Faculty Engagement, Learning, and Implementation: 2018-2019 Nationwide Findings

Elizabeth K. Lawner, PhD

Meghan Snow, EdM, MEd

Sara Veysey

Association of College and University Educators

September, 2020

Executive Summary

This paper presents nationwide findings on the faculty impact of ACUE's Course in Effective Teaching Practices using two overlapping samples. In accordance with ACUE's six-level evaluation model (MacCormack et al., 2018), this paper focuses on findings of impact from a large number of ACUE faculty course-takers and credential earners across the first three levels in the model: faculty engagement, faculty learning, and faculty implementation of evidence-based instructional practices. Results that occur while faculty are completing the course come from a sample of active course-takers in full courses that took place during the 2018-2019 academic year. Results on sustained faculty impact come from the 2019 survey of credentialed faculty, with results focusing solely on respondents who had earned their ACUE credential at least one semester prior to the survey.

Enrollment survey responses from active course-takers in the 2018-2019 academic year indicate that the typical course-taker considers teaching to be their primary role, is employed full-time at one institution, has been teaching in higher education for 9 years, and teaches 135 students in a typical academic year. Course-takers are most commonly adjunct/non-tenure-track faculty, tenure-track faculty, or tenured faculty, and the three most common disciplines are health sciences; business, management, and marketing; and biological and biomedical sciences. The vast majority of course-takers either teach only face-to-face courses or teach a mix of course formats (face-to-face, online, or hybrid).

The results of faculty course-takers' perception of the relevance of the module content from both the end-of-module and end-of-course surveys demonstrate high levels of engagement, and this was true across several faculty demographics. The only demographic difference found was tenure-track faculty reporting somewhat lower engagement, though their engagement was still very high.

Faculty course-takers' responses on the end-of-module surveys indicate that typical course completers learn 70 new instructional practices, learn more about 83 additional practices, implement 30 new practices, and plan to implement 65 additional practices. Importantly, the survey of credentialed faculty shows that the vast majority of faculty do sustain the changes they made to their teaching during the ACUE course and continue to use the practices in their courses, with most indicating they use the practices at least once a week.

Results from the end-of-course survey show large increases in faculty self-efficacy for instruction. Similar to the findings on faculty engagement, the changes in self-efficacy occur across faculty demographics, with larger improvements for some groups, including faculty with less experience, adjunct/non-tenure-track faculty, graduate students, and instructors who only teach in a single course format. Notably, though faculty with fewer than 10 years of teaching experience started out with lower self-efficacy for instruction than their more experienced peers, the gap was no longer significant at the end of the course.

The end-of-course survey also demonstrates significant improvements in faculty course-takers' teaching beliefs (e.g., "I can influence how students perceive their intelligence") and behaviors (e.g., "I use current educational research to inform my teaching"). The improvement in teaching beliefs and behaviors are found across faculty demographics, with larger improvements for some groups, including faculty with less experience, adjunct/non-tenure-track faculty, graduate students, and faculty who only teach hybrid courses.

Taken together, these results demonstrate strong impact of the ACUE course across Levels 1 through 3 of the six-level ACUE evaluation framework: faculty engagement, faculty learning, and faculty implementation. Furthermore, these finding come from nationwide data sources across various cohorts, institutions, and faculty demographics, which offers strong evidence that ACUE's courses are well-received by faculty and effectively support faculty in learning and implementing the evidence-based instructional practices shown in the literature (e.g., Armbruster et al., 2009; Burrowes, 2003; Kember & Gow, 1994; Mazur, 2009) to have positive impacts on student outcomes.

Introduction

Although college and university faculty are experts in their disciplines and research methods, many do not receive formal and comprehensive training in the evidence-based teaching practices that have been found to improve student motivation, engagement, persistence, and learning. When faculty are trained in evidence-based teaching practices, it is important that rather than simply relaying information, the experience encourages and supports faculty to develop their self-efficacy to successfully use the practices they have learned.

Self-efficacy, or beliefs in one's ability to produce a particular effect or level of performance (Bandura, 1994), is important because people need to believe that they have the ability to achieve a goal in order to pursue that goal (Bandura, 1999). In addition to being a necessary precursor to initiating a new behavior, self-efficacy also leads people to sustain their efforts when faced with setbacks (Bandura, 1997). Furthermore, self-efficacy has been demonstrated to be a strong predictor of academic (e.g., Stankov et al., 2014) and job performance (e.g., Stajkovic & Luthans, 1998). For these reasons, self-efficacy is important to measure as part of evaluating the effectiveness of professional development activities, such as a faculty development program.

Another type of belief that affects performance and pursuit of goals is growth mindset. Growth mindset refers to the belief that one can grow a particular attribute or trait, such as intelligence (Dweck, 2006). Individuals with a growth mindset tend to set learning goals that allow them to *improve* their abilities, whereas individuals with a fixed mindset (the opposite of a growth mindset) focus on performance goals that allow them to *prove* their abilities (Burnette et al., 2013; Dweck, 2012) and will even avoid actions to improve their skills if doing so would make them look unintelligent, such as taking remedial courses (Hong et al., 1999). Growth mindset also predicts academic performance, particularly when encountering difficult or new material, such as during the transition to college (Robins & Pals, 2002). More importantly, in the context of faculty, recent research has shown that faculty's growth mindset influences their students' educational outcomes, including reducing racial achievement gaps (Canning et al., 2019).

Although confidence is important, it can also be misleading, particularly among those who are poor performers or uninformed about what is needed to succeed at a task (Dunning et al., 2003). The Dunning-Kruger effect, in which low performers tend to vastly overestimate their skills, occurs because in many domains, the skills that allow people to successfully perform a task are the same skills that allow them to accurately judge their performance on the task (Dunning et al., 2003). Interestingly, people tend to overestimate their knowledge, even claiming to have impossible knowledge, such as knowledge of fake terms, in domains that they perceive themselves to have expertise (Atir et al., 2015). Importantly, research has shown that

when poor performers are trained on how to solve a particular type of problem, they were then able to provide more accurate ratings of their abilities (Kruger & Dunning, 1999). When applied to faculty development, this set of research supports the conclusion that prior to receiving training in effective teaching practices, faculty are likely to overestimate their teaching skills. However, once faculty are trained in evidence-based teaching practices, they will be better able to accurately assess their skills. Thus, a retrospective pre/post design may better estimate the increase in faculty's confidence in their teaching skills as a result of faculty development.

This paper presents nationwide findings on the faculty impact of ACUE's Course in Effective Teaching Practices using two overlapping samples. Results on impacts that occur while faculty are completing the course come from active course-takers in full courses that began after August 1, 2018 and ended by August 31, 2019. Results on sustained faculty impact come from the 2019 survey of credentialed faculty, which was sent in May 2019 to all ACUE-credentialed faculty as well as all active course-takers enrolled in courses scheduled to complete by the end of the summer; however, results reported here focus solely on respondents who were credentialed in fall 2018 or earlier and thus had earned their ACUE credential at least one semester prior to taking the survey.

Methodology

Participants

2018-2019 Academic Year Active Course-Takers

There are 2,060 course-takers across 92 cohorts and 68 institutions represented in the sample. However, eight course-takers (0.45%) did not complete the enrollment survey, and thus, are not represented in the description of the sample below. The typical course-taker has been teaching in higher education for 9 years and teaches 135 students in a typical academic year (see Table 1 for more detail). The plurality of course-takers are adjunct/non-tenure-track faculty members (28.5%), but this is closely followed by tenure-track faculty (26.5%) and tenured faculty (21.1%). The overwhelming majority (81.4%) of course-takers describe their primary role as teaching, and most (78.5%) course-takers describe their employment status as full-time at a community college, college, or university. The top three reported disciplines taught by course-takers are health sciences (11.0%), business, management, and marketing (8.2%), and biological and biomedical sciences (7.2%; see Table 2 for more detail on disciplines). Nearly half (49.8%) of course-takers teach only face-to-face courses, and 46.3% teach a mix of face-to-face, hybrid, and online courses. The majority (82.5%) of course-takers said that they have attended or plan on attending the ACUE course launch at the time of the survey[1]. See Figures 1-5 for more detail on faculty demographics.

[1] The options of planning to attend/not attend the course launch were added to the survey in January 2019.

Table 1

Descriptives of Faculty Experience and Students Taught by 2018-2019 Course-Takers

	Mean	SD	Median	Mode	Range
Years teaching in higher education	10.63	8.26	9	10	0 – 50
Students taught in a typical academic year	191.01	202.49	135	100	0 – 2,000

