CULTIVATING EXCELLENCE IN TEACHING:
SUSTAINED IMPACT OF ACUE-CERTIFIED FACULTY ON STUDENT OUTCOMES AT BROWARD COLLEGE

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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, Lester, et al., 2021; Lawner & Snow, 2018, 2019a, 2019b, 2020; Lawner, Snow, & Burt, 2019; Lawner, Snow, MacCormack, et al., 2019; Pippins, Chasteen, et al., 2021a, 2021b; Pippins, Hartigan, et al., 2021; Pippins, Lawner, et al., 2021).

This paper evaluates the impact of three cohorts of ACUE faculty on student course outcomes at Broward College, a primarily associate-degree-granting institution where most of the students are Black or Hispanic, nearly half are first-generation college students, and many students receive Pell grants. This paper focuses on the cohorts of ACUE faculty at Broward that became ACUE-certified in the 2018–2019 academic year. Specifically, we examine the impact of ACUE faculty in the year *after* they take the full-year ACUE course in Effective Teaching Practices. In a previous study, Lawner and Snow (2020) evaluated the impact of these ACUE faculty in the year *during* which they were taking the ACUE course and found a significant impact of ACUE faculty on students' likelihood of completing and passing their courses.

The current evaluation found that passing rates, DFW rates, and course grades improved more for students of ACUE faculty compared to students in matched course sections in the year after faculty earned their certificate. These findings support the conclusion that the ACUE course increased instructional quality and add to growing evidence of the sustained impact of ACUE faculty on students' postsecondary outcomes (Hecht, 2019; Lawner & Snow, 2019b, 2020; Pippins, Chasteen, et al., 2021a; Pippins, Hartigan, et al., 2021; Pippins, Lawner, et al., 2021). Furthermore, the evaluation was underway when COVID-19 forced all higher education institutions to make major adjustments to how instruction was delivered to students. Though this unanticipated event added a level of complexity to measuring the effects of ACUE faculty at Broward, it also allows an opportunity to examine the role of faculty development in managing institutional change.

ABOUT ACUE

The Association of College and University Educators' (ACUE) mission is to ensure student success through quality instruction. ACUE delivers courses, pathways, and certifications with quick-to-implement practices that impact student success. Instructors certified in ACUE's Effective Teaching Practice Framework have improved confidence, boost persistence and completion for students, and help institutions meet their strategic goals. Endorsed by the American Council on Education, ACUE's online, cohort-based, courses are delivered through institutional partnerships and open enrollment courses and are higher education's only provider of nationally recognized teaching certifications.

BACKGROUND

Research has found that specific evidence-based teaching practices improve student outcomes (e.g., Freeman et al., 2011). Because higher education faculty rarely receive formal, comprehensive training in those practices, ACUE developed and offers courses in effective teaching practices based on the Effective Practice Framework 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 course in Effective Teaching Practices on level 5.

The impact of "ACUE faculty"—that is, instructors who engage in the full-year and microcredential ACUE courses in Effective Teaching Practices—on student outcomes has been evaluated in several prior papers. Evaluations using course-level data have found evidence of positive effects of ACUE credentialling on student success rates (Hecht, 2019; Lawner & Snow, 2018) and average grades (Hecht, 2019; Lawner & Snow, 2019a, 2019b; Lawner, Snow, & Burt, 2019; Pippins, Hartigan, et al., 2021).[1] Evaluations using student-level data have found that not only were students taught by ACUE faculty more likely to complete and pass their courses, but a course completion gap closed for Black students and a course passing gap closed for Pell-eligible students (Lawner & Snow, 2020; Lawner, Snow, MacCormack, et al., 2019).

