A Study of ACUE Professional Development at Rutgers University-Newark

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Executive Summary

Between January 2017 and April 2019, the Center for Advanced Study in Education (CASE) conducted an evaluation of the impact of ACUE's Effective Teaching Practices course at Rutgers University – Newark. The evaluation included both qualitative and quantitative analyses and spans the first five levels of ACUE's six-level evaluation framework (MacCormack, Snow, Gyurko, & Candio Sekel, 2018).

The evaluation measured impact in terms of faculty learning and implementation of evidence-based instructional practices, as well as student course completion rates, grades, perceptions of classroom practices, and overall impressions of the course and instructor. Course completion, grades, and course evaluations were evaluated by comparing outcomes in course sections taught by ACUE-credentialed faculty over time (longitudinal), as well as to course sections taught by matched faculty who did not yet participate in the ACUE course.

The evaluation included faculty that completed the ACUE course between Spring 2017 and Spring 2018. By synthesizing data collected from different perspectives and at different points in time using varied methods, the following summary findings and conclusions were reached.

Key Findings

In a longitudinal comparison of 43 ACUE-credentialed faculty over time (Before/During/After) with data that included up to 7,183 students (2,468 with ACUE-after instructors, 2,086 with ACUE-during instructors and 2,629 with pretraining instructors):

- Students taught by instructors after they earned the ACUE credential were more likely to be successful (earn a grade of A-C) in their courses than students taught by the same faculty either during ($p < 0.001$) or before ($p < 0.0001$) the instructor earned the ACUE credential.
- Students were more likely to have higher grades if they were taught by an ACUE-credentialed faculty after they earned their credential than before or during the ACUE course.

When courses taught by 43 ACUE-credentialed faculty were compared to the matched courses with data that included up to 39,416 students (4,554 students from ACUE instructors and 32,233 students from comparison instructors).

- Students taught by ACUE-credentialed instructors received grades that were significantly higher

compared to students who were taught by comparison instructors ($p < 0.0001$).

- Students taught by ACUE-credentialed instructors were more likely to be successful (earning grades A-C) compared to students taught by comparison instructors ($p < 0.0001$).
- Students taught by ACUE-credentialed instructors had significantly higher completion rates compared to students who were taught by comparison instructors ($p < 0.001$)

Faculty Reflections

- Themes within faculty reflections were studied using qualitative coding computer software, NVIVO, to sort reflections into major themes and subthemes.
- Overall conclusions include:
    - Faculty were using the reflection process to deepen and fully consider what they had learned.
    - Reflections typically referenced multiple educationally relevant themes rather than a single topic addressed in the module that had just been completed.
    - Faculty reflected on gaining knowledge and skills that helped them to be more effective instructors.
    - Faculty reported an increased awareness of the different ways they could improve communications with students.

About ACUE

The Association of College and University Educators (ACUE) believes that all college students deserve an extraordinary education and that faculty members play a critical role in their success. In partnership with institutions of higher education nationwide, ACUE supports and credentials faculty members in the use of evidence-based teaching practices that drive student engagement, retention, and learning. Faculty members who complete ACUE courses earn certificates in effective college instruction endorsed by the American Council on Education. ACUE's Community of Professional Practice connects college educators from across the country through member forums, podcasts, and updates on the latest developments in the scholarship of teaching and learning. To learn more, visit acue.org.

Background

Rutgers University is a state university in New Jersey established in 1766. It is the eighth oldest higher education institution in the United States. The university enrolls more than 70,000 students and has 23,400 full- and part-time faculty members. Rutgers University-Newark is one of three campuses and houses seven colleges. The campus offers over 40 undergraduate majors and over 59 graduate programs. Rutgers University-Newark has the most racially and ethnically diverse student body in the country (Campus ethnic diversity: National universities, n.d.). Student enrollment includes approximately 13,400 students: 9,140 undergraduate students and 4,320 graduate students. Rutgers University-Newark has 585 full-time faculty. Between January 2017 and January 2019, faculty at Rutgers University-Newark participated in ACUE's Course in Effective Teaching Practices.

ACUE Professional Development - Effective Teaching Practices

ACUE's Course in Effective Teaching Practices is an online professional development program for college and university faculty that includes five units of study. This program was developed in consultation with leading subject matter experts and college faculty. The five units of study include:

- Designing an Effective Course and Class
- Establishing a Productive Classroom Environment
- Using Active Learning Techniques
- Promoting Higher Order Thinking
- Assessing to Inform Instruction and Promote Learning

The five units of study are addressed in 25 online modules, which include 180 instructional videos of exemplary teaching on campuses, interviews with leading scholars in teaching and learning, as well as multiple opportunities for discussion so faculty can learn with and from each other. A requirement for completing each module includes faculty choosing one of the evidence-based teaching practices presented in the module and implementing it in their classroom or online course and then reflecting in writing on the experience. The written reflections are scored against a rubric by a national ACUE reader, and faculty who complete 25 reflections receive ACUE's Certificate in Effective College Instruction endorsed by the American Council on Education (ACE).

Between January and April 2017, 32 faculty participated in Rutgers University-Newark's first two cohorts of the ACUE course: Cohorts A and B.

Table 1. ACUE Modules in Course Sequence for Rutgers University Newark Cohorts A and B.

ACUE Unit of Study[1]	Modules in Course Sequence	Number of Modules in Course Sequence	Total Number of Modules in Unit
Unit 1, Designing an Effective Course and Class	Establishing Powerful Learning Outcomes (1A) Aligning Assessments With Course Outcomes (1B) Aligning Activities and Assignments With Course Outcomes (1C) Preparing an Effective Syllabus (1D) Planning an Effective Class Session (1E)	5	5
Unit 2, Establishing a Productive Learning Environment	Leading the First Day of Class (2A) Promoting a Civil Learning Environment (2B) Connecting With Your Students (2C) Motivating Your Students (2D) Engaging Underprepared Students (2E)	7	7
Unit 3, Using Active Learning Techniques	Using Active Learning Techniques in Small Groups (3A) Using Active Learning Techniques in Large Classes (3B) Delivering an Effective Lecture (3C) Planning Effective Class Discussions (3D) Facilitating Engaging Class Discussions (3E)	5	6
Unit 4, Promoting Higher Order Learning	Providing Clear Directions and Explanations (4A) Using Advanced Questioning Techniques (4D) Developing Self-Directed Learners (4E)	3	5
Unit 5, Assessing to Inform Instruction and Promote Learning	Developing Fair, Consistent, and Transparent Grading Practices (5A) Developing and Using Rubrics and Checklists (5B) Providing Useful Feedback (5C) Checking for Student Understanding (5D) Using Student Achievement and Feedback to Improve Your Teaching (5E)	5	5

[1]Module 3F - Integrating Civic Learning into Your Course, Module 4B - Using Concept Maps and Other Visualization Tools, and Module 4C - Teaching Powerful Note-Taking Skills were not completed

The ACUE professional development at Rutgers University-Newark for Cohorts A and B occurred over a 13-week period. Each week instructors completed two modules. Faculty did not necessarily complete modules from the same unit during a single week. Data from three additional cohorts were included in analysis of student outcomes.