Figure 1

Self-Reported Employment Status of 2018-2019 Course-Takers

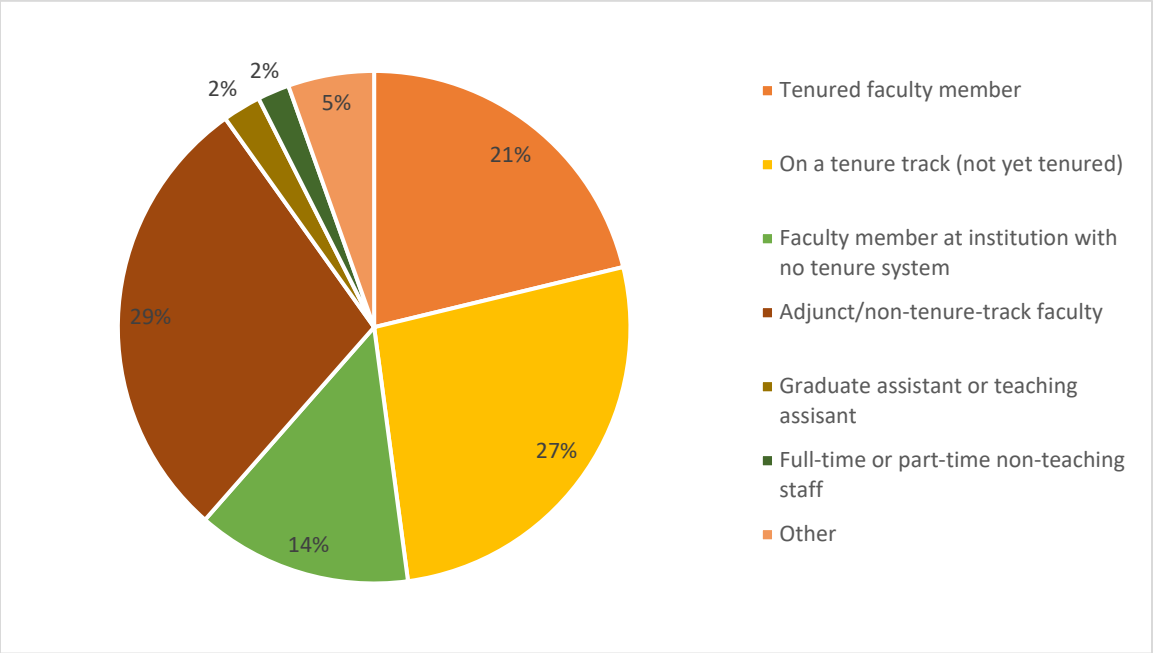


Figure 2

Self-Reported Primary Role of 2018-2019 Course-Takers

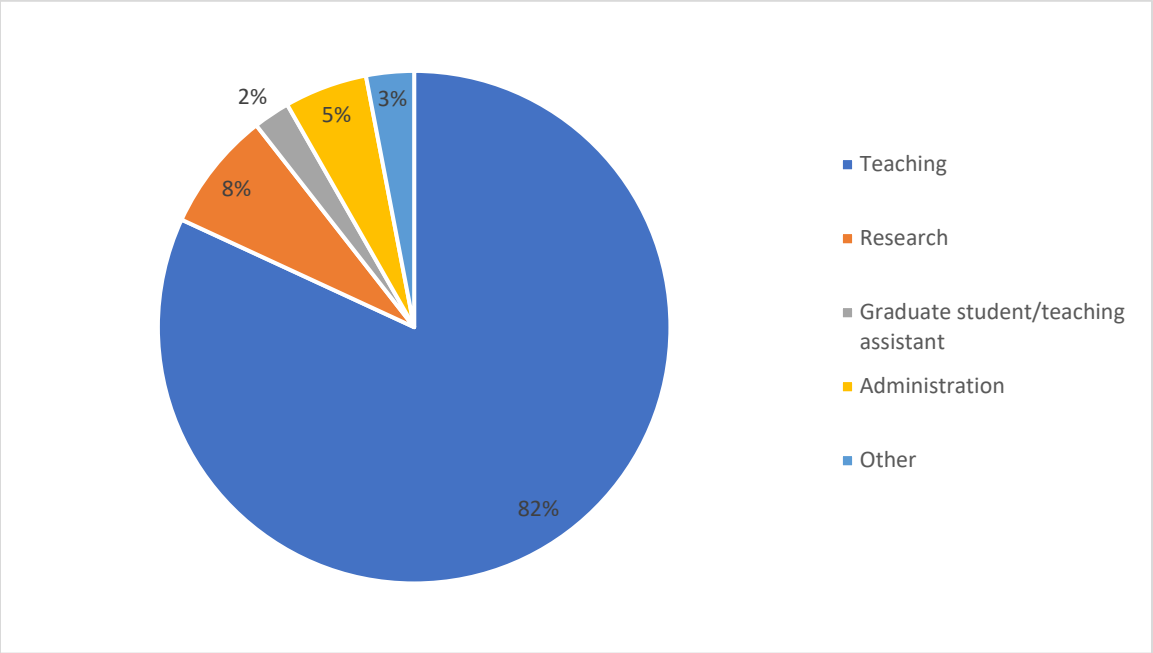


Figure 3

Self-Reported Employment Status of 2018-2019 Course-Takers

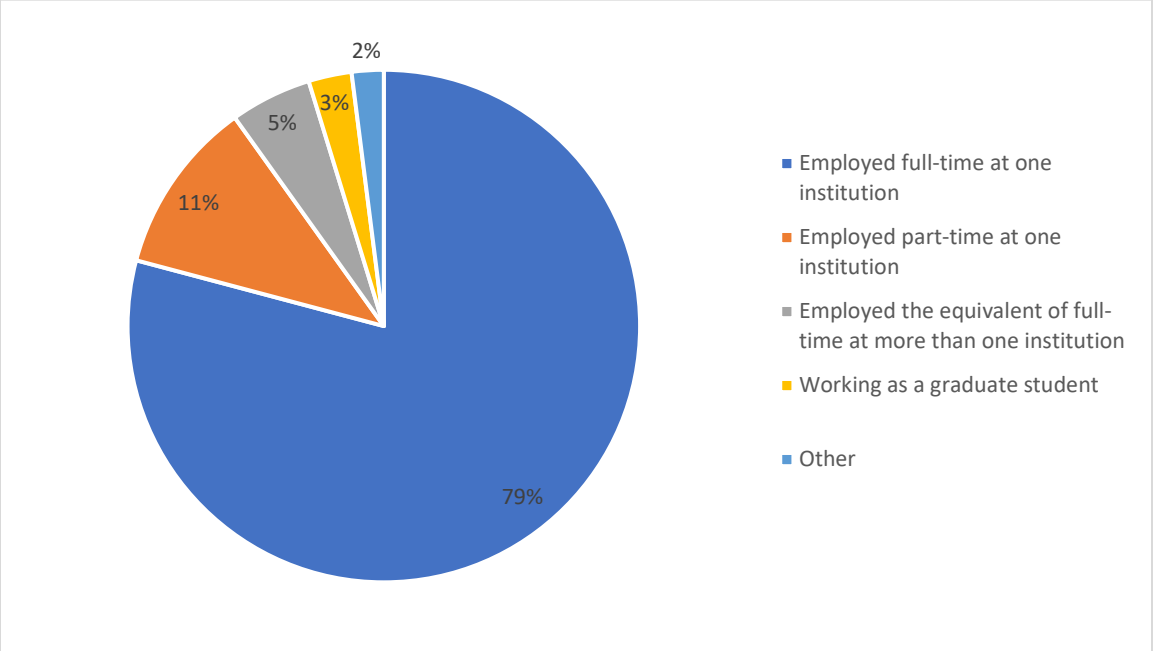


Figure 4

Self-Reported Format of Classes Taught by 2018-2019 Course-Takers

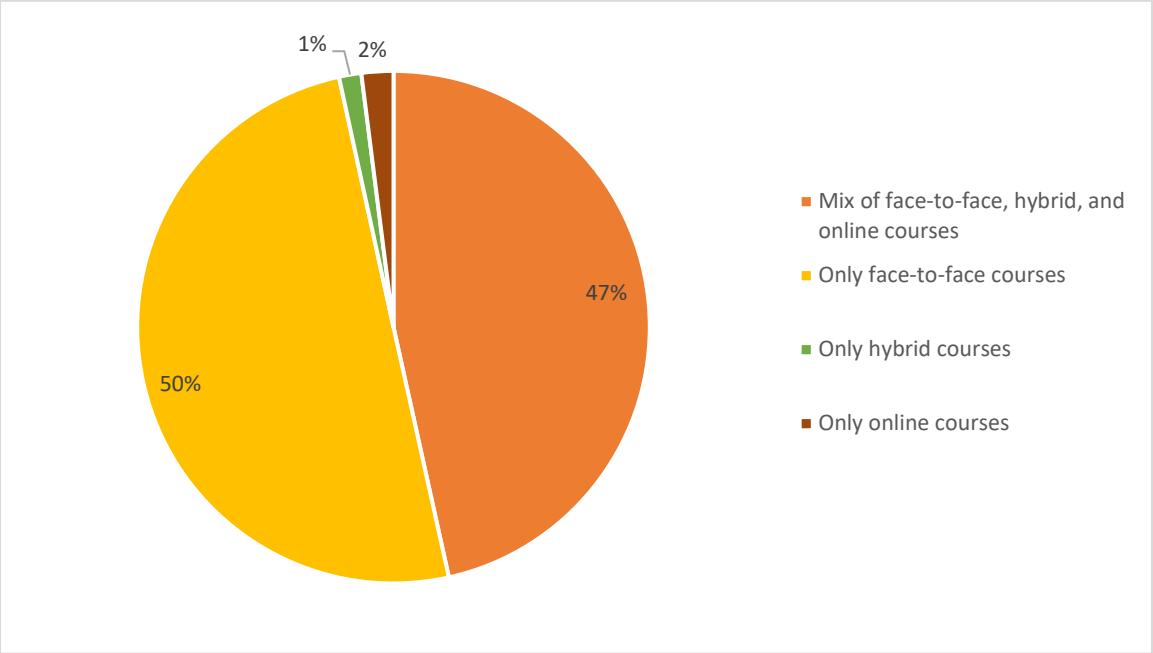


Figure 5

Self-Reported Launch Attendance of 2018-2019 Course-Takers

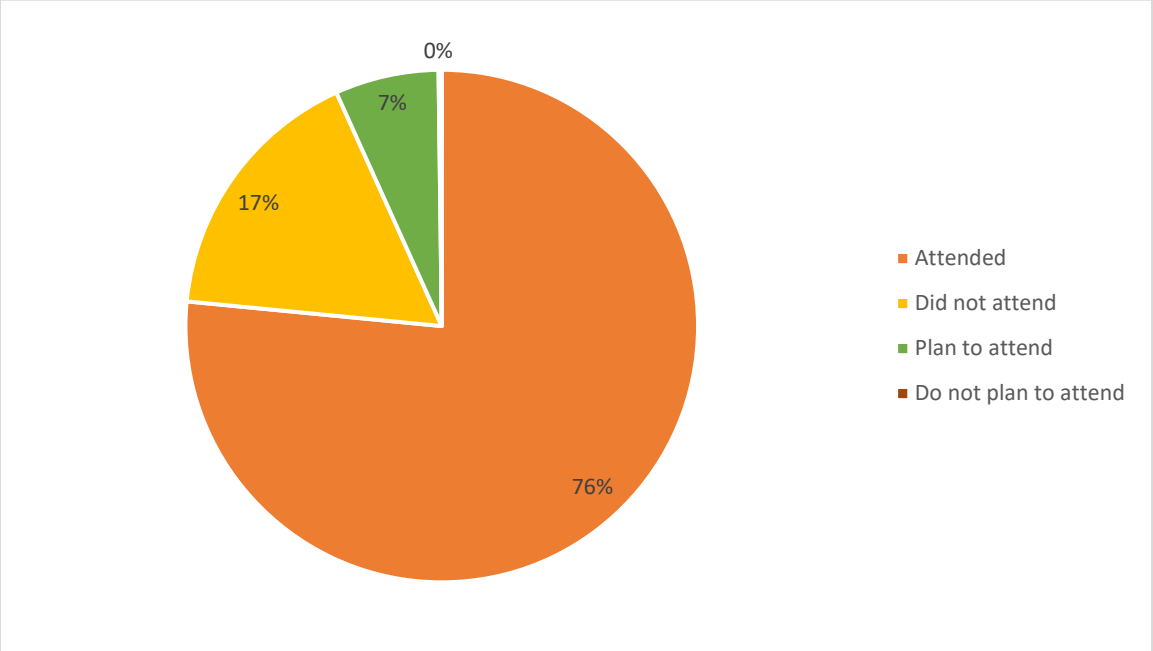


Table 2

Discipline Taught by Course-Takers

Discipline	Percent
Agriculture and Agriculture Operations	0.4
Architecture	0.2
Area, Ethnic, Cultural, Gender, and Group Studies	0.4
Biological and Biomedical Sciences	7.2
Business, Management, Marketing	8.2
Chemistry	3.7
Communication Technologies	0.3
Communications and Journalism	3.6
Computer and Information Sciences	2.6
Construction Trades	0.1
Education	3.5
Engineering and Engineering Technologies	2.2
English Language and Literature	6.9
Environmental Studies	0.9
Family and Consumer Sciences/Human Sciences	0.2
Foreign Languages, Literatures, and Linguistics	2.4
Health Sciences	11
History	2.4
Human Services	0.1
Law	0.8
Liberal Arts and Sciences Studies and Humanities	0.9
Library Science	0.4
Mathematics and Statistics	5.2
Multi/interdisciplinary Studies	0.3
Other	18.1
Personal and Culinary Services	0
Philosophy	1.4
Physical Sciences	1.7
Political Science	1.4
Psychology	4.5
Social Sciences	5.7
Theology and Religious Vocations	0.2
Visual and Performing Arts	2.5

Survey of Credentialed Faculty Respondents

At the end of the 2018-2019 academic year, all ACUE-credentialed faculty were invited to participate in a survey about their teaching practices. All 264 responses from faculty who were credentialed in fall 2018 or earlier were included in the analysis.

Measures

End-of-Module Surveys

At the end of each module, faculty report the relevance of the content to their teaching practice, as well as their learning and implementation of each practice presented in the module. The relevance item is responded to using a 4-point strongly agree to strongly disagree Likert scale. New learning is calculated by averaging the number of "I learned about this technique" responses for each response to get a per person per module average. Additional learning is calculated by averaging the number of "I learned more about this technique" responses for each response to get a per person per module average. Implementation is calculated by averaging the number of "I implemented this technique" responses for each response to get a per person per module average. Plans to implement are calculated by averaging the number of "I plan to implement this technique" responses for each response to get a per person per module average. There are 44,998 responses from active course-takers in full courses that began after August 1, 2018 and ended by August 31, 2019 included in the analysis.

End-of-Course Surveys