[1] Success rates as measured by earning grades A–C or a P (Pass) in courses

This paper evaluates the impact of three cohorts of ACUE faculty on student course outcomes at Broward College, a primarily associate-degree-granting institution where most of the students are Black or Hispanic, nearly half are first-generation college students, and many students receive Pell grants. The paper focuses on the cohorts of ACUE faculty at Broward that completed the ACUE course in the 2018–2019 academic year. Specifically, we evaluate the impact of these ACUE faculty in the year *after* they take the full-year ACUE course in Effective Teaching Practices. In a previous study, Lawner and Snow (2020) evaluated the impact of these ACUE faculty in the year *during* which they were taking the ACUE course and found a significant impact of ACUE faculty on students' likelihood of completing and passing their courses. To understand the sustainability of the impact of the ACUE credential, it is important to study the continued impact after faculty have earned their credential.

Notably, for our sample of 2018–2019 ACUE cohorts, the year after they take the ACUE course coincides with the onset of the COVID-19 pandemic in spring 2020, which resulted in Broward's transition to a remote learning environment for most of the semester. We test the extent to which our estimates may reflect the major institutional adjustments to how instruction was delivered to students by conducting follow-up analyses that treat fall 2019 and spring 2020 separately as the post period.

METHODS

Participants and Procedures

At Broward, three cohorts of ACUE faculty became "ACUE-certified" (i.e., they received the ACUE Certificate in Effective College Instruction) in the 2018–2019 academic year. To evaluate the change over time in student outcomes for those enrolled in courses taught by the 67 ACUE faculty across the three cohorts compared to students enrolled in a set of matched course sections taught by non-ACUE faculty over the same time, Broward College's Office of Institutional Research provided student-level course outcome data for all courses taught between fall 2015 and spring 2020. Data from the

2015–2016, 2016–2017, and 2017–2018 academic years were considered the baseline period, and data from the 2018–2019 academic year was considered the during period. Our focus was on data from the 2019–2020 academic year, or the post period.

Specifically, we reported on changes that occurred in student outcomes between the baseline and post period, before and after ACUE faculty were credentialed.[2]

The data included student characteristics (e.g., race/ethnicity, gender, age, Pell eligibility, first-generation status, international status), faculty characteristics (e.g., part-time, full-time), and course characteristics (e.g., course name, number, department, term offered). There was a total of 681,135 observations.[3] Of these observations, there were 72,503 non-unique student enrollments in 3,135 course sections taught by 67 ACUE faculty.[4] Matched sections were taught by non-ACUE faculty, and they include all other sections of the same course title as those taught by ACUE faculty. For this reason, there are many more match sections than ACUE sections and many more match faculty than ACUE faculty in the data set. Table 1 breaks down student enrollments and course sections by time and faculty type.

Table 1

Number of Student Enrollments and Course Sections by Faculty Type and Time Period

	Faculty type					
	ACUE			Non-ACUE		
Time period	Non-unique student enrollments	Course sections	Number of faculty	Non-unique student enrollments	Course sections	Number of faculty
Baseline (2017–2018)	40,757	1,801	63	389,198	15,893	1,478
During (2018–2019)	15,265	639	62	117,988	4,497	906
Post (2019–2020)	16,481	695	67	101,446	3,984	827

Some students are represented multiple times in the data set because they were enrolled in more than one course that was included.[5] There are 127,441 unique students in the data set. To report on student demographics at the unique student level, reported demographics, which sometimes varied by time point, were averaged across each

[2] Findings on the changes that occurred between the baseline and during period are reported in Lawner and Snow (2020).
[3] Students who audited courses were excluded from all analyses and thus are excluded from the description of the sample.
[4] Because we do not have identifiers for the non-ACUE faculty, we cannot report the number of unique non-ACUE faculty.
[5] Each unique student was included up to 32 times in the data set, with a median of four times.

instance that student was represented in the data set. The average age of students in the sample was 24.12 years (*SD* = 8.34), and the average number of credits earned to date was 25.22 (*SD* = 25.45). The most common race/ethnicity of students in the sample was Hispanic (37.6%), followed by Black (33.82%), and then White (17.3%). The majority (57.9%) of students in the sample were female, half (50%) were Pell eligible in at least one term, close to half (47.3%) were first-generation college students, and a small proportion were international students (4.5%). The demographics of the sample are fairly similar to those for Broward College as a whole.