Methodology

After each module, faculty applied what they learned in the module while teaching a class and then wrote a reflection about their experiences. Faculty also completed a faculty survey created by ACUE that asked about these experiences. Collection of a student survey, provided by ACUE was optional, and at the discretion of the faculty member. Additionally, Rutgers University-Newark provided grades of students in classes taught by instructors who had completed the ACUE course and grades of comparison students. Comparison data included students enrolled in similar courses but taught by faculty members who did not participate in the ACUE training and students taught by the ACUE-credentialed faculty member the semester(s) before their participation in the ACUE professional development. Qualitative analyses of faculty reflections focused on data from 24 faculty in Cohorts A and B. Student performance data focused on the 43 faculty from five cohorts who earned the ACUE credential and were the primary instructor for courses at Rutgers University-Newark during the relevant semesters.

Each data source was examined separately. A content analysis of faculty reflections identified reoccurring major themes and subthemes. The qualitative data analytic coding software, NVIVO 11, assisted in the process and allowed narratives to be tagged by content. *Level 1 coding (major themes)* involved a line-by-line review of each reflection and sorting into broad themes. When relevant, text was coded into multiple major themes (overlapping content). *Level 2 coding (subthemes)* further studied and defined each major theme by sorting these references into smaller subthemes. A similar line-by-line coding looked for patterns. Two coders sorted reflections during both codings and consistency in recognizing codes was established. After analysis of the reflections was completed, faculty and student surveys were examined and scale scores computed. Finally, student performance data were examined.

Faculty Reflections Following Teaching That Applied ACUE Training

Part 1 of the Rutgers University-Newark data analysis examined faculty reflections written after completing a module and teaching a lesson implementing what they learned. Faculty responded to guiding prompts that asked about their experiences during the lesson. The data pool included reflections written by 24 faculty who participated in the ACUE professional development and had submitted at least 10 reflections at the time of the analysis in July 2017. Sixteen faculty members (67%) had submitted a reflection for every module at that time. Five hundred seventy-seven reflections were studied. Table 2 summarizes the data coding process.

Table 2. The Three- Step Data Coding Process.

Step	Description of Step
Level 1 Coding: Sorting Reflections into Broad Major Themes	All reflections underwent line by line review. References (also called phrases) found within reflections were identified that represented the major themes. Reflections could include references to more than one major theme (overlapping content). New major themes were identified and added as they emerged.
Level 2 Coding: Sorting Broad Major Themes into Subthemes	References coded for each major theme underwent line by line review to identify subthemes. References could be coded into more than one major theme (overlapping content). New subthemes were added as they emerged.
Data Interpretation	Results from the Level 1 and Level 2 were reviewed and interpreted.

Major themes found within faculty reflections

CASE began by coding reflections into major themes identified during a prior study of ACUE reflections (Hecht & McNeill, 2018). Each reflection was read and phrases (called *references*) that referred to the major themes were labeled. As the data were coded, the original six major themes were expanded to nine. The references could consist of part of a sentence or include multiple sentences. Further, a single reflection could include multiple references to the same major theme (describing different experiences) or could include several major themes. The nine major themes' definitions and sample references are in Figure 1.

Figure 1. Nine Major Themes

1) **Instructional Techniques:** Descriptions of instructional techniques or strategies used by the faculty member during the lesson.

   "This semester I have added a new minilesson to break down a concept that students often struggle to grasp."

2) **Students' Emotional Response:** Descriptions of students' emotional responses to the class and/or instruction. Responses could be negative or positive, and included feelings of anxiety, confidence, likes, dislikes, etc.

   "Understandably, students are experiencing much anxiety and are asking for some extra credit work."

3) **Students' Engagement and Learning:** Evidence of perceived changes in student performance. Responses varied and described student demonstration of understanding and/or participation in class and assignments, or lack thereof.

    "Students seem to be responding very well to this approach, and I have noticed much better retention of information on their weekly quizzes."

4) **Classroom Environment:** Description about the classroom environment or atmosphere, including how students interact as a class.

    "One class had great chemistry and worked very hard, and another was emphatically neither."

5) **Classroom Communications and Interactions:** Descriptions of student-faculty, student-student, and faculty-faculty interactions and the nature of these interactions.

    "Most students come up to me individually and discuss their homework/assignments during office hours."

6) **Learning Objectives and Lesson Plan:** Descriptions of learning objectives or lesson plans.

    "I created a learning outcome indicating that students will be able to both identify and define several types of figurative language."

7) **Challenges Faced During Instruction:** Description of any challenges that faculty faced while implementing ACUE techniques or general challenges in teaching practice.

    "Some students will always tend to be more active in groups and others more passive, even with assigned roles."

8) **Possible Solutions to Challenges:** Descriptions about solutions proposed by faculty to challenges they faced.

    "Providing time for students to jot down thoughts and prepare to share them in small groups could go a long way to seeing that a plurality of students is involved in discussion."

9) **Future Plans and Goals:** Descriptions of possible plans considered by faculty for the future (I will, I plan, I could... etc.).

    "I will review my syllabi to see where it can be improved to reflect the ideas about productive discourse in class."

Number of references for each major theme

Level 1 coding found 4,687 references to the nine major themes. The four most commonly coded major themes were: *Instructional Techniques* (1,425 references; 30% of all references); *Future Plans and Goals* (948 references; 20% of all references); *Challenges Faced During Instruction* (802 references; 17% of all references) and *Students' Engagement and Learning* (427 references; 9% of all references). The least commonly mentioned major theme was *Classroom Environment* (31 references; 1% of all references). These data are presented in Table 3.

Table 3. Number and Overall Percentage of References for Each Major Theme.

Major Theme	Number of References (*n* = 4,687)	Percentage of Level 1 References[1]
Instructional Techniques	1,425	30%
Future Plans and Goals	948	20%
Challenges Faced During Instruction	802	17%
Students' Engagement and Learning	427	9%
Students' Emotional Response	323	7%
Classroom Communications and Interactions	305	6%
Possible Solutions to Challenges	233	5%
Learning Objectives and Lesson Plan	193	4%
Classroom Environment	31	1%

[1] Number of major theme references coded divided by the total number of references coded (e.g., the percentage of all Level 1 major theme references that were coded to Instructional Techniques is: 1,425/4,687 = 30%)

Overlap of major themes

As noted above, references could be coded into multiple major themes. This occurred when a single statement included mention of two or more themes within the same phrase. Approximately 15% of the references were double coded. This suggests that faculty were seeing an interconnectedness among the themes and their classroom experiences were not uniquely addressing a specific theme but instead were more comprehensive across themes. Overlap was most common for references to the major theme *Classroom Communications and Interactions,* with 87% of the references coded for this theme also being coded for another major theme.

Table 4. References Coded into Multiple Major Themes[1] (Shared References).