At the end of the course, faculty report on the relevance of the content to their work, how helpful the modules were in refining their teaching practice, and whether they would recommend the course to a colleague. These items are responded to on a 5-point "strongly agree" to "strongly disagree" Likert scale. In addition, faculty report on their confidence using evidence-based practices presented in the course and their teaching beliefs and behaviors, using a retrospective pre/post design. The confidence items are responded to using a 5-point Likert scale from "not at all" to "extremely." The confidence items were examined altogether as a single 29-item scale (α_{before} = .956, α_{after} = .954), and as separate sub-scales for each unit (Unit 1: α_{before} = .847, α_{after} = .829; Unit 2: α_{before} = .818, α_{after} = .819; Unit 3: α_{before} = .856, α_{after} = .838; Unit 4: α_{before} = .842, α_{after} = .837; Unit 5: α_{before} = .890, α_{after} = .893). The teaching beliefs and behaviors items are responded to using a 5-point Likert scale from "strongly disagree" to "strongly agree", with higher numbers indicating more positive beliefs and behaviors. These items were averaged to form a 10-item scale (α_{before} = .820, α_{after} = .833), and improvements on individual items were also examined. There are 1,714 responses received from active course-takers in full courses that began after August 1, 2018 and ended by August 31, 2019 included in the analysis.

Survey of Credentialed Faculty

The survey of credentialed faculty serves several purposes and thus includes items on a variety of topics, such as feedback on resources and how their institutions recognized their credential. The items that are reported here focus on sustained changes to teaching practice. Specifically, faculty were asked "To what degree did your ACUE course impact your teaching?", with response options of "My overall approach to instruction changed, and I continue to refine my practice," "I made many adjustments to my teaching, which have continued," "I made some adjustments to my teaching, which have continued," "I made adjustments to my teaching at the time of my participation, but have not really sustained them," and "My participation in ACUE did not impact my approach to instruction." They also reported how often they currently use practices they learned in their ACUE course with response options of "never," "rarely (once a month or fewer)," "occasionally (2 or 3 times per month)," "regularly (more than once per week)," and "very frequently (once or more per class session)."

Results

Relevance

On the end-of-module surveys, 98 percent (*N* = 43,914) of responses indicated that they agreed or strongly agreed that the content presented in the modules were relevant to their work (see Figure 6). On the end-of-course survey, 95 percent (*N* = 1,631) of faculty reported that they agreed or strongly agreed that the modules were helpful in refining their teaching practice, 94 percent (*N* = 1,613) agreed or strongly agreed that the modules were relevant to their experience as an educator, and 86 percent (*N* = 1,480) agreed or strongly agreed that it is likely they would recommend ACUE's course to a friend or colleague (see Figures 7-9).

Figure 6

Frequency of Responses on Content Relevance on End-of-Module Surveys

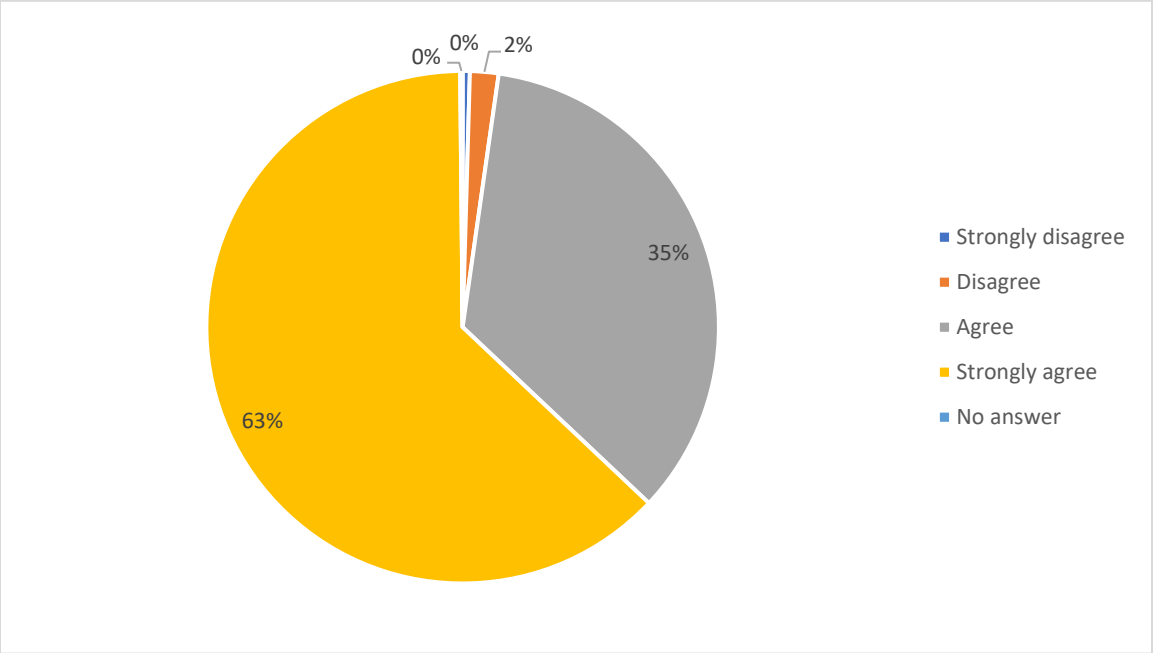


Figure 7

Frequency of Responses on Content Helpfulness in Refining One's Teaching Practice on End-of-Course Surveys

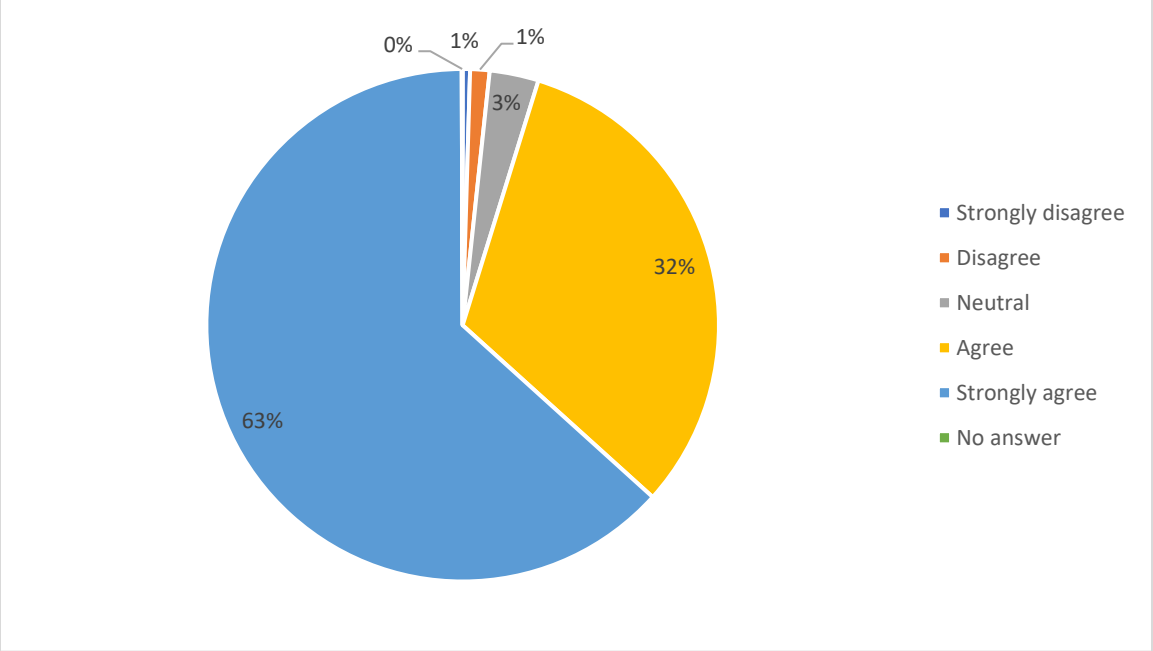


Figure 8

Frequency of Responses on Content Relevance to One's Experiences as an Educator on End-of-Course Surveys