Measures

The course outcomes assessed included course completion, passing, and DFW rates, as well as course grades. Students who dropped a course before the end of the add/drop period were excluded. Course completion was defined as all students who did not withdraw from a course, regardless of whether they received a passing final grade in the course. Passing was based on Broward College's definitions of successful and marginal grades, specifically receiving an A, B, C, D, CR (credit), S (satisfactory), and PR (progressing at a satisfactory pace but has not completed the course). Grades of F, I (incomplete), U (unsatisfactory), and W (withdrawal) were considered non-passing grades. All non-passing grades, with the addition of Ds, comprised DFW. To measure the impact on course grades, final grades in each section were converted from an alphabetic scale to a numeric equivalent (A = 4, B = 3, C = 2, D = 1, F = 0). Since only A through F letter grades can be calculated on this scale, students who withdrew from a course before receiving a final grade or had marks with no numeric equivalent were excluded when using course grades as an outcome.[6]

RESULTS

Data Analysis Plan

We estimated the impact of ACUE faculty on student outcomes using a difference-in-differences (DID) approach, allowing us to mitigate biases resulting from unobserved changes that take place over time at Broward, as well as from baseline differences between ACUE and non-ACUE faculty. Specifically, the approach compares the change in student outcomes between the baseline and post period for those who took course sections taught by ACUE to the change in student outcomes between the same time for

[6] Nonconvertible grades included CR (credit), I (incomplete), PR (progressing at a satisfactory pace but has not completed the course), S (satisfactory), U (unsatisfactory), and W (withdrawal).

those who took matched course sections taught by non-ACUE faculty. Effects on grades were estimated using linear regression, and effects on completion, passing, and DFW rates were estimated using both linear probability models and logit models. While the results for completion, passing, and DFW rates are similar between the two models, we only report those from the logit models given the outcomes are dichotomous.

All analyses controlled for observed student and faculty characteristics. Because most students were Hispanic, Black, or White, race/ethnicity was simplified to four categories, with the fourth category combining Asian, Pacific Islander, American Indian, and unknown/unreported race/ethnicity. Although the fourth category was the highest performing for both course completion and passing, it was not used as the reference group because it was a mix of several races/ethnicities, and therefore findings would be more difficult to interpret. Instead, White students, who were the second highest performing group, were used as the reference group. For gender, female was used as the reference group because the majority of students were female. College generational status was simplified to be first generation versus not first generation/unknown college generational status. International student status was simplified in the same way.

Faculty role was simplified to full-time faculty, part-time faculty, and all others, which combined temporary instructors and administrative staff, both of whom were represented in small numbers in the sample. Full-time faculty were used as the reference group because recruitment of ACUE faculty focused on that group. Main effects were also included for whether a faculty was an ACUE faculty (dummy coded 1 for ACUE faculty and 0 for non-ACUE faculty) and time period (2017–2018 vs. 2018–2019 vs. 2019–2020). Time periods corresponded to the baseline, during ACUE, and post-ACUE years, respectively. The parameters of interest were the two-way interactions between faculty type and post period, which capture the change over these time periods in student outcomes in course sections taught by ACUE faculty relative to course sections taught by non-ACUE faculty.

When the interactions between faculty type and post period were significant, follow-up analyses were conducted to examine the main effect of time among course sections taught by ACUE faculty and separately among course sections taught by non-ACUE faculty. There was also a particular interest at Broward College in understanding whether impacts are larger for students from marginalized groups. Therefore, additional analyses were conducted that separately examined interactions with race/ethnicity, Pell eligibility, and college generational status whenever an interaction between faculty type and post period was significant. In these analyses, the effect of interest is the three-way interaction between the demographic variable, post period, and faculty type.