Major Theme	Number of References (*n* = 4,687)	Number of References Shared With Another Major Theme	Percent of References Shared With Another Major Theme
Instructional Techniques	1,425	499	35%
Students' Emotional Response	323	127	40%
Students' Engagement and Learning	427	177	41%
Classroom Environment	31	12	39%
Classroom Communications and Interactions	305	265	87%

Major Theme	Number of References (*n* = 4,687)	Number of References Shared With Another Major Theme	Percent of References Shared With Another Major Theme
Learning Objectives and Lesson Plan	193	92	48%
Challenges Faced During Instruction	802	111	14%
Possible Solutions to Challenges	233	18	8%
Future Plans and Goals	948	327	34%

[1] Number of Major Theme references also coded in another Major Theme (e.g., of the 1,425 references coded as Instructional Techniques, 499 were also coded into another Major Theme; 499/1,425= 35%)

Major themes found by ACUE units

The number of references to each major theme broken down by the unit of study completed when the reflection was written can be found in Table 6. The number of references coded to each unit varied from 407, written after completing Unit 4, "Promoting Higher Order Thinking" to 1,521, written after Unit 3, "Using Active Learning Techniques." The number of references was not always related to the number of modules in a unit but instead appeared to be related to the topics covered.

Table 5. Number of References by Unit of Study.

ACUE Unit of Study	Number of Modules in Unit	Number of References Coded to This Unit	Percent of References Coded to This Unit[1]
Unit 1, Designing an Effective Course and Class	5	958	20%
Unit 2, Establishing a Productive Learning Environment	7	965	21%
Unit 3, Using Active Learning Techniques	5	1,521	32%
Unit 4, Promoting Higher Order Thinking	3	407	9%
Unit 5, Assessing to Inform Instruction and Promote Learning	5	836	18%

[1] Number of major theme references coded for reflections following a Unit of Study divided by the total number of references coded (e.g., for Unit 1: 958/4,687 = 20%)

The number of major themes references found within each unit of study showed an anticipated relationship, thereby providing validity evidence that faculty responded to the reflection prompts appropriately and were learning the content they just experienced. For example, references about *Lesson Plans* were most frequent following Unit 1, "Designing an Effective Course and Class" than the other units, while references about *Classroom Environment* were most common following Unit 2, "Establishing a Productive Learning Environment." References about *Classroom Communications and Interactions* were most common in references after Unit 2, "Using Active Learning Techniques."

Table 6. Number of Major Theme References by Unit of Study.

Major Theme	Unit of Study				
	Unit 1, Designing an Effective Course and Class	Unit 2, Establishing a Productive Learning Environment	Unit 3, Using Active Learning Techniques	Unit 4, Promoting Higher Order Thinking	Unit 5, Assessing to Inform Instruction and Promote Learning
Instructional Techniques	267	318	508	112	220
Future Plans and Goals	232	184	296	76	160
Challenges Faced During Instruction	144	191	206	93	168
Students' Engagement and Learning	58	72	125	63	109
Students' Emotional Response	73	76	115	16	43
Classroom Communications and Interactions	37	36	161	7	64
Possible Solutions to Challenges	45	48	45	33	62
Learning Objectives and Lesson Plan	96	23	58	7	9
Classroom Environment	6	17	7	0	1

Differences in how often major themes were referenced by faculty

As seen in Table 7, although faculty varied in how often they referenced the different major themes, all but two major themes were referenced by every faculty member at least once. The *Instructional Techniques* theme was the most frequently referenced, with an average of 59 references per faculty member. *Future Plans and Goals* averaged 39 references per faculty and *Challenges Faced During Instruction* averaged 33 references per faculty.

Table 7. Frequency Faculty Reflections Referenced Major Themes (24 Faculty).

Major Theme	Number of Faculty with at Least One Reference	Mean Number of References	Least and Most References by Individual Faculty Member
Instructional Techniques	24	59	33 – 84
Students' Emotional Response	24	13	4 – 25
Students' Engagement and Learning	24	18	2 – 38
Classroom Environment	16	1	0 – 4
Classroom Communications and Interactions	24	13	3 – 29
Learning Objectives and Lesson Plan	23	8	0 – 27
Challenges Faced During Instruction	24	33	22 – 45
Possible Solutions to Challenges	24	10	1 – 27
Future Plans and Goals	24	39	25 – 57

Subthemes of major themes and further refinement

References coded into each major theme were coded a second time using a line-by-line review. Coding into subtthemes allowed for increased specificity in defining the themes.

A total of twenty-one subtthemes emerged:

- Fifteen subtthemes emerged from within the *Instructional Techniques* major theme. These were further classified into techniques related to classroom activities and techniques related to assessment and grading.

- Five subtthemes emerged from within the *Students' Emotional Response* major theme.
- Six subtthemes emerged from with the *Students' Engagement and Learning* major theme.
- Two subtthemes emerged from within the *Classroom Environment* major theme.
- Three subtthemes emerged from within the *Classroom Communications and Interactions* major theme.
- Two subtthemes emerged from within the *Learning Objectives and Lesson Plan* major theme.
- Five subtthemes emerged from within the *Challenges Faced During Instruction* major theme.
- Five subtthemes emerged from within the *Possible Solutions to Challenges* major theme.
- Six subtthemes emerged from within the *Future Plans and Goals* major theme.

Major theme: Instructional techniques

The most common major theme, *Instructional Techniques* with 1,425 references, was coded into 15 subthemes and 1,772 references, an increase of 296 references. Following the initial subtheme coding, nine of the subthemes were classified as instructional techniques related to classroom activities and six subthemes were classified as related to assessment and grading. The classroom activities cluster included 942 references, and the assessment and grading cluster included 780 references. Table 8 presents definitions for each of the subthemes.

Table 8. Use of Instructional Techniques: Definitions of Subthemes.

Cluster	Subtheme	Definition of Subtheme
Classroom Activities	Segmenting class content	Breaking of lecture or class up into parts and providing strategic break times (including minilessons).
	Soliciting discussion and group thought	Techniques involving or improving class-wide work or discussion (including fishbowl, class discussion, student presentations).
	Tactics to maintain desired student behavior	Techniques to establish and maintain a certain class climate or norms (e.g., ice breakers, mediation techniques, distract the distractor, ensuring diversity, making sure students know what resources will be available to them, sharing personal stories).
	Group work activities	Students working with other students in groups or pairs (e.g., think-pair-share, analytic teams, group discussions).
	Keeping to intended lesson plan	Discussing main points of lecture to students, keeping lecture focused or on track.

Cluster	Subtheme	Definition of Subtheme
	Means of increasing student engagement	Techniques to improve upon lecture (e.g., use of images, video, stronger opening or closing, worksheet, improving assignments).
	Offering office hours	Holding office hours or speaking with student(s) outside of class.
	Maintaining momentum and participation	Encouraging or improving participation or engagement (e.g., cold-calling, wait time, tracking or grading participation). Techniques to increase the quality and quantity of student responses.
	Leveraging technology	Use of technology or online components (including use of social media in the classroom).
Assessment and grading	Soliciting student feedback on lesson	Any evaluative technique that prompts reflection in the classroom, either of student work/progress or teacher effectiveness/ clarity, including debriefing, implicit association test, and reflections during class (e.g., muddiest point, exam wrapper, one-minute paper, repeat and reflect exercises, performance prognosis).
	Grade altering policies	Extra-credit assignments in or out of class, methods for weighting assignments or grades or adding/deducting points for particular behaviors (e.g., amnesty coupons, weighted grade scale).
	Grading system	The use of grading rubrics, special syllabi, roadmaps, skeleton notes, goal setting and other sorts of guidelines (includes DAPPS and samples of student work).
	Homework assignments	Out-of-class assignments.
	Helping students reflect on lesson	Teacher asking students questions, opening the floor for students to question the teacher, or reciprocal interview (e.g., critical incident, scaffolding questions, devil's advocate, prompting questions, discussion questions).
	Activities to promote mastery	Review exercises or ungraded assignments (e.g., practice quizzes).