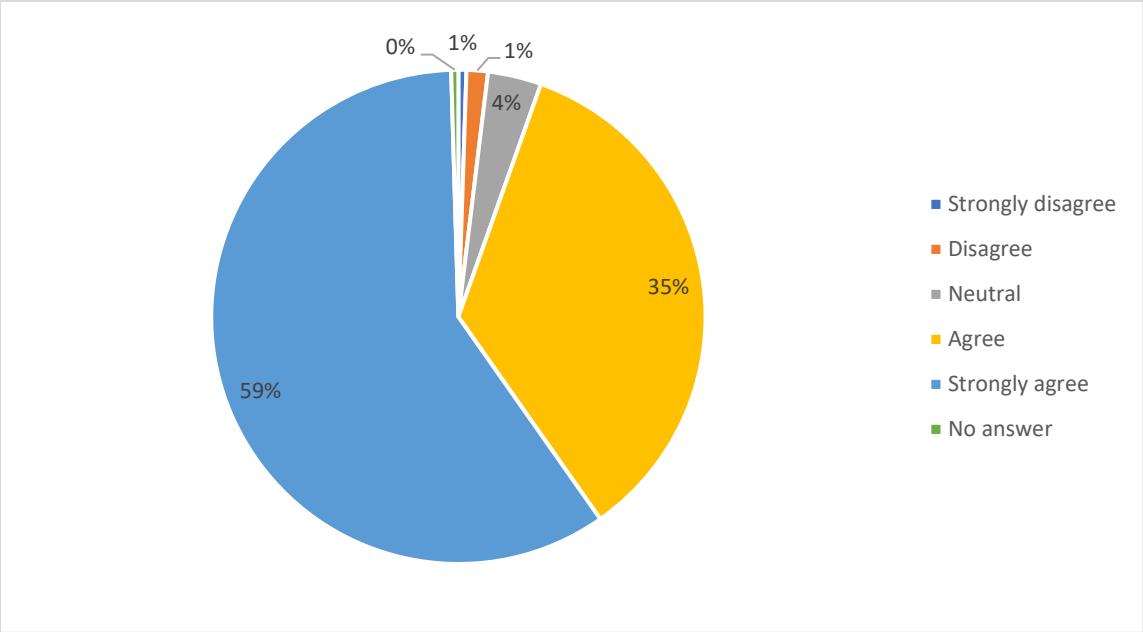
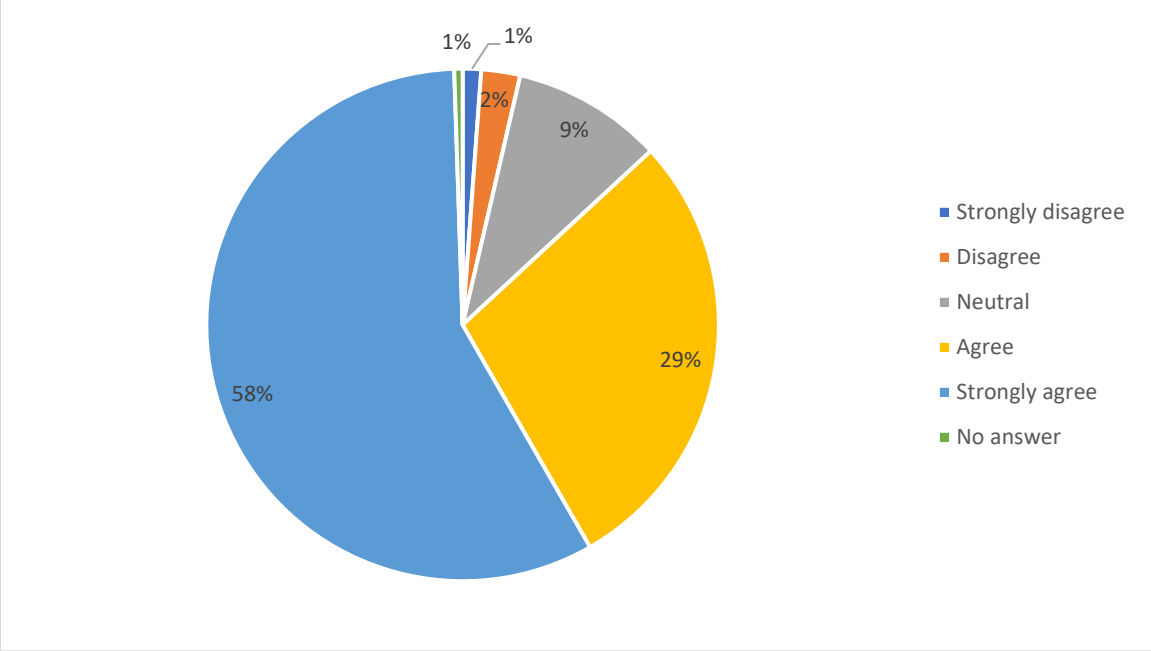


Figure 9

Frequency of Responses on Recommending Course to a Friend or Colleague on End-of-Course Surveys



Learning

On the end-of-module surveys, the average number of new techniques learned was 2.8 per module, and the average number of techniques faculty report learning more about was 3.3 per module. Thus, the typical completer learned 70 new teaching practices and learned more about 83 additional teaching practices.

Implementation

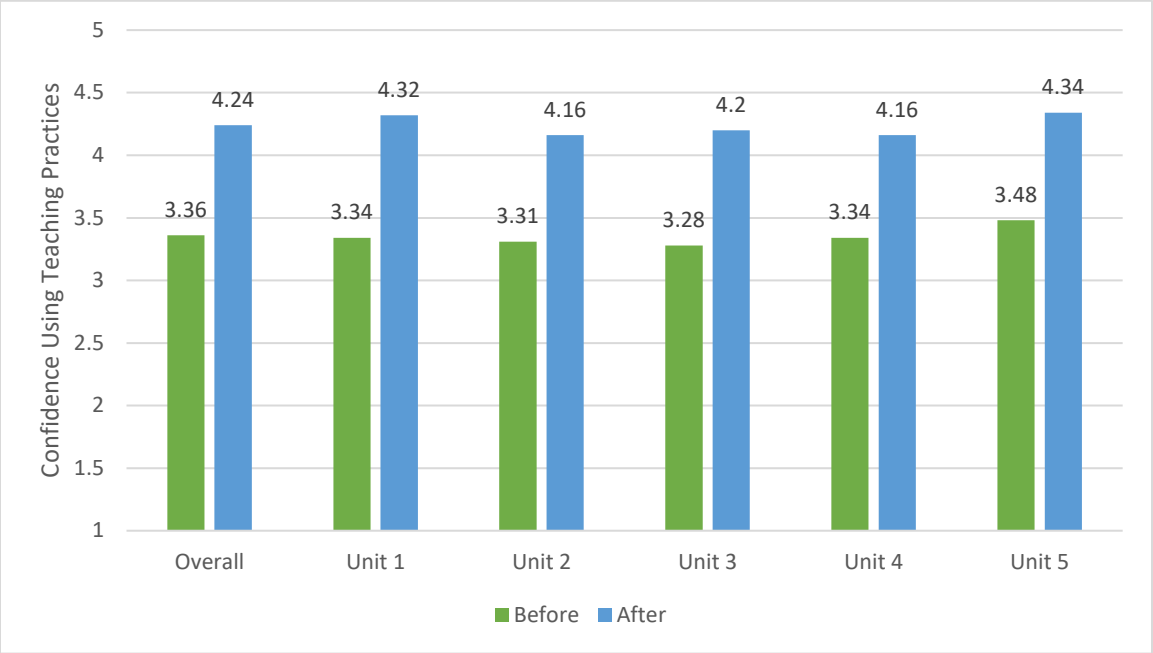
On the end-of-module surveys, the average number of techniques implemented was 1.2 per module, and the average number of techniques faculty report planning to implement was 2.6 per module. Thus, the typical completer implemented 30 new teaching practices and planned to implement 65 additional teaching practices.

Confidence

A repeated measures ANOVA showed a significant increase in overall self-reported confidence using evidence teaching practices, $F(1, 1{,}707) = 4{,}924.44$, $p < .001$, $d = 1.98$. Average confidence increased from 3.36 ($SD = 0.56$) to 4.24 ($SD = 0.45$). Similarly, repeated measures ANOVAs showed a significant increase in self-reported confidence using the teaching practices from Unit 1, $F(1, 1{,}704) = 4{,}195.77$, $p < .001$, $d = 1.65$, Unit 2, $F(1, 1{,}698) = 3{,}503.67$, $p < .001$, $d = 1.42$, Unit 3, $F(1, 1{,}697) = 3{,}948.53$, $p < .001$, $d = 1.56$, Unit 4, $F(1, 1{,}695) = 3{,}706.04$, $p < .001$, $d = 1.42$, and Unit 5, $F(1, 1{,}698) = 3{,}806.84$, $p < .001$, $d = 1.52$. Average confidence increased on Unit 1 practices from 3.34 ($SD = 0.68$) to 4.32 ($SD = 0.49$), on Unit 2 practices from 3.31 ($SD = 0.66$) to 4.16 ($SD = 0.54$), on Unit 3 practices from 3.28 ($SD = 0.66$) to 4.20 ($SD = 0.51$), on Unit 4 practices from 3.34 ($SD = 0.63$) to 4.16 ($SD = 0.52$), and on Unit 5 practices from 3.48 ($SD = 0.62$) to 4.34 ($SD = 0.49$); see Figure 10.

Figure 10

Average Increases in Self-Reported Confidence on End-of-Course Surveys.



