



FIRST YEAR AND BEYOND

Higher Retention Rate Among First-Year Students Taught by ACUE Faculty at the University of Southern Mississippi

Technical Paper

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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, Chasteen, 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.¹ 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

¹ 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.



probabilities of first-year students who took at least one course with ACUE faculty to those who took no courses with ACUE faculty.

The evaluation found that the retention rate for first-year students who took at least one course taught by ACUE faculty was 4 percentage points higher than first-year students who took no courses taught by ACUE faculty (70% compared to 66%). Put into context, this would suggest that an estimated additional 139 students in total returned across both years than would have otherwise. Supplementary analyses found that the higher the proportion of courses that first-year students took with ACUE faculty, the more likely they were to return in the subsequent academic year. A change from 0 to 50% of courses taken with ACUE faculty was associated with a 5 percentage point higher probability of returning. Using these retention findings, we also estimated an 861% return on investment (ROI) for USM's partnership with ACUE over the analysis years. All considered, this evaluation provides evidence that faculty development can improve student retention rates and provide a financial benefit to the institution.

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 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.²

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—a consensus statement of the teaching skills and knowledge that every college educator should possess to teach effectively, regardless of discipline (Candio Sekel, n.d.). ACUE’s courses are designed to improve instructional practices, and consequently impact student outcomes, through six levels of sequential outcomes (MacCormack et al., 2018): (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).³ Positive effects have also been found on students’ subsequent

² To learn more visit [acue.org](https://www.acue.org).

³ Success rates are measured by earning grades A–C or a P (Pass) in courses.



course outcomes (Pippins, Chasteen, et al., 2021b) and academic performance across all their courses (Lawner, Chasteen, 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 (cf., 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, 1994) 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 (1975, 1994) 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 (Bean, 1990) posits that students' beliefs, 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 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, Chasteen, 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, Chasteen, et al., 2021; Pippins, Chasteen, et al., 2021b). These impacts on academic performance should then positively impact students' academic integration, which includes academic progress, cognitive growth, and positive learning experiences (Tinto, 1975, 1994). 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, 1994). This is because faculty are the institutional members with whom students interact the most, and the classroom is the main setting for these interactions (Lester et al., 2013). Therefore, faculty can be influential in helping their students feel supported and, subsequently, their students' decision to stay at the institution. The emphasis throughout ACUE's course on supporting students and building relationships with them should promote 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, having a growth mindset 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 into 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.⁴ 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 competencies: (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,

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.



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.⁵

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).⁶ 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 11,309 first-year student enrollments in courses taught across 62 ACUE faculty and

⁵ The Luckyday 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>.

⁶ 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>.



38,989 first-year student enrollments in courses taught across 775 non-ACUE faculty. During the 2017–18 academic year, first-year students enrolled in courses taught by 49 ACUE faculty and 569 non-ACUE faculty. During the 2018–19 academic year, first-year students enrolled in courses taught by 58 ACUE faculty and 556 non-ACUE faculty.

Table 1
Number of Student Enrollments by Faculty Type and Academic Year

	Faculty type			
	ACUE		Non-ACUE	
Academic year(s)	Non-unique student enrollments	Number of faculty	Non-unique student enrollments	Number of faculty
2017–18	4,587	40	19,675	569
2018–19	6,722	58	19,308	556
2017–18 and 2018–19	11,309	62	38,989	775

Table 2 reports the descriptive statistics of the sample after extrapolating key variables from transcript records and merging them 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-thirds of the sample were in-state students (65%), about half were Pell eligible (56%), and roughly one-quarter were first-generation (24%).

Table 2 <i>Descriptive Statistics for First-Year Students (AY 2017–18 and 2018–19)</i> (<i>N</i> = 3,959)			
Variable		Mean	SD
Female (%)		.67	.47
Black (%)		.34	.47
White (%)		.55	.50



Other (%)	.11	.31
Age	18.08	.94
Pell eligible (%)	.56	.50
First-generation (%)	.24	.43
Student worker (%)	.10	.30
In-state student (%)	.65	.48
Honors College (%)	.06	.23
Luckyday scholars (%)	.04	.20
STEM major (%)	.12	.33
ACT composite score	22.61	4.60
High school GPA	3.33	.53
Transfer credits	3.67	.53
Took at least one course taught by ACUE faculty (%)	.87	.33
Proportion of courses taken with ACUE faculty (%)	.22	.15
Credits attempted	30.39	6.57
Total courses taken	12.62	3.06
Total courses taken with ACUE faculty	2.84	2.03
Cumulative GPA	2.66	1.09
Retention rate (%)	.69	.46

In terms of academic preparation, 6% of students enrolled in USM's Honors College and 4% were Luckyday scholars. In addition, 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. First-year students attempted, on average, 30.39 credits across 12.62 courses, and they had an average GPA of 2.66.⁷ Approximately 87% of first-year students took at least one course taught by ACUE faculty (see Table 3 for a breakdown of student counts across academic years). This high proportion is likely because, for at least some early ACUE cohorts, USM targeted faculty who taught gateway courses as they are a precursor to numerous academic programs at the university. Finally, first-year students took a little more than one-fifth (22%) of their courses with ACUE faculty, on average.⁸ This translated to first-year students taking an average of 2.84 courses with ACUE faculty.