Course Completion. Regressions on completion rates showed no significant interaction between faculty type and the post period, *b* = .05, *OR* = 1.05, *SE* = .04, 95% CI [0.97, 1.13], *p* = .234, compared to the baseline period.

Passing. Regressions on passing rates showed a significant interaction between faculty type and the post period, *b* = .09, *OR* = 1.10, *SE* = .03, 95% CI [1.04, 1.15], *p* = .001, compared to the baseline period. Follow-up analyses examining students of ACUE faculty and students of matched sections separately show that students taught by ACUE faculty were significantly more likely to pass courses in the post period compared to the baseline period, *b* = .29, *OR* = 1.34, *SE* = .03, 95% CI [1.27, 1.41], *p* < .001, as were students in matched sections over the same time, *b* = .19, *OR* = 1.21, *SE* = .01, 95% CI [1.19, 1.23], *p* < .001, but the magnitude of the difference between time periods was larger for students taught by ACUE faculty.

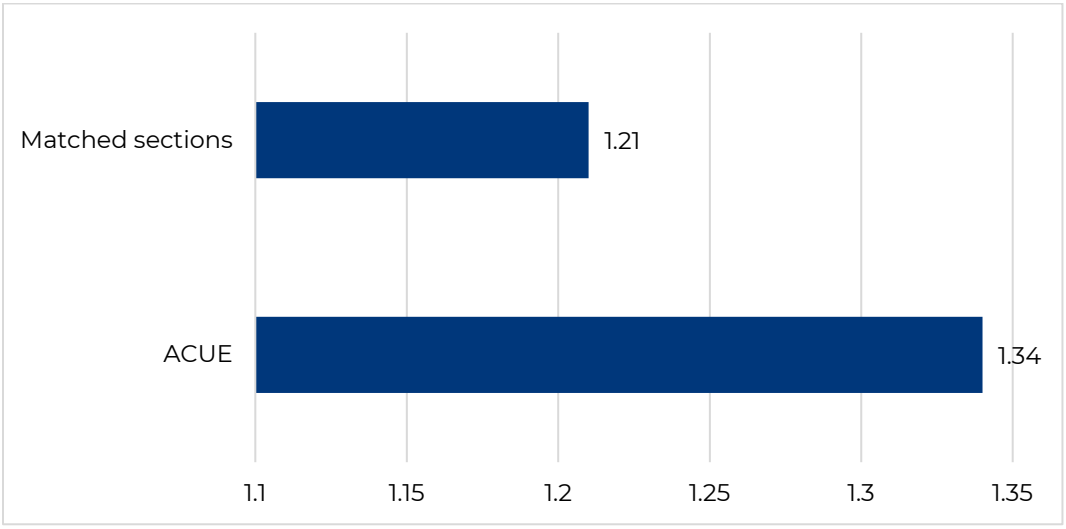

Figure 1

Odds ratios for likelihood of passing courses in post-ACUE period compared to baseline by faculty type

Note: All estimates significant at the 1 percent alpha level

Interactions With Race/Ethnicity. Analysis adding interactions with race/ethnicity found no significant interaction between Black students, faculty type, and the post period, *b* = .09, *OR* = 1.10, *SE* = .09, 95% CI [0.93, 1.30], *p* = .280; between Hispanic students, faculty type, and the post period, *b* = -.07, *OR* = .94, *SE* = .08, 95% CI [0.79, 1.10], *p* = .427; or between "Other" students, faculty type, and the post period, *b* = -.03, *OR* = .97, *SE* = .10, 95% CI [0.79, 1.19], *p* = .754.

