24</td>
<td>.43</td>
</tr>
<tr>
<td>Student worker (%)</td>
<td>.10</td>
<td>.30</td>
</tr>
<tr>
<td>In-state student (%)</td>
<td>.65</td>
<td>.48</td>
</tr>
<tr>
<td>Honors College (%)</td>
<td>.06</td>
<td>.23</td>
</tr>
<tr>
<td>Luckyday scholars (%)</td>
<td>.04</td>
<td>.20</td>
</tr>
<tr>
<td>STEM major (%)</td>
<td>.12</td>
<td>.33</td>
</tr>
<tr>
<td>ACT Composite score</td>
<td>22.61</td>
<td>4.60</td>
</tr>
<tr>
<td>High School GPA</td>
<td>3.33</td>
<td>.53</td>
</tr>
<tr>
<td>Transfer credits</td>
<td>3.67</td>
<td>.53</td>
</tr>
<tr>
<td>Took at least one course taught by ACUE faculty (%)</td>
<td>.54</td>
<td>.50</td>
</tr>
<tr>
<td>Credits Attempted</td>
<td>30.39</td>
<td>6.57</td>
</tr>
<tr>
<td>Cumulative GPA</td>
<td>2.66</td>
<td>1.09</td>
</tr>
<tr>
<td>Retention Rate (%)</td>
<td>.69</td>
<td>.46</td>
</tr>
</tbody>
</table>

In terms of academic preparation, 6% of students enrolled in USM’s Honors College and 4% were Luckyday scholars. Moreover, the average high school GPA was 3.33 (B+), the average ACT composite score was 22.61, and students transferred in an average of 3.67 credits. In their first year, students attempted, on average, 30.39 credits and had an average GPA of 2.66. A little more than half of the first-year students (54%) took at least one course taught by ACUE faculty (see Table 3 for a breakdown of students counts across academic years).

Table 3
Student Counts by Courses Taken with ACUE Faculty

<table>
<thead>
<tr>
<th>Academic Year(s)</th>
<th>Took at least one course with ACUE faculty</th>
<th>Took no courses with ACUE faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>682</td>
<td>1,220</td>
</tr>
<tr>
<td>2018-19</td>
<td>1,461</td>
<td>619</td>
</tr>
<tr>
<td>2017-18 and 2018-19</td>
<td>2,143</td>
<td>1,839</td>
</tr>
</tbody>
</table>
MEASURES

The primary goal of these analyses was to estimate whether first-year students taught by ACUE faculty were more likely to be retained in the subsequent academic year after initial enrollment. Accordingly, the main outcome in these analyses, retention, was a binary measure equaling 1 if a student was retained and 0 otherwise. Table 2 reports that 69% of first-year students in the sample were retained. The parameter of interest, ACUE faculty, was a binary measure for students’ exposure to at least one ACUE faculty in their first year. The parameter was equal to 1 if a first-year student took a course with at least one ACUE faculty and 0 otherwise. We used a binary measure of exposure to ACUE faculty because approximately 64% of first-year students who take a course with ACUE faculty do so with only one.22

RESULTS

Data Analysis Plan

We used binomial logistic regression (e.g., Stock & Watson, 2012) to estimate the likelihood that first-year students who took at least one course with ACUE faculty returned in the subsequent academic year. Specifically, we compare the subsequent year retention rates of first-year students who took at least one course with ACUE faculty to those who took no courses with ACUE faculty. We also estimated the marginal effects of our parameter of interest.

A bivariate regression of our parameter of interest on retention would have likely been biased because students and faculty were not randomly assigned to courses. For example, if first-year students accessed information online about faculty before arriving to campus or switched into specific courses during add/drop periods, estimates might be biased by course selection and student preferences. Although we believe that bias attributable to systematic sorting of students into courses by ACUE faculty status was likely minimal—it was unlikely students sorted into (or out of) courses based on ACUE faculty status given the phase-in of faculty over time to taking ACUE microcredential courses—all

22 As a robustness check, we used a measure of the number of ACUE faculty with whom first-year students took courses instead of a binary measure of taking a course with at least one ACUE faculty. Results (unreported) were qualitatively similar.
analyses included a robust set of control variables (as indicated in Table 2). These variables were chosen based on previous literature that identifies several factors related to student retention, including student demographics, academic ability/performance, intellectual development, and institutional factors (see, e.g., Tinto, 1975, 2006). A dummy variable was also included to control for cohorts across years. The dummy variable equaled to 1 if a student was a first-year student in the 2018-19 academic year and 0 otherwise (first-year students in the 2017-18 academic year were thus the reference group). Even with the inclusion of controls, it remains that our results are only indicative of associational relationships and should be interpreted as such.

In addition to estimating the association between retention rates and taking at least one course taught by ACUE faculty, we tested for heterogeneity in effect. We ran regression models that separately examined the interaction of our parameter of interest with race/ethnicity, Pell eligibility, and first-generation status.

**Retention.** The results from our binomial logistic regression indicated that there was a positive and statistically significant influence of taking at least one course taught by ACUE faculty in a student’s first year on retention rates, $b = .27$, $OR = 1.31$, $SE = .12$, 95% CI [1.09, 1.57], $p = .004$. Estimating marginal impacts suggest that the retention rate for first-year students who took at least one course taught by ACUE faculty was 3.7 percentage points higher than first-year students who took no courses taught by ACUE faculty. The estimated retention rate for first-year students who took at least one course taught by ACUE faculty was 71.0% compared to 67.3% for first-year students who took no courses taught by ACUE faculty (see Figure 1).