Tables 9 and 10 present information about the subthemes grouped into the two classifications. The most common subthemes focus on classroom activities related to increasing student engagement (201 references) and efforts to maintain desired student behavior (179 references). All faculty wrote reflections with subtheme references about ways to maintain desired student behavior and about group work activities.

The first column of data is the number of references to each subtheme. The second column presents the percentage of those subthemes based on the total number of major theme references (*n* = 1,776), while the third column presents the percentage based on the subtheme groupings (classroom activities or assessment). The next three columns display information about faculty, including the number of faculty with at least one reference, the least and most references per faculty member, and the average number of references per faculty.

Table 9. Use of Instructional Techniques: Subtheme References Describing Classroom Activities.

Subtheme	Number of Instructional Technique Subtheme References (*n* = 1,722)	Percentage of Subtheme References (*n* = 1,722)	Percentage of Classroom Activities References (*n* = 942)	Number of Faculty with at Least One Reference	Least and Most Number of References per Faculty	Average Number of References per Faculty
Segmenting content	61	4%	6%	22	0 – 9	3
Soliciting discussion and group thought	114	7%	12%	22	0 – 12	5
Tactics to maintain desired student behavior	179	10%	19%	24	3 – 12	7
Group work activities	136	8%	14%	24	1 – 14	5
Keeping to intended lesson plan	35	2%	4%	13	0 – 6	1
Means of increasing student engagement	201	12%	21%	23	0 – 24	8
Offering office hours	17	1%	2%	8	0 – 4	1
Maintaining momentum and participation	107	6%	11%	22	0 - 10	4
Leveraging technology	92	5%	10%	22	0 - 16	4

Table 10 presents similar data about the Assessment and Grading subtheme references. The most common reference described use of grading systems such as rubrics or samples of student work (352 references) or the use of student feedback about a lesson (202 references). Only 16 instructors referenced formal homework assignments as an assessment and grading activity. Faculty references to *Instructional Techniques* were common across all reflections and the most commonly cited major theme. Further coding revealed two groups of subthemes related to how instructors work with students and how instructors assess students. These two subthemes, a focus on working with students and a focus on assessing students occurred several times.

Table 10. Use of Instructional Techniques: Subtheme References Describing Assessment and Grading.

Subtheme	Number of Instructional Technique Subtheme References (*n* = 1,722)	Percentage of Subtheme References (*n* = 1,722)	Percentage of Assessment and Grading References (*n* = 942)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Soliciting student feedback on lesson	202	12%	26%	24	1 – 21	8
Grade altering policies	64	4%	8%	23	0 – 6	3
Grading system	352	20%	45%	24	7 – 25	15
Homework assignments	28	2%	4%	16	0 – 5	1
Helping students reflect on lesson	89	5%	11%	24	1 – 10	4
Activities to promote mastery	45	3%	6%	17	0 – 9	2

Major theme: Students' emotional response

Major theme references about *Students' Emotional Responses* to the class were coded into five subthemes related to comfort, engagement, confidence, and a generally negative or a positive response. Level 2 coding resulted in an increase of 24 references (from 323 to 345) and greater specificity about the types of emotional response observed. Table 11 presents the definitions for each subtheme.

Table 11. Students' Emotional Response: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Student is comforted	Students are comforted as concerns or stressors are reduced.
Student is engaged	Students are engaged, excited, or attentive to lesson.
Students communicate confidence in ability to succeed	Students show understanding of what is expected of them and increased confidence.
Negative impact on instruction	Reports of negative emotional impact or negative impact on the instructor.
Positive impact on instruction	Nonspecific positive emotional impact or positive impact on the instruction.

The most common subtheme references were positive emotional impact on instruction (119 references) or students' engagement and interest in class activities (98 references). Across all faculty, they were most likely to provide multiple references about general positive impact on instruction. Negative impacts were only reported in 9% of the references. Every faculty member, at least four times, described his or her students' emotional reactions, and overwhelmingly, they described positive emotional responses.

Table 12. Students' Emotional Responses: Subtheme Reference

Subtheme	Number of References	Percentage of Subtheme References (*n* = 345)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Student is comforted	47	14%	21	0 – 5	2
Student is engaged	98	28%	22	0 – 10	4
Negative impact on instruction	31	9%	15	0 – 4	1
Positive impact on instruction	119	34%	23	0 – 12	5
Students communicate confidence in ability to succeed	50	14%	22	0 – 6	2

Major theme: Students' engagement and learning

Major theme references about *Students' Engagement and Learning* were coded into six subthemes. Five hundred twenty-three references were coded, an increase of 96 references from when *Students' Engagement and Learning* was examined. The six subthemes were grouped into two clusters based on their content: three about positive engagement and learning and three about a lack of engagement and learning.

Table 13. Students' Engagement and Learning: Definitions of Subthemes

Cluster	Subtheme	Definition of Subtheme
Positive engagement and learning	Mastery	Students show learning and understanding about the lesson and lesson objectives. They perform well on assignments.
	Positive student responses to instruction	General reports of satisfactory student performance or responses.
	Active participation	Students pay attention, attend to materials, are involved in the lesson, respond to questions, communicate with others, or are generally more motivated to do these things.
Lack of engagement and learning	Lack of mastery	Students are not learning or understanding lesson and lesson objectives. They perform poorly on assignments.
	Poor student performance/response to instruction	General reports of poor student performance or response.
	Lack of participation	Students are not paying attention, not attending to materials, not involved in lesson, not responding, or are engaged in unproductive side-conversation.

The majority of subtheme references, 86% of the total, were coded into one of three types of positive engagement in learning. Out of these, 35% of the references described student engagement in the lesson and 28% described active participation of students. As seen below, only 15% of the subtheme references described a lack of engagement or a lack of learning. Additionally, at most only seven faculty reported a lack of student engagement in any area.

Table 14. Students' Engagement and Learning: Subtheme References Describing Students' Positive Engagement and Learning.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 523)	Percentage of Positive Engagement References (*n* = 445)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Mastery	118	23%	27%	16	0 - 16	5
Positive responses to instruction	183	35%	41%	22	0- 22	7
Active participation	144	28%	32%	23	0-24	6

All instructors described examples of *Student Engagement and Learning* when writing their reflections, and most of the references described positive engagement and learning.

Table 15. Students' Engagement and Learning: Subtheme References Describing Lack of Student Engagement and Learning.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 523)	Percentage of Lack of Engagement References (*n* = 78)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Lack of mastery	14	3%	18%	4	0 – 4	1
Poor response to instruction	31	6%	40%	7	0 – 7	1
Lack of participation	33	6%	42%	5	0 – 5	1

Major theme: Classroom environment

Major theme references about *Classroom Environment* were coded into two subthemes, one that included descriptions about a positive classroom environment and the other about a negative classroom environment. Thirty-four references were coded, an increase of three references, from those when only *Classroom Environment* was examined.