Teaching Beliefs and Behaviors

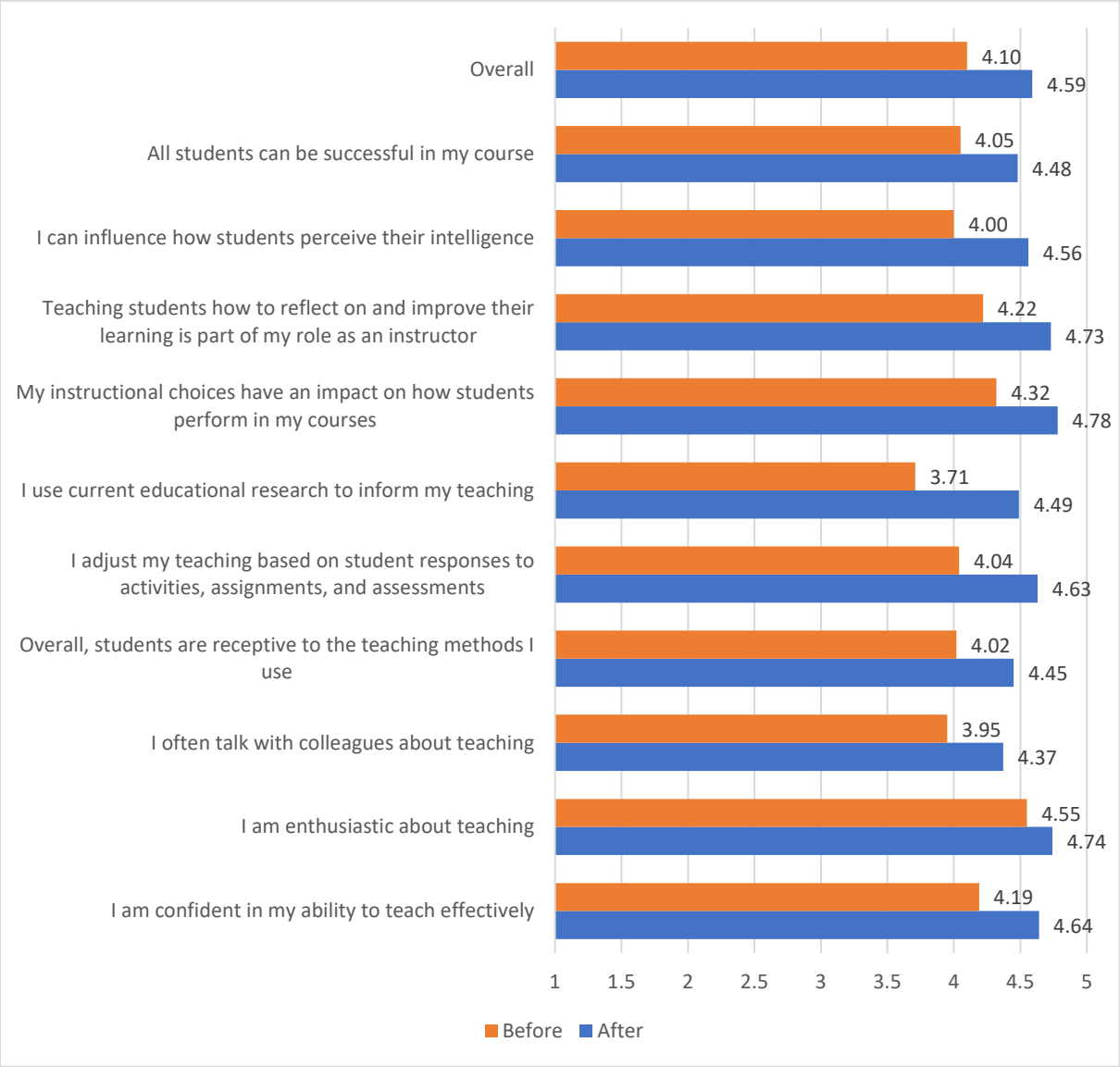
A repeated measures ANOVA showed a significant improvement in overall teaching beliefs and behaviors, $F(1, 1{,}698) = 2{,}365.55$, $p < .001$, $d = 1.15$, which increased from 4.10 (SD = 0.46) to 4.59 (SD = 0.37). Similarly, repeated measures ANOVAs showed significant improvement on each individual item (see Figure 11):

- "All students can be successful in my course," $F(1, 1{,}690) = 825.75$, $p < .001$, $d = 0.55$, increased from 4.05 (SD = 0.85) to 4.48 (SD = 0.70);
- "I can influence how students perceive their intelligence," $F(1, 1{,}691) = 1{,}252.31$, $p < .001$, $d = 0.84$, increased from 4.00 (SD = 0.73) to 4.56 (SD = 0.60);
- "Teaching students how to reflect on an improve their learning is part of my role as an instructor," $F(1, 1{,}686) = 1{,}104.90$, $p < .001$, $d = 0.84$, increased from 4.22 (SD = 0.70) to 4.73 (SD = 0.50);
- "My instructional choices have an impact on how students perform in my courses," $F(1, 1{,}690) = 981.14$, $p < .001$, $d = 0.81$, increased from 4.32 (SD = 0.65) to 4.78 (SD = 0.48);
- "I use current educational research to inform my teaching," $F(1, 1{,}696) = 1{,}641.91$, $p < .001$, $d = 1.01$, increased from 3.71 (SD = 0.90) to 4.49 (SD = 0.63);

- “I adjust my teaching based on student responses to activities, assignments and assessments,” $F(1, 1{,}694) = 1{,}302.24$, $p < .001$, $d = 0.93$, increased from 4.04 ($SD = 0.72$) to 4.63 ($SD = 0.55$);
- “Overall, students are receptive to the teaching methods I use,” $F(1, 1{,}693) = 877.89$, $p < .001$, $d = 0.71$, increased from 4.02 ($SD = 0.63$) to 4.45 ($SD = 0.58$);
- “I often talk with colleagues about teaching,” $F(1, 1{,}690) = 678.58$, $p < .001$, $d = 0.51$, increased from 3.95 ($SD = 0.91$) to 4.37 ($SD = 0.71$);
- “I am enthusiastic about teaching,” $F(1, 1{,}690) = 283.36$, $p < .001$, $d = 0.33$, increased from 4.55 ($SD = 0.63$) to 4.74 ($SD = 0.51$); and
- “I am confident in my ability to teach effectively,” $F(1, 1{,}693) = 815.73$, $p < .001$, $d = 0.70$, increased from 4.19 ($SD = 0.73$) to 4.64 ($SD = 0.53$).

Figure 11

Average Increases in Self-reported Teaching Beliefs and Behaviors on End-of-Course Surveys



Sustained Use

On the survey of credentialed faculty, 96 percent (*N* = 247) of faculty who were credentialed in fall 2018 or earlier reported that they have sustained the changes they made to their teaching as a result of the ACUE course (see Figure 12). In addition, 34 percent (*N* = 90) of faculty who were credentialed in fall 2018 or earlier reported that they continue to use the evidence-based teaching practices they learned in the ACUE course once or more per class session, and an additional 46 percent (*N* = 121) report using the practices more than once per week (see Figure 13).

Figure 12

Frequency of Responses on Degree to which the ACUE Course Impacted Teaching on Survey of Credentialed Faculty

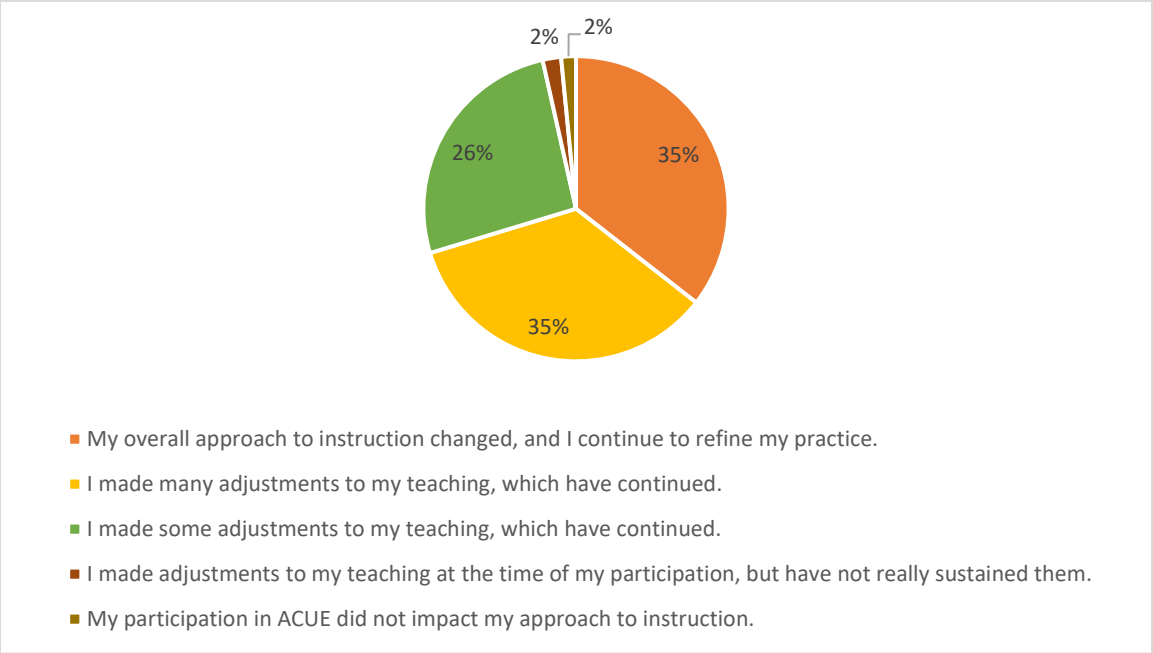
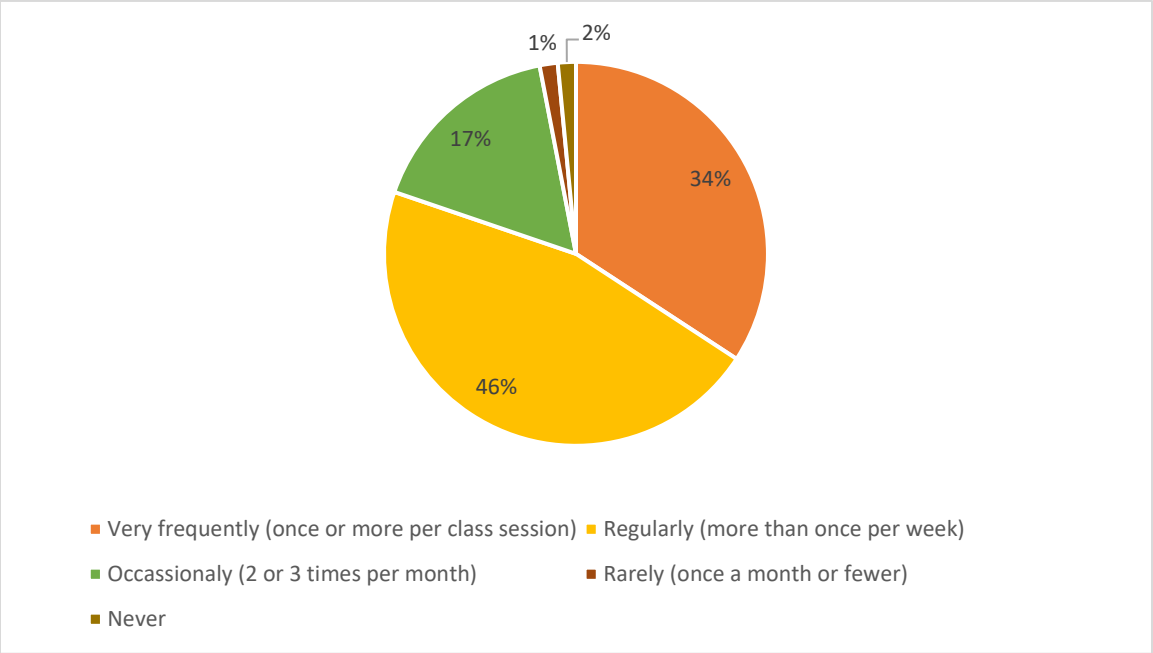


Figure 13

Frequency of Responses on How Often Respondents Currently Use the Practices Learned in the ACUE Course on Survey of Credentialed Faculty



Differences in Outcomes by Faculty Characteristics

In addition to examining overall impacts, faculty responses on the enrollment survey were connected to their end-of-course survey responses to explore whether the impact differs by faculty characteristics, specifically teaching experience, tenure status, and teaching format.