⁷ This accounts for any courses and/or labs taken across summer, fall, and spring terms.

⁸ The proportion of courses taken with ACUE faculty ranged from 0.00 to 0.77.

Table 3

Student Counts by Courses Taken With ACUE Faculty

Academic year(s)	Took at least one course with ACUE faculty	Took no courses with ACUE faculty
2017–18	1,562	340
2018–19	1,914	166
2017–18 and 2018–19	3,476	506

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. We used two constructs for our parameter of interest, *ACUE faculty*. The first 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. However, given low variation (87% of first-year students took at least one course with ACUE faculty), we also used a continuous construct of ACUE faculty to measure the proportion of courses students took taught by ACUE faculty. This allowed us to test for a dosage effect.

Results

Data Analysis Plan

We used binomial logistic regression (e.g., Stock & Watson, 2014) 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 compared 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 on campus or switched to 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 analyses included a robust set of control variables (as indicated in Table 2).⁹ 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).¹⁰ A dummy variable was also included to control for cohorts across years. The dummy variable equaled 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

⁹ Systematically similar students would have needed to know the exact semesters that faculty began and/or completed the ACUE course.

¹⁰ 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.



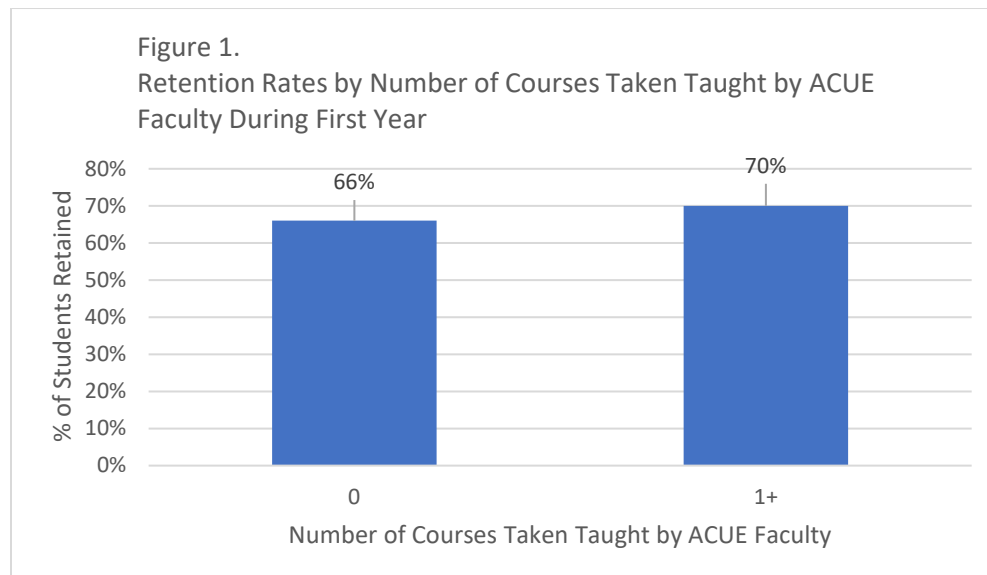
examined the interaction of our parameter of interest with race/ethnicity, Pell eligibility, and first-generation status.

Retention

The results from our binomial logistic regression indicate that there is 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, $b = .29$, $OR = 1.33$, $SE = .18$, 95% CI [1.02, 1.74], $p = .038$. Estimating marginal impacts suggests that the retention rate for first-year students who took at least one course taught by ACUE faculty was 4 percentage points (pp) 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 70% compared to 66% for first-year students who took no courses taught by ACUE faculty (see Figure 1).

Similarly, there was a positive and significant influence of taking a higher proportion of courses with ACUE faculty on retention. For every 1-pp increase in the proportion of first-year students' courses taken with ACUE faculty, their likelihood of returning to USM increased, on average, 1.008 times, $p = .007$. Put another way, a change from 0 to 50% of courses taken with ACUE faculty was associated with a 5-pp higher probability of first-year students returning to USM.¹¹

¹¹ Each 1-pp increase in the proportion of courses taken with ACUE faculty was associated with a 0.1 pp increase in the probability of returning to USM.



Note. The retention outcomes above reflect the regression-adjusted means. The difference between the two groups is statistically significant, $p = .038$.