Table 16. Classroom Environment: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Negative classroom environment	Negative comments regarding the classroom environment (e.g., confusion, uncomfortable) or descriptions of unfavorable conditions for learning
Positive classroom environment	Positive comments regarding classroom environment (e.g., enthusiasm, thoughtfulness, liveliness) or descriptions of favorable conditions for learning

Only a small number of faculty described the *Classroom Environment* during their reflections. However, among those who did, 14 subtheme references described positive conditions within the classroom, and 20 described negative conditions. Although references that described a classroom environment were infrequent, these references were somewhat more likely to be negative than positive. However, negative references often described a general sense of confusion in the classroom. The references also did not include what actions, if any, were taken to remediate the negative environment.

Table 17. Classroom Environment: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 31)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Negative classroom environment	20	65%	11	0 – 3	< 1
Positive classroom environment	14	45%	9	0 – 2	< 1

Major theme: Classroom communications and interactions

Major theme references about *Classroom Communications and Interactions* were coded into three subthemes. Each reference was sorted into a single subtheme that described the people involved in the communication, as seen in Table 18.

Table 18. Classroom Communications and Interactions: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Between faculty	Descriptions of communications between instructors and other instructors or faculty members.
Between students and faculty	Descriptions of communications between the instructor and any number of students, whether past or planned. This includes overt communications, like questions, and covert communications, like expressions and body language.
Between students	Stories about intra-class communications, including classroom chatter. This includes overt communications, like conversation, and covert communications, like expressions and body language.

The majority of *Classroom Communications and Interactions* subtheme references referred to communications between students and faculty (217 references, 78% of all interactions). Very few reflections (*n* = 10) referred to communications among faculty members. The finding that communication was most often between student and faculty was expected, although the number of reflections between students was somewhat lower than expected.

Table 19. Classroom Communications and Interactions: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 305)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Among faculty	10	3%	9	0 – 2	< 1
Among students and faculty	236	78%	24	2 – 21	9
Among students	59	19%	19	0 – 9	2

Major theme: Learning objectives and lesson plans

The major theme *Learning Objective and Lesson Plan* was coded into two subthemes about content and techniques. Level 2 Coding showed an increase of 14 references (from 193 references for Level 1 coding to 207 references for Level 2 coding).

Table 20. Learning Objectives and Lesson Plans: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Content faculty intends to cover	Addresses the content or material is to be covered or describes learning outcomes.
Technique faculty intends to employ	Plans for use of specific technique(s).

Although the number of references was small (only 4% of the total), the subthemes suggest instructors differentiated between content and techniques when considering their learning objectives and lessons plans. Faculty were slightly more likely to mention techniques than content, and all but one instructor wrote at least one reflection that described a technique.

Table 21. Learning Objectives and Lesson Plans: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 207)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Content faculty intends to cover	90	43%	18	0 – 21	4
Technique faculty intends to employ	117	57%	23	0 – 12	5

Major theme: Challenges faced during instruction

The major theme *Challenges Faced During Instruction* was coded into five subthemes. The major theme included 802 references but was expanded to 850 references during the Level 2 coding. Challenges were grouped into five areas as shown in Table 22.

Table 22. Challenges Faced During Instruction: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Inefficacy of instructional techniques	Instruction or technique not fitting well with class content. It is described as ineffective for a variety of reasons (e.g., misapplication, instructor apprehension, challenges with setting, or class size).
Managing time	Faculty experiences difficulty completing the lesson during the anticipated time.

Subtheme	Definition of Subtheme
Poor student performance in response to instruction	Faculty describes, despite being implemented correctly, instructional techniques led to poor performance or struggles. Includes challenges related to grading.
Faculty unprepared for class	Faculty reported not being fully prepared to teach the lesson. Could include own negligence, external obstacles, lack of notes, a need for more materials, or not planning.
Student behavior disrupting learning	Students display behavior that challenges the classroom learning environment, including misbehaving, inattention, and lack of interest and participation.

The most common subthemes referenced ways that student behaviors disrupted learning (340 references) and how instructional techniques did not fit well with class content (275 references), with all faculty referencing these challenges. Seven faculty members reported being unprepared as a challenge. Of the five subthemes, approximately half of the faculty described instructor efforts (e.g., ineffective instructional strategies) and half described student efforts (disruptive behavior). The data coding did not consider evidence of efforts to address these challenges but instead focused on identifying the types of challenges faced.

Table 23. Challenges Faced During Instruction: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 850)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Inefficacy of instructional techniques	275	32%	24	2 – 21	10
Managing time	95	11%	21	0 – 15	4
Poor student performance in response to instruction	122	14%	22	0 – 11	5
Faculty unprepared for class	18	2%	7	0 – 5	1
Student behavior disrupting learning	340	40%	24	4 - 24	14

Major theme: Possible solutions to challenges

The major theme *Possible Solutions to Challenges* was coded into five subthemes, with 259 references, an increase of 26 references over those when just *Possible Solutions to Challenges* was coded (Level 1 Coding).

Table 24. Possible Solutions to Challenges: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Adjusting instruction	Suggestions about how to adjust instruction/techniques for the class or class content.
Improving time management	Suggestions about how to better utilize time in or out of the classroom.
Improve student performance	Suggestions about why students may have performed poorly or how to improve their performance in the future.
Being more prepared	Suggestions about how to better prepare techniques or lesson plan for class.
Encouraging greater student focus	Suggestions about how to better handle students to motivate participation, mitigate conflict, or otherwise improve student behavior.

Fifty percent of the *Possible Solutions to Challenges* referenced ways the instructor might encourage or motivate students (129 references). The other solutions focused more on instruction and classroom preparedness, including improving time management. While the major theme *Solutions to Challenges* did not directly link to the *Challenges Faced During Instruction* theme, the subtheme references indicated that faculty were engaged in reflective thought about how to address challenges they faced. Of the five subthemes, four focused on ways instructors could address a challenge (i.e., adjust instruction, improve time management, be more prepared, encourage student focus) suggesting a sense of confidence in being about to implement changes. The fifth subtheme was more generic; this one referred to improving student performance.

Table 25. Possible Solutions to Challenges: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 259)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Adjusting instruction	49	19%	17	0 – 8	2

Subtheme	Number of References	Percentage of Subtheme References (*n* = 259)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Improving time management	19	7%	11	0 – 4	1
Improve student performance	34	13%	17	0 – 3	1
Being more prepared	28	11%	15	0 – 7	1
Encouraging greater student focus	129	50%	21	0 - 16	5

Major theme: Future plans and goals

The major theme *Future Plans and Goals* was coded into six subthemes. Level 2 Coding resulted in an increase of 76 references over the original 948.

Table 26. Future Plans and Goals: Definitions of Subthemes.

Subtheme	Definition of Subtheme
Increase collaboration with colleagues	Plan to seek out the help of colleagues.
Adhere to lesson plan	Plan to help keep future lectures on track, address the main points and purpose of lectures or assignments, and tie back into the objectives for the course.
Effectively pace lecture	Plan to improve pacing of the lesson/better manage time.
Better prepare for classroom lectures	Plan to better prepare for future lessons or classes, or encourage students to better prepare for class, including revising syllabi and other guidelines.
Ensure student engagement	Plan to find ways to improve student engagement with lecture material or assignments, plan to involve more students in lecture, and work on decreasing disruptive student behavior.
Improve fit of technique employed for class	Plan to use new techniques that may fit learning objectives better, and plan to improve upon (or gather feedback in order to improve upon) previous techniques that may fit learning objectives better.