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23 Systematically similar students would have needed to know the exact semesters that faculty began and/or completed the ACUE course.

24 Because, *a priori*, taking courses with ACUE faculty should lead to improved academic performance, we excluded first-year cumulative GPA from all analyses reported in this section. In analyses that included cumulative GPA (not reported in this paper), results were qualitatively similar.
Note. The retention outcomes above reflect the regression-adjusted means. The difference between the two groups is statistically significant, $p = .004$.

**Interactions with Race/Ethnicity.** Analysis adding interactions with race/ethnicity found no significant interaction between Black students and whether students took at least one course taught by ACUE faculty, $b = -.21$, OR = .81, $SE = .15$, 95% CI [0.56, 1.16], $p = .248$, or between “Other” students and whether students took at least one course taught by ACUE faculty, $b = -.11$, OR = .90, $SE = .27$, 95% CI [0.50, 1.61], $p = .719$.

**Interaction with Pell eligibility.** Analysis adding interactions with Pell eligibility found no significant interaction between Pell-eligible students and whether students took at least one course taught by ACUE faculty, $b = .09$, OR = 1.09, $SE = .19$, 95% CI [0.77, 1.54], $p = .629$.

**Interactions with First-generation status.** Analysis adding interactions with first-generation status found no significant interaction between first-generation students and whether students took at least one course taught by ACUE faculty, $b = -.09$, OR = .92, $SE = .18$, 95% CI [0.62, 1.35], $p = .658$. 

![Figure 1. Retention Rates by Number of Courses Taken Taught by ACUE Faculty during First Year](image)
DISCUSSION

This evaluation provided suggestive evidence that increasing the number of ACUE faculty would have a positive influence on first-year student retention rates. For the 2017-18 and 2018-19 cohorts of first-year students at USM, the probability of being retained in the subsequent academic year was 3.7 percentage points higher for those who took at least one course taught by ACUE faculty compared to those who did not take any courses taught by ACUE faculty. Controlling for student demographics, this result indicates that an estimated additional 80 students in total returned across both years than would have otherwise. The positive association between courses taken with ACUE faculty and retention rates adds to prior evidence demonstrating a positive impact of ACUE faculty on students’ course outcomes (Hecht, 2019; Lawner, Lester et al., 2021; Lawner & Snow, 2018, 2019a, 2019b, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, & Waltje, 2019; Pippins, Chasteen et al., 2021a, 2021b; Pippins, Hartigan et al., 2021). Thus, the finding extends our knowledge of the impact that faculty development may have on a variety of student outcomes.

One limitation of the current study is that our results cannot be interpreted causally. As previously mentioned, students were not randomly assigned to courses taught by ACUE and non-ACUE faculty, nor did we exploit quasi-experimental variation in course assignment to estimate the causal impact of exposure to ACUE faculty. For these reasons, our results should be interpreted with caution, although we believed there to be little selection bias attributable to students systematically sorting into courses by ACUE status. While it is possible that students with higher propensities of being retained were more likely to take courses with ACUE faculty, it is unlikely given that the sample is entirely first-year students who would have little prior knowledge of the faculty and when they began taking ACUE courses (given the phase-in to ACUE course taking over time). We also controlled for a robust set of covariates that are

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25 For examples of quasi-experimental designs, see Angrist & Pischke (2008).
commonly found to be associated with student retention. Therefore, our finding remains useful in suggesting the potential for investments in faculty development to reduce student attrition.26

Another limitation is that we cannot identify the mechanism driving the difference in retention rates. If ACUE faculty are meaningfully improving their students’ experiences and beliefs, then colleges could potentially do more to facilitate this change. Future research should seek to understand the mechanisms driving differences so that recommendations can be provided to improve student retention. Additionally, future research should explore whether the higher retention rates associated with taking courses taught by ACUE faculty translate into higher graduation rates. While retention rates help to measure short term persistence, graduating is the long-term goal for students who enroll in college. A final limitation is that this study focuses on only two cohorts of first-year students at a single institution. Findings therefore lack external validity such that they cannot be readily generalized to other institutions with different geographic and demographic compositions.

Despite these limitations, the findings suggest that ACUE faculty do positively influence first-year student retention. This conclusion is most plausible when we consider the positive findings among three previous evaluations of ACUE faculty at USM. In the first evaluation of ACUE faculty on students’ outcomes in gateway courses, we found significant improvements in grades, passing, and DFW rates in years while faculty were taking ACUE courses (Pippins, Chasteen et al., 2021a). We also found significant improvements in passing and DFW rates in years after faculty were ACUE-credentialed. In the second evaluation, we examined students’ subsequent course performance to gateway courses and found significant differences between students of ACUE and non-ACUE faculty in DFW Rates (Pippins, Chasteen et al., 2021b). Specifically, students taking gateway courses with ACUE faculty at USM had significantly lower DFW rates in subsequent courses in the same field of study. In the third evaluation, we found students at USM had better academic outcomes when they took more courses with ACUE faculty (Lawner, Lester et al., 2021). There was a significant positive relationship between the number of courses taken with ACUE faculty and GPA, course completion,

26 To further address concerns of selection bias, future research might adopt an instrumental variable approach such as that introduced by Bettinger and Long (2005, 2010).
passing, and success. Although this study cannot alone isolate the mechanisms driving the differences in retention, the consistent positive findings across previous studies suggest that one mechanism might be improved academic performance and thus academic integration.

To conclude, future research will calculate the return on investment (ROI) from USM’s investment in faculty development, which can assist in institutional decisions on whether, and/or how much, to invest in future professional development opportunities.

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