In the previous analysis (Lawner & Snow, 2020), we found significant subgroup effects by race. The impact of the ACUE faculty on students' likelihood of passing courses was significantly larger for Black students compared to White students. Among Black students, those taught by ACUE faculty were 1.14 times more likely to pass their courses during the year in which faculty completed the ACUE course compared to those of the same faculty at baseline (p = .002). Although the three-way interactions between race/ethnicity, faculty type, and the post period were not significant in this analysis, we again explore subgroup effects by race to determine whether the same pattern still holds.

In follow-up subgroup analyses by race, we find that Black students taught by ACUE faculty were 1.42 times more likely to pass their courses during the post period compared to Black students of the same faculty at baseline, b = .35, SE = .06, 95% CI [1.30, 1.55], p < .001). In relation to previous findings, the magnitude of the impact of ACUE faculty on students' likelihood of passing is higher in the post period. Moreover, White students taught by ACUE faculty were 1.33 times more likely to pass their courses during the post period compared to White students of the same faculty at baseline, b = .29, SE = .09, 95% CI [1.16, 1.52], p < .001). In previous findings, White students taught ACUE faculty were only 1.02 times more likely to pass their course in the during period compared to White students of the same faculty at baseline; the effect, however, was statistically insignificant (p = .772).

Interactions With Pell Eligibility. Analysis adding interactions with Pell eligibility found no significant interaction between Pell eligibility, faculty type, and the post period, b = .00, OR = 1.00, SE = .05, 95% CI [0.90, 1.11], p = .951.

Interactions With College Generational Status. Analysis adding interactions with college generational status found no significant interaction between first-generation students, faculty type, and the post period, b = .07, OR = 1.08, SE = .06, 95% CI [0.97, 1.20], p = .172.

DFW. Regressions on DFW rates showed a significant interaction between faculty type and the post period, b = -.08, OR = .92, SE = .02, 95% CI [0.88, 0.97], p = .001, compared to the baseline period. Follow-up analyses examining students of ACUE faculty and students of matched sections separately show that students taught by ACUE faculty were significantly less likely to receive DFW grades in the post period compared to the baseline period, b = -.31, OR = .73, SE = .02, 95% CI [0.70, 0.77], p < .001, as well as students in matched sections over the same time, b = -.23, OR = .80, SE = .01, 95% CI [0.78, 0.81], p < .001.

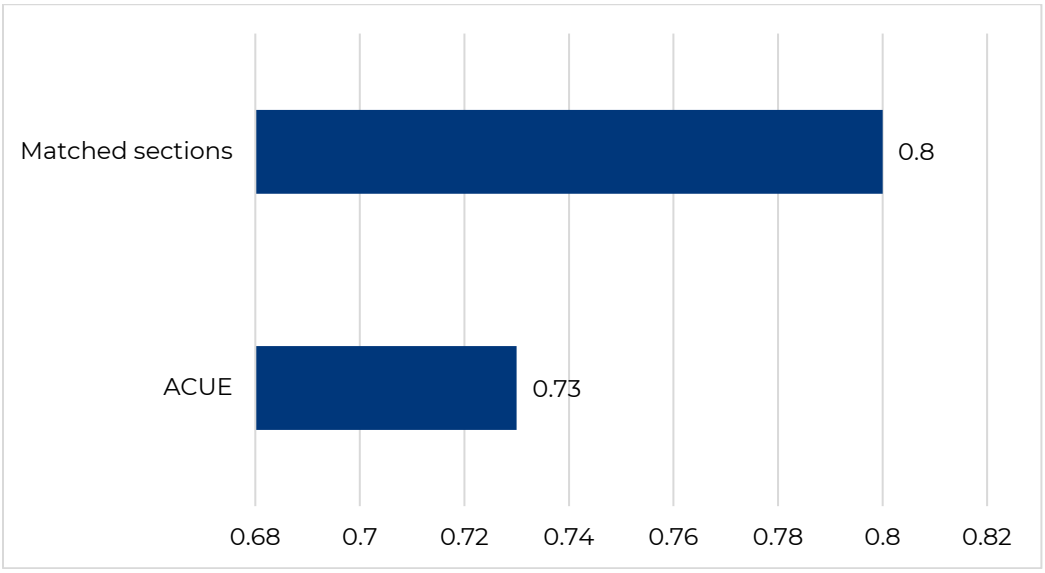

Figure 2

Odds ratios for likelihood of receiving DFW grades in post-ACUE period compared to baseline by faculty type