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, $b = .12$, $OR = 1.12$, $SE = .33$, 95% CI [0.63, 2.01], $p = .692$, or between “Other” students and whether students took at least one course taught by ACUE faculty, $b = .55$, $OR = 1.73$, $SE = .77$, 95% CI [0.73, 4.13], $p = .214$. Results were qualitatively similar when using the proportion of courses taken with ACUE faculty as the parameter of interest.

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, $b = .03$, $OR = 1.03$, $SE = .28$, 95% CI [0.61, 1.76], $p = .906$. Results were qualitatively similar when using the proportion of courses taken with ACUE faculty as the parameter of interest.



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, $b = .23$, $OR = 1.26$, $SE = .38$, 95% CI [0.70, 2.26], $p = .444$. Results were qualitatively similar when using the proportion of courses taken with ACUE faculty as the parameter of interest.

Estimated Return on Investment

Faculty development programs can require significant resources to implement, so institutional leaders may reasonably expect a positive financial return on their investment (ROI). It can be challenging, however, for institutional leaders to estimate the ROI as they are rarely aware of the revenue or of the decreases in expenditures that individual initiatives may generate (Rossman et al., 2019). One reason is that institutions often focus on success in terms of improved student outcomes, with little to no data collected on cost-effectiveness of initiatives. Furthermore, it is difficult to isolate and measure the gains of individual projects, with institutions likely working on several overlapping projects in support of the same goal (Vignare et al., 2019). Recently, online tools have emerged to assist institutional leaders in estimating the ROI for specific interventions. One such ROI tool was developed through a partnership between the American Council on Education (ACE) and Ithaka S+R. Their ROI tool, which builds on the framework of a 2018 ACE white paper by Jessie Brown and Martin Kurzweil, helps users consider the key components of an instructional intervention, the associated costs, and potential ROI (Rossman et al., 2019). Although their ROI tool targets community colleges, we draw on elements of the tool to estimate USM's return on investment (ROI) from their ACUE partnership across the analysis years.



Using retention rates as our primary impact measure, we calculated USM's ROI by applying the following simple formula:

$$ROI = \frac{Net\ Benefits}{Costs} \times 100 = \frac{Additional\ Revenue - Costs}{Costs} \times 100$$

Intuitively, the ROI is calculated by dividing USM's total net benefits (additional revenue minus costs) by the total cost of their investment in ACUE. When the additional revenue accrued from implementing the training program outweighs the costs, there will be a positive ROI indicating a positive overall return. Conversely, when the costs of implementation outweigh the additional revenue, there will be a negative ROI indicating a negative overall return. We next considered the sources of revenue and cost at USM to input into the ROI formula.

There are several sources of additional net revenue that may accrue to USM through higher retention rates. One source is the additional tuition revenue generated by returning students. We estimated the number of additional students retained at USM based on our retention finding (that first-year students taught by at least one ACUE faculty had a 4 pp higher probability of returning). Results indicated that, controlling for student demographics, an estimated additional 139 students in total returned across both years than would have otherwise.¹² Provided with student-level data from USM on the net tuition revenue, we then calculated the average net tuition revenue per full-time equivalent first-year student across cohorts to be \$5,788. Multiplying the average net tuition by the number of additional students retained yielded an estimated additional net tuition revenue of \$804,532. A second

¹² We derived 139 students by multiplying 3,476 (the number of students who were taught by at least one ACUE faculty) by 0.04 (the approximated difference in retention rates).



source of revenue from higher retention may be cost savings if, for example, USM spends less on recruiting new students with high attrition rates (Rossman et al., 2019). While we could not collect enough information to determine cost savings, USM administrators estimated the value to be zero or greater. We therefore assumed the value to be zero, which provided us with a conservative estimate of additional net revenue.

There are also different types of costs associated with implementing the ACUE course, including direct and indirect costs.¹³ Most obvious are the direct costs such as the contractual amount USM paid ACUE to enroll faculty in their ACUE Effective Teaching Practices (ETP) courses. Other direct costs include any additional funds USM paid to staff to administrate the organization and training of ACUE cohorts. Indirect costs are those associated with changes in student behavior (MDRC, n.d.). For example, if a substantial number of students return year after year, institutions may need to hire more faculty to support additional courses or invest in infrastructure (e.g., classroom space or dorms) to support additional capacity. USM reported one-time direct costs of \$1,350 per ACUE faculty. Given that 62 ACUE faculty taught first-year students over the analysis year, we estimated the total direct cost of USM's ACUE partnership to be \$83,700.¹⁴ We assumed the total direct cost to be the total cost because USM reported there to be little to no indirect costs incurred from their ACUE partnership.