Teaching Experience

A faculty member's years of experience was not correlated with agreement that the modules were helpful in refining their teaching practice, $r = .02$, $p = .383$, agreement that the modules were relevant to their experiences as educators, $r = .03$, $p = .306$, or agreement that they would likely recommend the course to a friend or colleague, $r = .04$, $p = .101$.

Teaching experience was a significant moderator of the increase in confidence, $F(1, 1{,}698) = 55.91$, $p < .001$. Faculty with fewer than 10 years of teaching experience reported significantly lower confidence before they started the ACUE course ($M = 3.25$, $SD = 0.58$) than faculty with 10 or more years of teaching experience ($M = 3.47$, SD 0.52), $F(1, 1{,}698) = 70.69$, $p < .001$. However, at the end of the course, faculty with fewer than 10 years of teaching experience reported only marginally lower confidence ($M = 4.22$, 38$SD = 0.44$) than their more experienced peers ($M = 4.26$, $SD = 0.45$), $F(1, 1{,}698) = 3.69$, $p = .066$. The improvement in confidence was significant for both less experienced faculty, $F(1, 880) = 2{,}727.75$, $p < .001$, $d =$

1.87, and more experienced faculty, $F(1, 818) = 2{,}350.49$, $p < .001$, $d = 1.62$, but the significant interaction between faculty experience and time indicates that the magnitude of the improvement was larger among faculty with fewer than 10 years of experience.

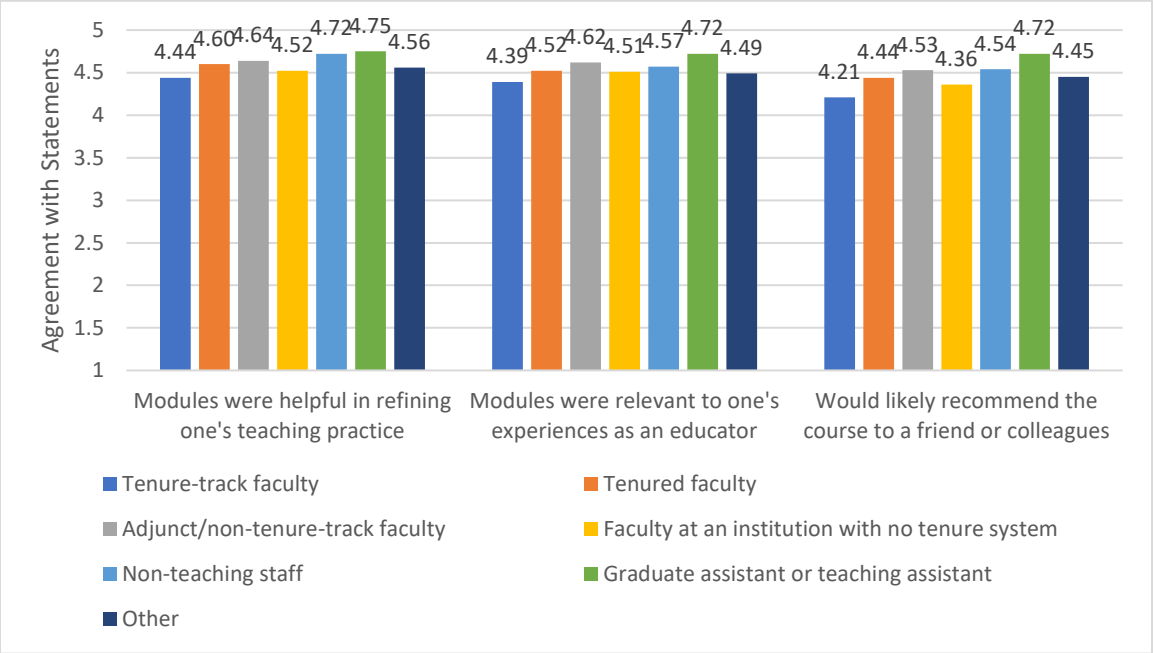
Teaching experience was also a significant moderator of the improvement in teaching beliefs and behaviors, $F(1, 1{,}689) = 26.68$, $p < .001$. Faculty with fewer than 10 years of teaching experience reported significantly less positive teaching beliefs and behaviors before taking the course ($M = 4.05$, $SD = 0.49$) compared to faculty with more experience ($M = 4.16$, SD 0.43), $F(1, 1{,}689) = 22.83$, $p < .001$. However, at the end of the course, faculty with fewer than 10 years of teaching experience were no different in their teaching beliefs and behaviors ($M = 4.59$, $SD = 0.37$) than their more experienced peers ($M = 4.59$, $SD = 0.37$), F (1, 1,689) = 0.08, $p = .775$. The improvement in teaching beliefs and behaviors was significant for both less experienced faculty, $F(1, 877) = 1{,}318.82$, $p < .001$, $d = 1.23$, and more experienced faculty, $F(1, 812) = 1{,}072.88$, $p < .001$, $d = 1.07$, but the significant interaction between faculty experience and time indicates that the magnitude of the improvement was larger among faculty with fewer than 10 years of experience.

Tenure Status

There was a significant effect of tenure status on agreement that the modules were helpful in refining one's teaching practice, $F(6, 1{,}703) = 5.08$, $p < .001$. Bonferroni post-hoc tests showed that tenure-track faculty reported lower agreement ($M = 4.44$, $SD = 0.76$) than tenured faculty ($M = 4.60$, $SD = 0.59$), $p = .008$, and adjunct/non-tenure-track faculty ($M = 4.64$, $SD = 0.63$), $p < .001$; no other comparisons were significant, p's > .05. There was a significant effect of tenure status on agreement that the modules were relevant to one's experiences as an educator, $F(6, 1{,}696) = 5.11$, $p < .001$. Bonferroni post-hoc tests showed that tenure-track faculty reported lower agreement ($M = 4.39$, $SD = 0.77$) than adjunct/non-tenure-track faculty ($M = 4.62$, $SD = 0.62$), $p < .001$; no other comparisons were significant, p's > .05. There was a significant effect of tenure status on agreement that they would likely recommend the course to a friend or colleague, $F(6, 1{,}695) = 6.83$, $p < .001$. Bonferroni post-hoc tests showed that tenure-track faculty reported lower agreement ($M = 4.21$, $SD = 0.96$) than tenured faculty ($M = 4.44$, $SD = 0.78$), $p = .003$, and adjunct/non-tenure-track faculty ($M = 4.53$, $SD = 0.77$), $p < .001$; no other comparisons were significant, p's > .05 (see Figure 14).

Figure 14

Average Responses to Relevance Questions on End-of-Course Survey by Faculty Tenure Status



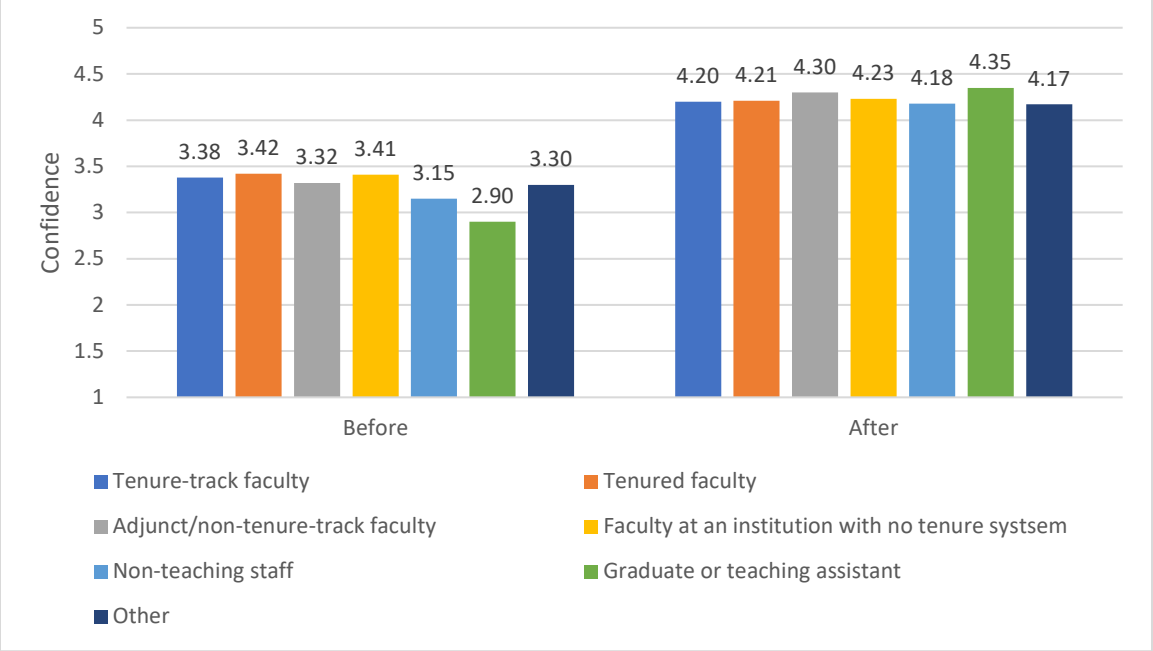
Tenure status was a significant moderator of the increase in confidence, $F(6, 1{,}698) = 14.71$, $p < .001$. There was a significant effect of tenure status on self-reported confidence before the course, $F(6, 1{,}698) = 6.55$, $p < .001$. Bonferroni post-hoc tests showed that graduate and teaching assistants reported lower confidence before the course ($M = 2.90$, $SD = 0.68$) than adjunct/non-tenure-track faculty ($M = 3.32$, $SD = 0.55$), $p < .001$, tenure-track faculty ($M = 3.38$, $SD = 0.56$), $p < .001$, tenured faculty ($M = 3.42$, $SD = 0.54$), $p < .001$, faculty at institutions with no tenure system ($M = 3.41$, $SD = 0.53$), $p < .001$, and instructors who reported their employment type as "other" ($M = 3.30$, $SD = 0.58$), $p = .005$; no other comparisons were significant, p's > .05. There was still a significant effect of tenure status on self-reported confidence after the course, $F(6, 1{,}698) = 3.48$, $p = .002$, but the pattern was different. Bonferroni post-hoc tests showed that adjunct/non-tenure-track faculty reported significantly higher confidence after the course ($M = 4.30$, $SD = 0.43$) compared to tenure-track faculty ($M = 4.20$, $SD = 0.46$), $p = .006$, and marginally higher compared to tenured faculty ($M = 4.21$, $SD = 0.46$), $p = .083$; no other comparisons were significant, p's > .05 (see Figure 15). Notably, the improvement in confidence was significant for all groups, though the magnitudes of the improvement varied:

- Adjunct/non-tenure-track faculty: $F(1, 471) = 1{,}626.35$, $p < .001$, $d = 2.00$;
- Tenure-track faculty: $F(1, 456) = 1{,}267.54$, $p < .001$, $d = 1.60$;

- Tenured faculty: $F(1, 360) = 940.27$, $p < .001$, $d = 1.59$;
- Faculty at institutions with no tenure system: $F(1, 245) = 716.19$, $p < .001$, $d = 1.73$;
- Non-teaching staff members: $F(1, 35) = 116.30$, $p < .001$, $d = 1.69$;
- Graduate assistant or teaching assistant: $F(1, 35) = 158.22$, $p < .001$, $d = 2.57$; and
- Other employment type: $F(1, 96) = 331.44$, $p < .001$, $d = 1.60$.

Figure 15

Average Reported Confidence on End-of-Course Survey by Faculty Tenure Status



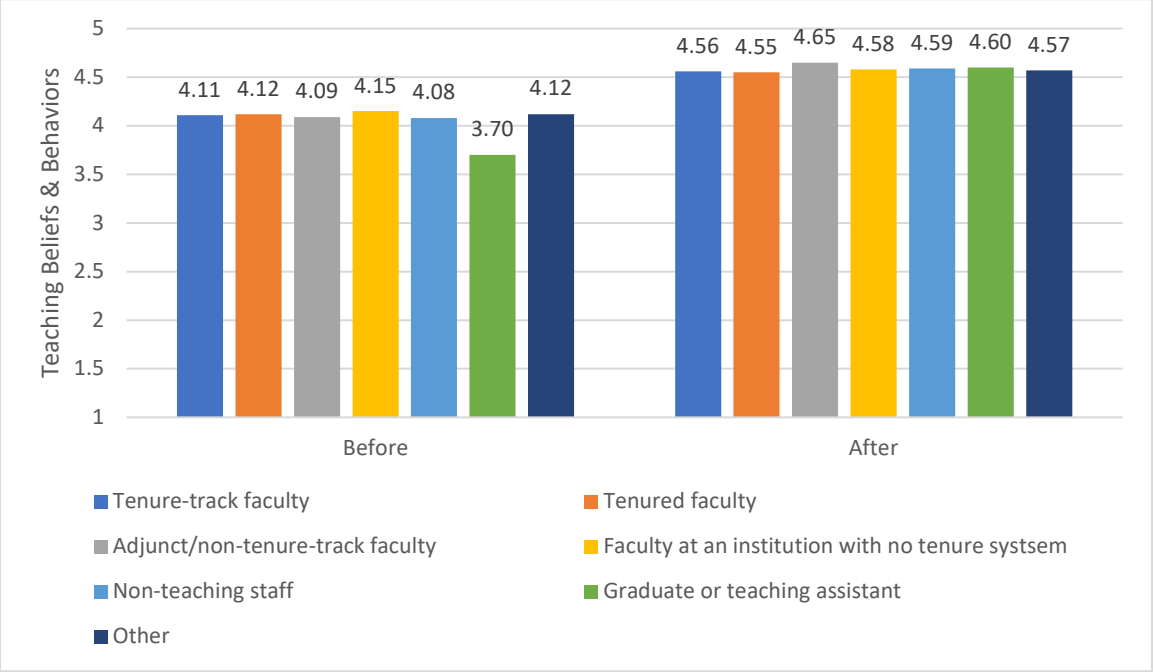
Tenure status was a significant moderator of the positive change in improvement in teaching beliefs and behaviors, $F(6, 1{,}689) = 11.74$, $p < .001$. There was a significant effect of tenure status on self-reported teaching beliefs and behaviors before the course, $F(6, 1{,}698) = 5.28$, $p < .001$. Bonferroni post-hoc tests showed that graduate and teaching assistants reported less positive teaching behaviors and beliefs before the course ($M = 3.70$, $SD = 0.55$) than adjunct/non-tenure-track faculty ($M = 4.09$, $SD = 0.44$), $p < .001$, tenure-track faculty ($M = 4.11$, $SD = 0.48$), $p < .001$, tenured faculty ($M = 4.12$, $SD = 0.45$), $p < .001$, faculty at institutions with no tenure system ($M = 4.15$, $SD = 0.46$), $p < .001$, non-teaching staff members ($M = 4.08$, $SD = 0.51$), $p = .009$, and instructors who reported their employment type as "other" ($M = 4.12$, $SD = 0.48$), $p < .001$; no other comparisons were significant, p's $> .05$. There was still a significant effect of tenure status on self-reported teaching beliefs and behaviors after the course, $F(6, 1{,}698) = 3.62$, $p = .001$, but the pattern was different. Bonferroni post-hoc tests showed that adjunct/non-tenure-track faculty reported significantly more positive teaching beliefs and

behaviors after the course (*M* = 4.65, *SD* = 0.31) compared to tenure-track faculty (*M* = 4.56, *SD* = 0.42), *p* = .002, and tenured faculty (*M* = 4.55, *SD* = 0.37), *p* = .002; no other comparisons were significant, *p*'s > .05 (see Figure 16). Notably, the improvement in teaching beliefs and behaviors was significant for all groups, though the magnitudes of the improvement varied:

- Adjunct/non-tenure-track faculty: $F(1, 470) = 846.30$, $p < .001$, $d = 1.47$;
- Tenure-track faculty: $F(1, 452) = 581.31$, $p < .001$, $d = 1.00$;
- Tenured faculty: $F(1, 356) = 420.95$, $p < .001$, $d = 1.04$;
- Faculty at institutions with no tenure system: $F(1, 245) = 321.31$, $p < .001$, $d = 1.02$;
- Non-teaching staff members: $F(1, 35) = 57.88$, $p < .001$, $d = 1.22$;
- Graduate assistant or teaching assistant: $F(1, 35) = 104.26$, $p < .001$, $d = 2.02$; and
- Other employment type: $F(1, 96) = 131.66$, $p < .001$, $d = 1.02$.

Figure 16

Average Reported Teaching Beliefs and Behavior on End-of-Course Survey by Faculty Tenure Status



Teaching Format

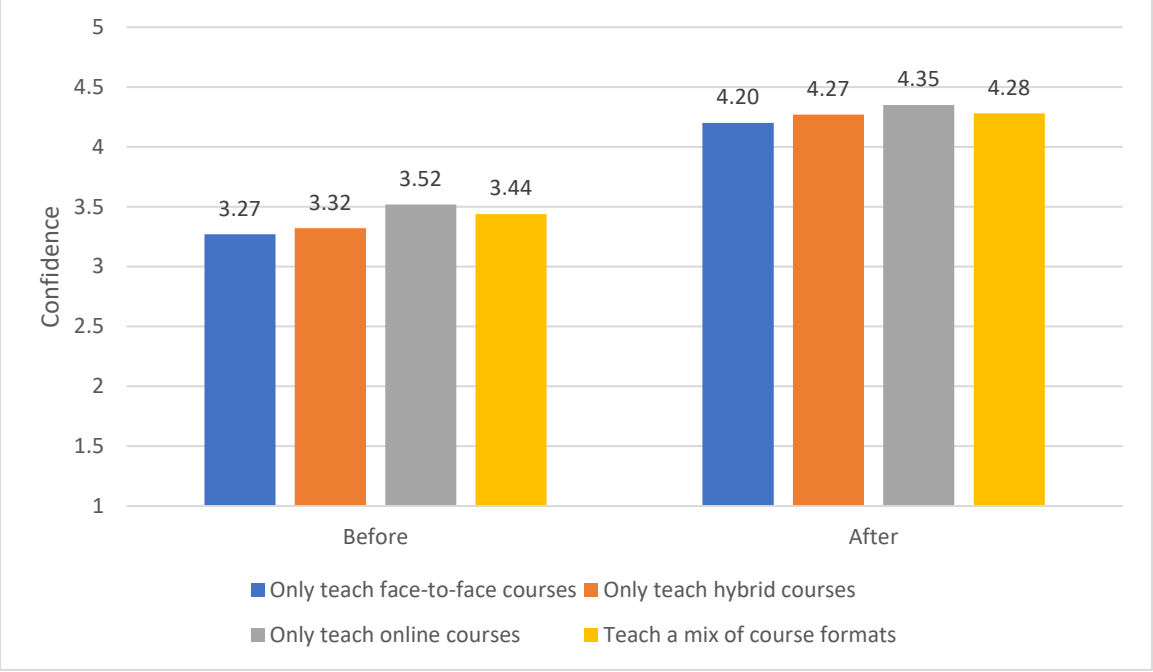
Teaching format was not related to agreement that the modules were helpful in refining one's teaching practice, $F(3, 1{,}705) = 0.02$, $p = .998$, agreement that the modules were relevant to one's experiences as an educator, $F(3, 1{,}698) = 1.30$, $p = .272$, or agreement that they would likely recommend the course to a friend or colleague, $F(3, 1{,}697) = 1.10$, $p = .350$.