Note: All estimates significant at the 1 percent alpha level

Interactions With Race/Ethnicity. Analysis adding interactions with race/ethnicity found no significant interaction between Black students, faculty type, and the post period, b = -.03, OR = .97, SE = .08, 95% CI [0.83, 1.13], p = .690; between Hispanic students, faculty type, and the post period, b = .09, OR = 1.10, SE = .08, 95% CI [0.94, 1.27], p = .246; or between "Other" students, faculty type, and the post period, b = -.01, OR = .99, SE = .09, 95% CI [0.82, 1.18], p = .873.

Interactions With Pell Eligibility. Analysis adding interactions with Pell eligibility found no significant interaction between Pell eligibility, faculty type, and the post period, b = .03, OR = 1.03, SE = .05, 95% CI [0.94, 1.14], p = .951.

Interactions With First Generation Status. Analysis adding interactions with college generational status found no significant interaction between first-generation students, faculty type, and the post period, b = -.07, OR = .93, SE = .05, 95% CI [0.84, 1.02], p = .533.

Grades. Regressions on course grades showed a significant interaction between faculty type and the post period, b = .05, SE = .01, 95% CI [0.03, 0.08], p < .001, compared to the baseline period. Follow-up analyses examining students of ACUE faculty and students of matched sections separately show that students taught by ACUE faculty received statistically significantly higher grades in the post period compared to the baseline period, b = .18, SE = .01, 95% CI [0.15, 0.20], p < .001, as well as students in matched sections over the same time, b = .13, SE = .01, 95% CI [0.12, 0.14], p < .001.