We substituted the additional net tuition revenue (\$804,532) and the total cost (\$83,700) into the ROI formula, yielding an ROI of 861%. The ROI estimate would suggest that USM's ACUE partnership

¹³ Direct costs should include all costs associated with implementing and sustaining a program or intervention. Thus, they vary by the type of intervention. It is recommended to consider costs related to staff, office/classroom space, computers and technology, financial support to students, and more (MDRC, n.d.).

¹⁴ Although USM began paying designated faculty a "facilitator fee" in later years with the expansion of their ACUE partnership, they did not pay this fee during the analysis years.



paid for itself while generating benefits to both students and society.¹⁵ Importantly, we derived the ROI estimate based on several assumptions. First, the average net tuition revenue calculation assumes that the costs incurred by first-year students were constant over time, i.e., that first-year students paid the same net tuition in their second year. Realistically, net tuition per student may fluctuate over time for several reasons, including annual tuition increases at institutions, number of credits attempted by students, and changes in grants or scholarships awarded to students. At the time of this calculation, we did not have the net tuition for students in their returning year. To the extent that net tuition per student increased in students' second year, the underlying assumption will lead to more conservative estimates of the ROI. Comparatively, if returning students attempted significantly fewer credits, the ROI would be overstated.

Second, state and local appropriations per full-time equivalency (FTE) student is another recommended source of revenue to include in the ROI calculation for public institutions (e.g., Rossman et al., 2019). Although we did not include these amounts in our revenue estimates, they would likely be positive for an institution with positive enrollment or student outcomes. Therefore, we assumed our revenue estimate to be more conservative.

Third, we assumed the one-time direct cost of implementing the ACUE program to be the total cost. Another cost to consider is the marginal cost per credit to USM; that is, the cost incurred to USM to offer one additional credit. In the online ROI tool, the marginal cost per credit is assumed to equal 30% of the average cost per credit. It is typically lower due to the many fixed costs associated with running a college (MDRC, n.d.). Because of the size of USM and because the ACUE partnership occurred at the

¹⁵ It has been suggested that ROI in higher education should account for value, or social outcomes, in addition to dollars (Rossman et al., 2019; Vignare et al., 2019). While our ROI does not account for potential social outcomes, one can incorporate social outcomes as a benefit in the ROI calculation. If USM attributes a positive value to increased retention rates, holding all else constant, then we would expect the ROI to increase.



instructor level, we assumed the marginal cost per credit to educate the additional retained students to be 0% of the average cost per credit. The ROI may vary depending on the true marginal cost per credit.

Relatedly, given the focus on retention of first-year students, the associated costs in this ROI calculation only accounted for ACUE faculty that taught first-year students. These were assumed to be the only cost; however, there were additional faculty who took ACUE courses yet may not have taught first-year students. While the overall direct cost of implementing the ACUE ETP program was likely higher at USM, we scaled our estimates because 1) USM targeted gateway course instructors when recruiting ACUE faculty and 2) there has not been a study to determine the effect of ACUE on retention for the non-first-year students taught by the additional ACUE faculty. To the extent that additional benefits (e.g., retention or graduation) occur to students later in their college career, ROI estimates may still be conservative.

Discussion

This evaluation provides evidence that increasing the number of ACUE faculty has 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 4 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 139 students in total returned across both years than would have otherwise. Furthermore, the higher the proportion of courses that first-year students took with ACUE faculty, the more likely they were to return in the subsequent academic year. Analyses suggest that a change from 0 to 50% of courses taken with ACUE faculty is associated with a 5-percentage points higher probability of returning. Higher education administrators might be particularly interested in the



ROI in faculty development to assist in institutional decisions on whether, and/or how much, to invest in future professional development opportunities. We estimate an 861% ROI for USM's partnership with ACUE over the analysis years, suggesting a financial benefit to the institution in addition to benefits to student outcomes.

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, Chasteen, 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.¹⁶ For these reasons, our results should be interpreted with caution, although we believe 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 of when they began taking ACUE courses (given the phase-in to taking ACUE courses over time). We also controlled for a robust set of covariates that are commonly found to be associated with student retention. Therefore, our finding

¹⁶ For examples of quasi-experimental designs, see Angrist & Pischke (2009).



remains useful in suggesting the potential for investments in faculty development to reduce student attrition.¹⁷

Future research should seek to understand the mechanisms driving differences in retention so that recommendations can be provided to further improve student retention, since this study does not identify the mechanism underlying 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. 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. Finally, this study focuses on only two cohorts of first-year students at a single institution. Similar research would need to be conducted at other institutions with different characteristics, such as geographic and demographic composition, to be able to generalize the findings beyond similar institutions.

Conclusions

The findings are consistent with 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-certified. In the second evaluation, we examined students' subsequent course performance to gateway courses and found significant differences between students

¹⁷ 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).



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, Chasteen, et al., 2021). There was a significant positive relationship between the number of courses taken with ACUE faculty and GPA, course completion, 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.



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