Teaching format was a significant moderator of the increase in confidence, $F(3, 1{,}700) = 3.92$, $p = .008$. There was a significant effect of teaching format on self-reported confidence before the course, $F(3, 1{,}700) = 13.10$, $p < .001$. Bonferroni post-hoc tests showed that faculty who only teach face-to-face courses reported having significantly lower confidence before the course ($M = 3.27$, $SD = 0.55$) compared to faculty who teach a mix of course formats ($M = 3.44$, $SD = 0.56$), $p < .001$, and marginally lower confidence compared to faculty who only teach online ($M = 3.52$, $SD = 0.53$), $p = .073$; no other comparisons were significant, p's > .05. There was still a significant effect of teaching format on self-reported confidence after the course, $F(3, 1{,}700) = 5.28$, $p = .001$. Bonferroni post-hoc tests showed that faculty who only teach face-to-face courses reported having significantly lower confidence after the course ($M = 4.20$, $SD = 0.45$) compared to faculty who teach a mix of course formats ($M = 4.28$, $SD = 0.44$), $p = .002$; no other comparisons were significant, p's > .05 (see Figure 17). Importantly, the improvement in confidence was significant for all groups, though the magnitudes of the improvement varied:

- Only teach face-to-face courses: $F(1, 834) = 2{,}607.17$, $p < .001$, $d = 1.84$
- Only teach online courses: $F(1, 32) = 80.43$, $p < .001$, $d = 1.83$
- Only teach hybrid courses: $F(1, 23) = 80.43$, $p < .001$, $d = 2.17$
- Teach a mix of course formats: $F(1, 811) = 2{,}176.33$, $p < .001$, $d = 1.65$

Figure 17

Average Reported Confidence on End-of-Course Survey by Faculty Teaching Format

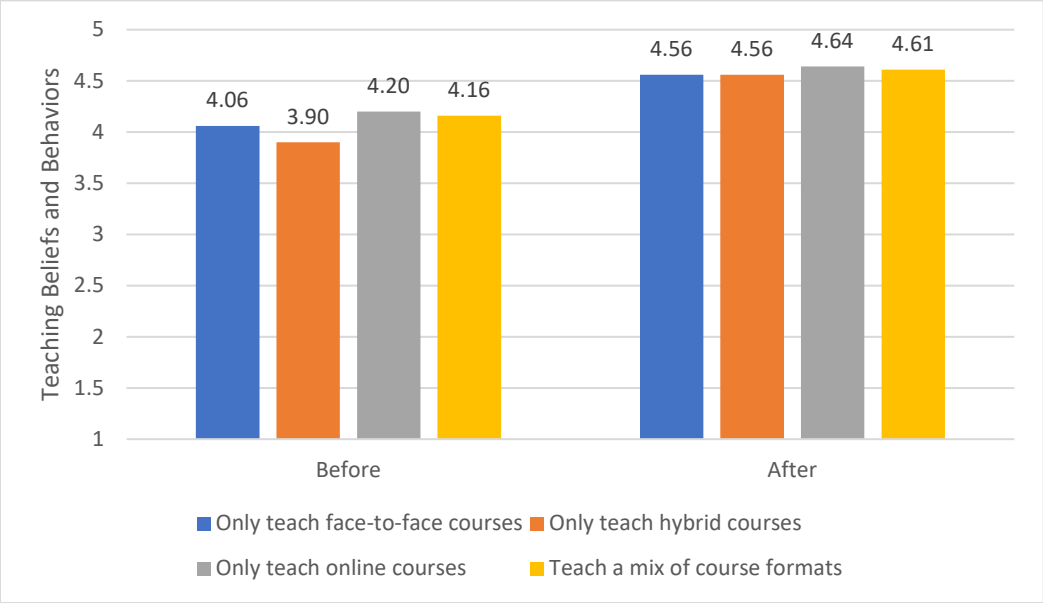


Teaching format was a significant moderator of the improvement in teaching beliefs and behaviors, $F(3, 1{,}691) = 3.42$, $p = .017$. There was a significant effect of teaching format on self-reported confidence before the course, $F(3, 1{,}691) = 8.24$, $p < .001$. Bonferroni post-hoc tests showed that faculty who teach a mix of course formats reported significantly more positive teaching beliefs and behaviors before the course ($M = 4.16$, $SD = 0.46$) compared to faculty who only teach face-to-face courses ($M = 4.06$, $SD = 0.47$), $p < .001$, and marginally more positive compared to faculty who only teach hybrid courses ($M = 3.90$, $SD = 0.40$), $p = .051$; no other comparisons were significant, p's > .05. There was still a significant effect of teaching format on self-reported confidence after the course, $F(3, 1{,}691) = 2.88$, $p = .035$, but as can be seen in Figure 18, the differences were smaller. Bonferroni post-hoc tests showed that faculty who teach a mix of course formats reported significantly more positive teaching beliefs and behaviors after the course ($M = 4.61$, $SD = 0.37$) compared to faculty who only teach face-to-face courses ($M = 4.56$, $SD = 0.37$), $p = .029$; no other comparisons were significant, p's > .05. Importantly, the improvement in teaching beliefs and behaviors was significant for all groups, though the magnitudes of the improvement varied:

- Only teach face-to-face courses: $F(1, 829) = 1{,}270.26$, $p < .001$, $d = 1.19$;
- Only teach online courses: $F(1, 32) = 57.60$, $p < .001$, $d = 1.13$;
- Only teach hybrid courses: $F(1, 23) = 49.65$, $p < .001$, $d = 1.67$; and
- Teach a mix of course formats: $F(1, 807) = 1{,}005.13$, $p < .001$, $d = 1.11$.

Figure 18

Average Reported Teaching Beliefs and Behaviors on End-of-Course Survey by Faculty Teaching Format



Discussion

The results on faculty course-takers' perception of the relevance of the module content from both the end-of-module and end-of-course surveys demonstrates high levels of engagement, and this was true across several faculty demographics. The only faculty demographic that impacted engagement was tenure status, with tenure-track faculty reporting somewhat lower engagement. However, even among tenure-track faculty, their engagement was still very high.

Faculty course-takers' responses on the end-of-module surveys indicate that typical course completers learn 70 new teaching practices, learn more about 83 additional practices, implement 30 new practices, and plan to implement 65 additional practices. Importantly, the survey of credentialed faculty shows that the vast majority of faculty do sustain the changes they made to their teaching during the ACUE course and continue to use the practices at least once a week.

Results from the end-of-course survey show large increases in self-efficacy, which based on Bandura's self-efficacy theory (1999, 1997) should help faculty try out the practices they indicated they plan to implement, and should help them continue working on teaching practices they've already tried, even when faced with challenges. Similar to the findings on faculty engagement, the results on changes in self-efficacy occur across faculty demographics, though there seem to be larger improvements for some groups, including faculty with less experience, adjunct/non-tenure-track faculty, graduate students, and instructors who only teach in a single course format.

The end-of-course survey also demonstrates significant improvements in faculty course-takers' teaching beliefs and behaviors, several of which are related to growth mindset. Those particular beliefs are likely to impact their students, particularly those from disadvantaged backgrounds who may not always get the message from their professors that they have what it takes to succeed in college (Canning et al., 2019). The results on teaching beliefs and behavior also show increases in faculty course-takers' enthusiasm about teaching, how much they are using educational research to inform their teaching, and how much they talk to colleagues about teaching. The results on improved teaching beliefs and behavior are true across faculty demographics, though improvements are larger for some groups, including faculty with less experience, adjunct/non-tenure-track faculty, graduate students, and faculty who only teach hybrid courses.

Taken together, these results demonstrate strong impact of the ACUE course on Levels 1 through 3 of the ACUE evaluation framework (MacCormack et al., 2018): faculty engagement, faculty learning, and faculty implementation. Furthermore, these findings come from nationwide data sources across various cohorts, institutions, and faculty demographics.

References

Armbruster, P., Patel, M., Johnson, E., & Weiss, M. (2009). Active learning and student-centered pedagogy improve student attitudes and performance in introductory biology. *CBE Life Sciences Education, 8,* 203–213. https://doi.org/10.1187/cbe.09-03-0025

Atir, S., Rosenzweig, E., & Dunning, D. (2015). When knowledge knows no bounds: Self-perceived expertise predicts claims of impossible knowledge. *Psychological Science, 26,* 1295-1303.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). Academic Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* Freeman.

Bandura, A. (1999). A sociocognitive analysis of substance abuse: An agentic perspective. *Psychological Science, 10,* 214-217.

Burnette, J.L., O'Boyle, E.H., VanEpps, E.M., Pollack, J.M., & Finkel, E.J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139,* 655-701.

Burrowes, P. A. (2003). A student-centered approach to teaching general biology that really works: Lord's constructivist model put to a test. *The American Biology Teacher, 65,* 491–502. https://doi.org/10.2307/4451548

Canning, E.A., Muenks, K., Green, D.J., & Murphy, M.C. (2019). STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes. *Science Advances, 5,* doi: 10.1126/sciadv.aau4734.

Dunning, D., Johnson, K., Ehrlinger, J., & Kruger, J. (2003). Why people fail to recognize their own incompetence. *Current Directions in Psychological Science, 12,* 83-87.

Dweck, C.S. (2006). *Mindset: The new psychology of success.* Random House.

Dweck, C.S. (2012). Implicit theories. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories in social psychology* (Vol. 2, pp. 43–61). Sage.

Hong, Y.Y., Chiu, C., Dweck, C. S., Lin, D., & Wan, W. (1999) Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology, 77,* 588–599.

Kember, D., & Gow, L. (1994). Orientations to teaching and their effect on the quality of student learning. *Journal of Higher Education, 65,* 58–74. https://doi.org/10.2307/2943877

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology, 77,* 1121-1134.

MacCormack, P., Snow, M., Gyurko, J., & Candio Sekel, J. (2018). *Connecting the dots: A proposed accountability method for evaluating the efficacy of faculty development and its impact on student outcomes.* Association of College and University Educators.

Mazur, E. (2009). Farewell, lecture? *Science, 323*(5910), 50–51. https://doi.org/10.1126/science.1168927

Robins, R.W., & Pals, J.L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, and self-esteem change. *Self and Identity, 1,* 313-336.

Stajkovic, A.D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin, 124,* 240-261.

Stankov, K., Morony, S., & Lee, Y.P. (2014). Confidence: The best non-cognitive predictor of academic achievement? *Educational Psychology: An International Journal of Experimental Educational Psychology, 34,* 9-28.