Over 90% of *Future Plans and Goals* subtheme references described a desire to be better prepared for future classroom lessons, to ensure student engagement, or to improve the fit of the technique employed within future classes. The most common subtheme, improve the fit of techniques employed in the classroom, was referenced 520 times and at least 10 times for each instructor.

Table 27. Future Plans and Goals: Subtheme References.

Subtheme	Number of References	Percentage of Subtheme References (*n* = 1,059)	Number of Faculty with at Least One Reference (24 Faculty)	Least and Most Number of References per Faculty	Average Number of References per Faculty (24 Faculty)
Increase collaboration with colleagues	25	2%	14	0 – 6	1
Adhere to lesson plan	32	3%	15	0 – 5	1
Effectively pace lecture	36	4%	20	0 – 5	1
Better prepare for classroom lectures	189	18%	24	3 – 15	8
Ensure student engagement	222	22%	24	1 - 20	9
Improve fit of technique employed for class	520	51%	24	10 – 39	21

ACUE Faculty Survey and Student Questionnaire Responses

Faculty participants completed the ACUE Faculty Survey after they finished all modules. The survey, developed by ACUE, includes four sections that ask about Instructional Practice, Engagement With Students During Instruction, Beliefs About Students and Learning, and Teaching Beliefs and Behaviors.

The first two sections ask instructors to think about their practices before and after completing the ACUE course, allowing the retrospective responses (feedback about self before the ACUE course) to be compared with the responses about their current practices. Each statement asks about a topic covered in a specific ACUE module. The second two sections focus on beliefs and behaviors about students and about teaching.

Confidence implementing ACUE instructional practices

The Instructional Practice section of the Faculty Survey includes 19 statements about faculty confidence using instructional practices discussed in an ACUE Module. Faculty rate their level of confidence using a five-point scale ranging from 1 = *not at all confident* to 5 = *extremely confident*. For example, faculty report how confident they feel (or felt) *"Using active learning techniques in a small- to medium-sized class,"* a topic addressed during Module 3A. Although completed after finishing the full ACUE course, faculty rate their confidence as it was before taking the ACUE course (retrospective) and after completing the ACUE course.

Data were available for 19 faculty from Cohorts A and B. Scale scores showed, on average, that faculty were more confident in their instructional practice after completing the ACUE professional development. A matched-paired t-test comparing responses about each point in time revealed a statistically significant difference: $t(18) = 3.56$, $p = .002$.

Mean (retrospective and current) responses were:

Before (retrospective) completing the course:	Mean = 2.62 (*SD* = .554)
After (current) completing the course:	Mean = 3.16 (*SD* = .411)

Engaging with students during instruction

The Engagement With Students During Instruction section includes 10 statements aligned with topics discussed in an ACUE module. Faculty report on their ability to engage with students using a five-point scale. For example, they indicate if "*I can do…(*1 = *nothing*, 2 = *very little*, 3 = *some*, 4 = *quite a bit*, or 5 = *a great deal*) *to ensure students become lifelong learners,"* a topic discussed in Module 4E. Faculty report about their current (after the ACUE course) and prior (before the ACUE course) engagement with students.

Seventeen instructors answered the 10 statements about both points in time. After completing the course faculty reported greater ability to engage with students during instruction. A matched paired t-test revealed this mean difference was statistically significant: $t(16) = 8.719$, $p < .001$.

Mean (retrospective and current) responses were:

Before (retrospective) completing the course:	Mean = 3.05 (*SD* = .482)
After (current) completing the course:	Mean = 4.38 (*SD* = .471)

Beliefs about students and learning

The third section asks faculty to indicate how much they agree with five statements about students and learning. Faculty use a five-point scale (5 = *Strongly agree*, 4 = *Agree*, 3 = *Neutral*, 2 = *Disagree*, 1 = *Strongly disagree*). A sample statement is "*All students can be successful in my course.*"

Eighteen instructors provided ratings to the five statements about their beliefs before and after the ACUE training. The mean difference was statistically significant: $t(17) = 6.206$, $p < .001$ with current ratings being higher and retrospective ratings and prior beliefs.

Mean (retrospective and current) responses were:

Before (retrospective) completing the course:	Mean = 3.94 (*SD* = .439)
After (current) completing the course:	Mean = 4.54 (*SD* = .346)

Teaching beliefs and behaviors

The final eight statements ask about faculty teaching beliefs and behaviors. Faculty rate their agreement using a five-point scale (5 = *Strongly agree*, 4 = *Agree*, 3 = *Neutral*, 2 = *Disagree*, 1 = *Strongly disagree*.) A sample teaching behavior statement is *"I am enthusiastic about teaching."*

Data from 16 instructors showed their beliefs were more somewhat positive after participating in the ACUE course than before. Faculty agreed with most statements when responding about both points in time; the increase was statistically significant: $t(15) = 7.028$, $p < .001$.

Mean (retrospective and current confidence) responses were:

Before (retrospective) completing the course:	Mean = 3.80 (*SD* = .430)
After (current) completing the course:	Mean = 4.50 (*SD* = .351)

In summary, the Faculty Survey responses showed that when asked to reflect on their practice before and after participating in ACUE, instructors were more confident in their instructional practices and more confident in engaging with students after participating in the ACUE training. It is noteworthy that the survey statements were aligned with the ACUE training topics, providing further evidence of instructor learning from the ACUE training experience. Additionally, faculty reported beliefs that are more positive about students and student learning as well as more positive beliefs and behaviors about teaching following the training. The surveys suggest that instructors were not just learning techniques but also developed a new understanding about themselves as teachers and about their students as learners.

ACUE student questionnaire

An optional Student Questionnaire, developed by ACUE, was available to faculty who participated in the ACUE course. Seven Rutgers University-Newark Faculty opted to collect these questionnaires from at least 24 students. In total, 422 questionnaires were answered, but there was great variability in the number submitted by instructor, with totals ranging from 24 Student Questionnaires to 173 Student Questionnaires per faculty. The data were examined without consideration of faculty.

The ACUE Student Questionnaire includes two sections. Part I included 17 statements about student perceptions of instructor practices related to the ACUE course content (e.g., "*My instructor helped me feel welcome in and valuable to the class"*). Students used a 5-point scale (ranging from *strongly disagree* to *strongly agree*, with a neutral mid-point) to rate their agreement. For purposes of discussion, this scale is called "Student Perceptions of Classroom Practices." Part II includes seven statements about student confidence engaging in school-related activities expected to lead to school success (e.g., "*manage time effectively"*). Students rate their level of confidence using a 5-point scale ranging from 1 = *not at all confident* to 5 = *extremely confident*.