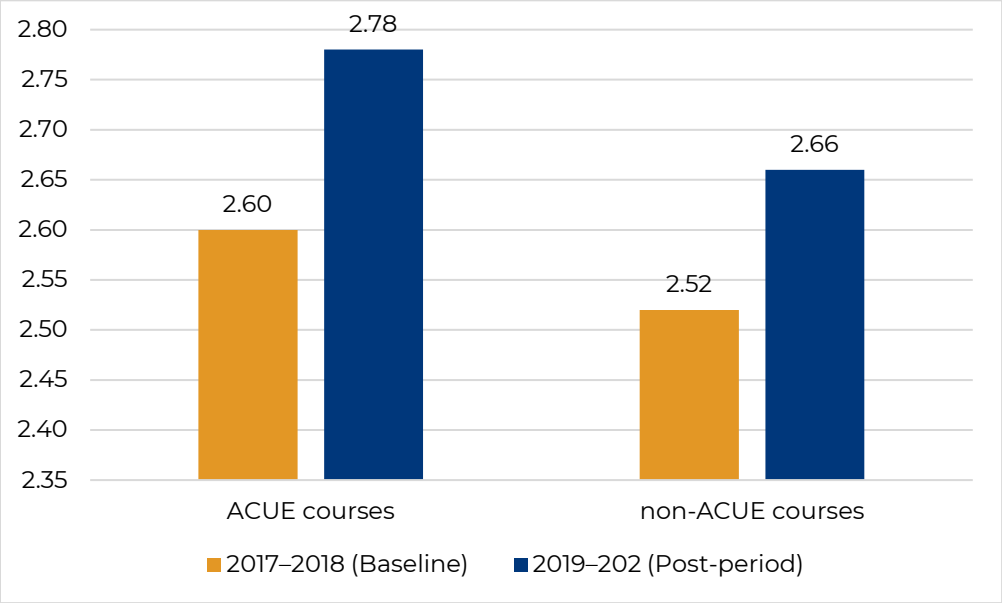

Figure 3

Average course grades by academic year and faculty type

Interactions With Race/Ethnicity. Analysis adding interactions with race/ethnicity found a significant interaction between Hispanic students, faculty type, and the post period, b = -.11, SE = .04, 95% CI [-0.18, -0.03], p = .008. Follow-up analyses showed that the interaction between Hispanic students and the post period was not significant within the ACUE faculty group, b = -.05, SE = .04, 95% CI [-0.13, 0.02], p = .151, but was significant within the non-ACUE faculty group, b = .05, SE = .02, 95% CI [0.02, 0.08], p = .002, indicating that the three-way interaction is due to differences between Hispanic and White students in the non-ACUE group.

There was no significant interaction between Black students, faculty type, and the post period, b = -.03, SE = .04, 95% CI [-0.11, -0.06], p = .522, or between "Other" students, faculty type, and the post period, b = .00, SE = .05, 95% CI [-0.09, 0.10], p = .944.

Interactions With Pell Eligibility. Analysis adding interactions with Pell eligibility found no significant interaction between Pell eligibility, faculty type, and the post period, b = -.02, SE = .02, 95% CI [-0.05, 0.01], p = .274.

Interactions With First Generation Status. Analysis adding interactions with college generational status found no significant interaction between first-generation students, faculty type, and the post period, b = -.02, SE = .02, 95% CI [-0.05, 0.01], p = .218.

ACADEMIC DISRUPTIONS DURING COVID-19

Due to the COVID-19 pandemic, Broward announced on March 16, 2020 that courses would operate remotely for the remainder of the semester.[7] Considering the post-ACUE period overlaps with the onset of the pandemic during spring 2020, we conducted follow-up analyses on passing rates, DFW rates, and course grades treating fall 2019 and spring 2020 separately as the post period.

Passing. Follow-up analyses using only fall 2019 as the post period showed a marginally significant interaction between faculty type and the post period, $b = .06$, $OR = 1.06$, $SE = .04$, 95% CI [0.99, 1.13], $p = .098$. Moreover, follow-up analyses that use only spring 2020 as the post period showed a significant interaction between faculty type and the post period, $b = .14$, $OR = 1.14$, $SE = .04$, 95% CI [1.06, 1.23], $p < .001$.

DFW. Follow-up analyses using only fall 2019 as the post period showed a marginally significant interaction between faculty type and the post period, $b = -.06$, $OR = .94$, $SE = .03$, 95% CI [0.89, 1.00], $p = .065$. Moreover, follow-up analyses that use only spring 2020 as the post-ACUE period showed a significant interaction between faculty type and the post period, $b = -.10$, $OR = .90$, $SE = .03$, 95% CI [0.84, 0.96], $p < .002$.

Grades. Follow-up analyses using only fall 2019 as the post period showed a significant interaction between faculty type and the post period, $b = .05$, $SE = .02$, 95% CI [0.01, 0.08], $p = .008$. Follow-up analyses that use only spring 2020 as the post period also showed a significant interaction between faculty type and the post period, $b = .05$, $SE = .02$, 95% CI [0.02, 0.09], $p = .004$.

For all outcomes, the observed patterns when separating the post-period terms are the same as described when considering the terms together and provide evidence that the impact of ACUE on average course grades was persistent despite the academic disruption caused by COVID-19.

DISCUSSION

There was a significant improvement in passing and DFW rates, as well as course grades for students in sections taught by both ACUE and non-ACUE faculty between the baseline period and the post period. However, the improvement was significantly larger for students in course sections taught by ACUE faculty. The positive effect of ACUE faculty in the year after earning an ACUE credential not only provides evidence of the sustained

[7] To view the announcement, visit https://news.broward.edu/2020/03/broward-college-transitions-to-remote-work-to-support-the-countys-effort-to-limit-the-spread-of-covid-19.html.

effect of faculty who took the ACUE course, but also that the ACUE course improved instructional quality.