Student perceptions of classroom practices

A principal axis factor analysis of responses to the 17 Student Perceptions of Classroom Practices statements revealed a single factor accounted for 70% of the shared common variance, suggesting a single scale. The alpha reliability coefficient was α= .975, comfirming consistency in responses across the statements. Therefore, an average scale score was computed by summing a student's responses and dividing by 17, the total number of statements. Average scale scores ranged from 1 (all responses *strongly disagree*) to 5 (all responses *strongly agree*). Overall, student responses were positive. Four students had a scale score of 1 (*strongly disagree*, no practices were observed) while 182 students had an average scale score of 5 (*strongly agree*, all practices were evident). The mean response was 4.63, with a standard deviation of .62, indicating students perceived their instructors as using the practices that are covered in the ACUE course.

Student confidence engaging in school-related activities to support learning

A principal axis factor analysis of responses to the seven statements suggested two scales best represent the data. The two factors accounted for 59% of the shared common variance.

Based on an examination of the highest factor loadings following a varimax rotation, the two scales were characterized as follows:

> **Confidence in self-monitoring school-related activities** (i.e., managing time effectively, keeping up to date on school work, preparing effectively for an exam/long assignment, taking good classroom notes). This scale includes four statements.
>
> **Confidence in school-related communication** (i.e., participating in class discussion, attending professor's office hours, asking a question). This scale includes three statements.

Alpha reliability coefficients were α = .826 for the self-monitoring scale and α = .786 for the communications scale. Average scale scores were computed by summing a student's response and dividing by the number of statements within the scale. Response ranged from 1 = *not at all confident* to 5 = *extremely confident*.

Confidence in self-monitoring school-related activities

Six students had an average scale score of 1 (*not at all confident to all statements*.) Sixty-seven students responded *very confident* to every statement. The mean response was 4.11, with a standard deviation of .78, indicating that students felt fairly confident in their ability to self-monitor their school-related activities.

Confidence in school-related communications

Six students had an average scale score of 1 (*not at all confident* seeking help from others) while 72 students reported they were *very confident* engaging in each activity. The mean response was 3.62, with a standard deviation of 1.04, indicating moderate confidence seeking school-related communications.

In summary, Student Questionnaire results, although only collected by a small, likely unrepresentative sample, suggest that faculty applied what they learned during the ACUE training. Further, the student surveys provide preliminary data that students taught by ACUE trained faculty are confident and engaged in behaviors that can help learning, including self-monitoring and seeking support from others.

Student performance data

The next phase examined student performance data to explore whether course completion rates, success in their courses, and grades were higher for students enrolled in a course taught by ACUE-credentialed faculty than for courses taught by a comparison instructor. Two comparison groups were included: students taught by ACUE-credentialed faculty before that faculty member participated in the ACUE training and students in similar classes but taught by faculty not trained by ACUE. For most analyses, students in courses either taught during or after the faculty member was credentialed by ACUE were considered as the ACUE-credentialed condition.

Although the comparison (non-ACUE) faculty classes were not matched, the classes compared were similar in terms of content or the same course but a different section. Rutgers University-Newark selected the faculty included as a comparison group. Separate analyses examined the small sample of students in classes that could be matched (i.e., a course with multiple sections with sections taught by both an ACUE-credentialed and comparison faculty).

Table 28 shows the grades that a student at Rutgers University-Newark can receive and how each grade was assigned for these analyses. Completion and success are dichotomous variables. Grades range from 0 (failure) to 4 (A).

Table 28. Rutgers University-Newark Possible Grades and Interpretation.

Grade Student Received in the Course	Analysis of Course Completion	Success in the Course	Analysis of Grade
A	Completed	Successful	A (score of 4)
B	Completed	Successful	B (score of 3)
C	Completed	Successful	C (score of 2)
D	Completed	Not successful	D (score of 1)
F	Completed	Not successful	F (score of 0)
IN	Not completed	Considered missing	Considered missing
NG	Considered missing	Considered missing	Considered missing
PA	Completed	Successful	Considered missing
S	Completed	Successful	Considered missing
U	Completed	Not successful	Considered missing
W	Not completed	Not successful	Considered missing
XF	Not completed	Not successful	Considered missing
Z	Not completed	Not successful	Considered missing

The data were examined in several ways to assess differences in student grades, course completion, and general success in the courses. All data were aggregated for the analyses and most analyses used Chi-Square analyses to test for statistical differences between groups.

Course completion

Course completion meant students finished their course and did not withdraw or receive an incomplete grade. Ninety-seven percent of the 4,563 students taught by 43 faculty during or after participating in the ACUE training completed their course, while 96% of the 32,284 students taught by a comparison faculty member completed their course. A Chi-Square analysis showed this difference is statistically significant, X^2 (1) = 12.736, p = 0.0004.

97% of students taught by an ACUE-credentialed faculty completed

96% of students taught by a comparison faculty completed their course

There were no statistically significant differences in terms of completion rates for students taught by instructors before, during, or after participation in ACUE training. However, the majority of all students taught by ACUE-credentialed instructors passed their courses, in each condition. As such, there was little likelihood of finding statistically significant differences. (97% of students enrolled in courses before an instructor was ACUE-credentialed passed; 97% of students enrolled in courses while an instructor was in the ACUE training completed; and 98% of students enrolled in courses after an instructor was ACUE-credentialed completed their course.)

Finally, the data were analyzed using a more stringent process for matching ACUE-credentialed and comparison courses. Students enrolled in courses with multiple sections taught by both an ACUE-credentialed instructor and a comparison instructor were compared. Student data were available for 57 courses and included 32,090 students (4,274 with ACUE-credentialed instructors and 27,816 with comparison instructors). Although due to rounding 97% of the students completed the course in both groups, the Chi-Square analysis was statistically significant, X^2 (1) = 9.737, p = 0.0018.

In summary, the student performance data showed that students taught by ACUE-credentialed instructors had higher completion rates than students taught by comparison instructors.

Student success

The next analyses examined pass (success) rates for students in courses taught by an ACUE-credentialed instructor. Pass rates for 4,554 students taught by instructors during or after the ACUE training were 93%, while pass rates for 32,233 students taught by comparison instructors were 85%. This difference is statistically significant, X^2 (1) = 230.989, $p < 0.0001$.

93% of students taught by an ACUE-credentialed faculty passed their course

85% of students taught by a comparison faculty passed their course

Similar results were found when the more stringent criteria were used and matched data were examined. A Chi-Square analysis was statistically significant, X^2 (1) = 281.292, $p < 0.0001$ Ninety-four percent of students in the ACUE trained class passed while 84% of students in the comparison classes passed.

Students taught by ACUE-credentialed instructors had a significantly higher proportion of passing grades compared to students taught by comparison instructors, whether or not more stringent matching was used.

Pass rates for students taught by instructors before, during or after they participated in ACUE training also revealed statistically significant differences. Data included 7,183 students (2,468 students taught by instructors after ACUE training, 2,086 students taught by instructors during ACUE training, and 2,629 students taught by instructors before ACUE training. Pass rates were higher for students taught by faculty who had completed the ACUE training;

91% of students in courses before an instructor was ACUE trained passed;

92% of students in courses while an instructor was in the ACUE training passed; and

95% of students enrolled in courses after an instructor was ACUE trained passed.

The Overall 2x3 Chi-Square analysis was statistically significant, X^2 (2) = 20.456, $p < 0.0001$. Pairwise comparisons with Bonferroni corrections of the p-value determined that the success rates for students after ACUE training were significantly higher than success rates before or during.

pre-ACUE vs during-ACUE: X^2 (1) = 0.6004, $p = 0.438$ - not significant

during-ACUE vs after-ACUE: X^2 (1) = 11.74, $p = 0.0006$ - significant

pre-ACUE vs after-ACUE: X^2 (1) = 19.320, $p < 0.0001$ - significant

Students taught by instructors after they completed the ACUE training were more likely to pass the course than students either taught during or taught before the instructor completed the training.

Grades

Grades were then compared for students in courses taught by 43 ACUE-credentialed instructors and courses taught by comparison instructors. Data included 35,416 students (4,447 students taught by an ACUE-credentialed instructor and 30,969 students taught by a comparison instructor. The ANOVA test was statistically significant, $F(1) = 500.67$, $p < 0.0001$.

> Average grade for students in the ACUE trained courses was 3.356 (*SD* = 0.863). This is approximately a B to B+ average.
>
> Average grade for students in comparison courses was 2.954 (*SD* = 1.151). This is approximately a B average.

Similar results were found when the more stringent criteria were used and matched courses were included in the analyses. Data included 57 courses and 30,886 students (4,167 students taught by an ACUE-credentialed instructor and 26,719 students taught by a comparison instructor). A one-way ANOVA was statistically significant, $F(1) = 612.97$, $p < 0.0001$.

> Average grade for students in the ACUE-trained class was 3.366 (*SD* = 0.852).
>
> Average grade for students in comparison class was 2.893 (*SD* = 1.186).

Grades were then compared for students taught by 43 ACUE-credentialed instructors before, during, and after they participated in the training. These data included 7,007 students (2,416 students after an instructor participated in the ACUE training, 2,031 students taught by an instructor during their ACUE training, and 2,560 students taught by an instructor before ACUE training). Grades ranged from 0 (Failure) to 4 (A/A+). Grades were slightly higher for students after their instructor had completed the course. A 2x3 ANOVA revealed these differences were statistically significant, $F(2) = 14.59$, $p<0.0001$.

> Average grade for students enrolled in courses before an instructor was ACUE trained was 3.273 (*SD* = 0.961).
>
> Average grade for students during the semester the instructor was in the ACUE training was 3.299 (*SD* = 0.926).
>
> Average grade for students enrolled in courses after an instructor was ACUE trained was 3.405 (*SD* = 0.804).

Post-hoc Tukey tests revealed two statistically significant differences:

pre-ACUE vs during- ACUE: $p = 0.367$ – not significant

during-ACUE vs after-ACUE: $p < 0.0001$ – significant

pre-ACUE vs after-ACUE: $p < 0.0001$ – significant

Students taught by ACUE-credentialed instructors received grades that were significantly higher compared to students who were taught by comparison instructors, and students taught by an ACUE-credentialed faculty after the training was completed received significantly higher grades than those taught by the same instructors before or during the training.

Summary and Overview

Data sources included reflections collected during the process of the ACUE Faculty Development, faculty retrospective surveys (answered after completing the entire professional development sequence), student surveys (optional and only completed by some students in classes taught by an ACUE-trained faculty member), and student performance data (grades). The analyses were not hypothesis-driven but rather exploratory in nature, with the goal being to learn as much as possible about students and faculty from the available information. By synthesizing data collected from different perspectives, collected at different points in time, and using different data collection methods, summary findings and conclusions were reached.

Reflections Became Part of Faculty Development

Reflections were a required part of the ACUE Faculty Development experience and were integrated into each module lesson. After completing a module, the instructor applied the materials in a class and then wrote a reflection about the experience. Each reflection was reviewed and coded twice using a line-by-line approach. References or phrases that described similar themes were identified and tagged. Among the faculty who submitted at least 10 reflections (out of a possible 25), the average number of references per reflection ranged from 5.7 to 11.3.

Overall, reflections were rich and complex. Across all reflections there was evidence that faculty were thinking about what they do before, during, and after instruction and how this reflective process helped them to support student learning. Reflections typically described multiple educationally relevant themes rather than only a single topic covered in the module just completed. However, the major themes and subthemes found in the reflections often aligned with the topics covered in the

ACUE units of study completed immediately before the reflection. The number of references varied for the different units of study with the largest number of references following modules in Unit 3: Using Active Learning Techniques, a unit that provided numerous concrete suggestions for prompting active learning.

Based on the content of the reflections, it appears that the writing experience became part of the learning process. That is, faculty used the reflection process to deepen their understanding and to think about what they were learning. For example, the most commonly referenced major themes were *Instructional Techniques* (e.g., "*I added a new mini-lesson*") and *Plans and Goals for Future Lessons* (e.g., "I will review my syllabi"). These reflections may provide a link between what is learned during a module (Instructional Techniques) and how faculty hope to eventually apply what was learned (Future Plans).

Faculty Development Enhanced Instructional Practices

The faculty reflections suggest the ACUE training impacted their instructional practices. Faculty learned new instructional strategies and reflected on knowledge and skills learned that helped them be a more effective instructor. They described ways they could better prepare and deliver a lesson, such as paying greater attention to pacing classroom sessions and time management, planning lessons to explore, asking questions to elicit critical thinking, and improve for thoughtful discussion and planning/learning activities. Faculty also reported an increased awareness of how planning ahead could lead to more effective instruction. They reflected on the value of planning not only course content but also how discussions could be led and paced.

Faculty Development Affected Student Learning

Faculty also reported an increased awareness of different ways they could improve communications with students. They described ways they could engage students and improve participation through effective questioning, feedback, and group discussions. They noted the importance of attending to these elements of classroom instruction. Similarly, faculty described ways they could create a positive classroom environment that was safe and supportive of learning. A positive instruction environment was described as a way to promote learning, critical thinking, questioning, discussion, and cross-connections.

Faculty also described their efforts to help their students think about their own learning using

assessments, class discussions, and feedback. They described more ways to use assessments, often reflecting on how assessment is not only a means to evaluate students but also a way to provide formative feedback to both the students and instructors.

The student performance data suggest faculty successfully impact students. Students taught by an ACUE trained instructor had higher completion rates than students taught by comparison faculty. Students taught by an ACUE-credentialed instructor were also more successful and received higher average grades compared to students taught by the same instructor before or during ACUE as well as students taught by a comparison instructor.

Conclusions

Based on a content analysis of 577 reflections from 24 faculty members who completed all 25 ACUE professional development modules, there is evidence the experiences had a positive impact on them and their teaching. The faculty reflections indicate that faculty developed an increased awareness of how their instructional practices can help them support student learning. The student data, both grades and responses to the questionnaire, show that students recognize that faculty are using instructional practices stressed during the ACUE training. They are also outperforming, more likely to complete, and more successful than students in a sample of comparison classes taught by faculty with no prior ACUE training. It should, however, be remembered that some findings were based upon faculty self-reports (reflections and faculty questionnaires). These self-reports are subjective and therefore the reported outcomes might not be observed in actual classroom practice. Additional demographic, background, or context data were not available. It is unknown what differences would be found across different characteristics or what mediating factors may affect findings.

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