The coefficients from the regression equations along with the number of students taught by ACUE faculty in the post period were used to estimate the number of additional students who passed their courses due to the ACUE course. The calculations indicate that an additional 200 students passed their courses than would have otherwise in the year after the faculty completed the ACUE course. We similarly estimated how many fewer students received DFW grades due to the ACUE course. The calculation indicate that 209 fewer students received DFW grades in their courses than would have otherwise in the year after faculty completed the ACUE course. Finally, we estimated the regression-adjusted improvement in average grades due to the ACUE course. The calculations indicate that, in course sections taught by ACUE faculty, average grades were 0.05 grade points higher in 2019–2020 than they would have been otherwise (i.e., 2.78 instead of 2.73 on a 4.0 scale).

Findings complement prior evidence demonstrating that faculty development courses can result in improved student outcomes, including student success rates (Lawner & Snow, 2018), average grades (Lawner & Snow, 2019a; Pippins, Chasteen, et al., 2021a, 2021b; Pippins, Hartigan, et al., 2021; Pippins, Lawner, et al., 2021), and passing rates (Lawner & Snow, 2020; Pippins, Chasteen, et al., 2021a). The findings also extend previous research in important ways. Importantly, while Lawner and Snow (2020) found a significant impact of ACUE faculty on students' likelihood of completing and passing their courses *while* faculty were participating in the ACUE course, our findings provide evidence of the continued impact of ACUE courses on faculty effectiveness in the year after participation. There are multiple reasons why the ACUE course leads to increased grades, including broadly stronger instruction by ACUE faculty that leads to better student learning.

Of interest is the continued positive effect of faculty development training on grades during academic disruptions, specifically COVID-19. ACUE's content around engaging students, active learning, and emphasis on clarity in grading and expectations might have been particularly important throughout a period of disruption in students' lives during COVID-19, leading students to better demonstrate their knowledge. Positive findings in the COVID-19 semester echo those found elsewhere (Pippins, Hartigan, et al., 2021). Future research should seek to understand the impact of ACUE credentialing during the COVID-19 pandemic and how faculty development functions as a driver of student success in times of transition at an institution.

Future research should also consider why the positive effect on completion found in the during period in Lawner and Snow (2020) is not evident in the post period. Additionally, Lawner and Snow (2020) found results demonstrating a larger impact of ACUE faculty on low-income students and Black students. The greater impact for these groups led to the closing or narrowing of several gaps in course outcomes: the gap in course completion between Black and White students of ACUE faculty closed, and the gap in passing courses between Black and White students of ACUE faculty was cut in half. While gaps that closed in the during period remain closed in the post period, there is no longer a differential impact of ACUE faculty on low-income and Black students. Follow-up analyses reveal that the lack of a differential impact in passing rates is partially because the impact of ACUE faculty on White students increased considerably between the during period and post period.

One limitation of the current study is that the analyses do not account for clustering of outcomes, such as within sections, courses, or faculty. This non-independence of observations can affect the standard errors and thus statistical significance. However, given that faculty teach multiple courses and sections, and those courses include some sections taught by ACUE faculty and others taught by non-ACUE faculty, it is unclear whether sections should be considered nested within faculty or vice versa. Choosing a method of clustering is additionally complicated because students are not unique to courses; rather, they may be 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 groups are more similar to each other. Furthermore, the benefit of the ACUE course on students' growth mindset, for example, could carry over into those students' outcomes in their other courses. We find some evidence of this in recent studies (Lawner, Lester, et al., 2021), in which higher ACUE "dosages," based on the number of courses students took with ACUE faculty, were associated with higher GPAs and completion, as well as more passing and success in courses taught by instructors who had not yet started any ACUE course. This suggests that students are influenced by ACUE instructors in ways that are positively related to their engagement, behavior, and performance in all of their 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.

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