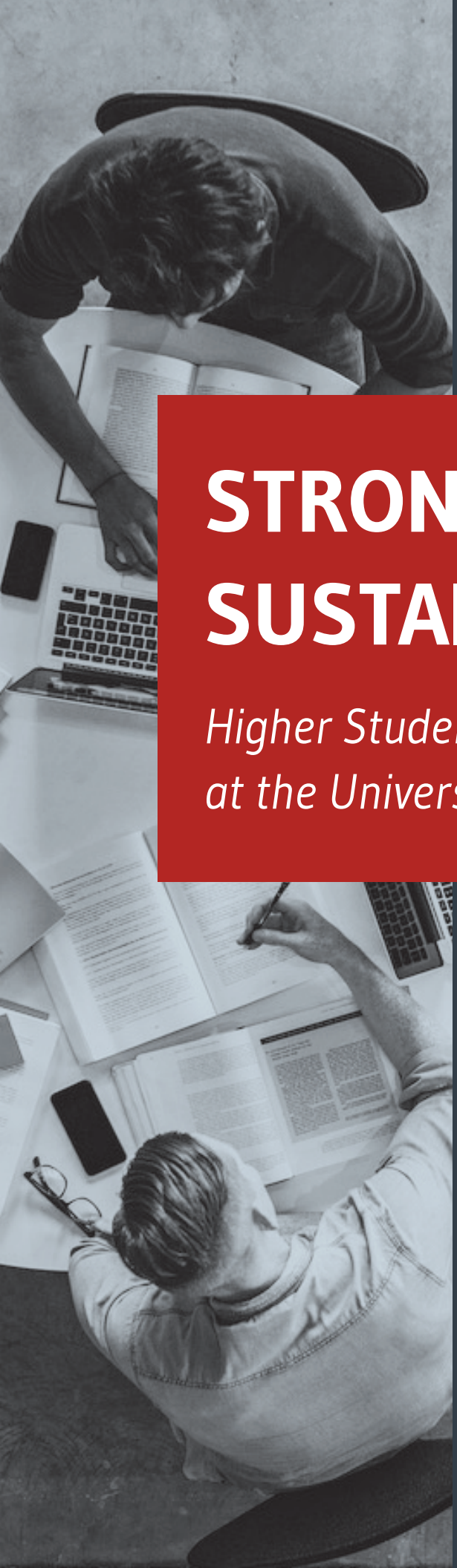

AUGUST 26, 2019

STRONG INSTRUCTION, SUSTAINED:

Higher Student Evaluations and Grades at the University of Nevada, Reno

Elizabeth K. Lawner, PhD

Meghan Snow, EdM, MEd

ACUE | Teaching Excellence

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ABOUT ACUE

In an effort to catalogue the evidence-based teaching practices that improve student achievement, ACUE reviewed over 300 citations from the scholarship of teaching and learning and engaged with teaching and learning experts across the country to develop its Effective Practice Framework©. The Framework was independently validated by the American Council on Education (ACE) and serves as a consensus statement of the teaching skills and knowledge that every college educator should possess in order to teach effectively, regardless of discipline. ACUE developed and offers online courses in effective teaching practices that are fully aligned to the Framework's five major units of study: Designing an Effective Course, Establishing a Productive Learning Environment, Using Active Learning Strategies, Promoting Higher Order Thinking, and Assessing to Inform Instruction and Promote Learning. ACUE's courses on effective college teaching recommend over 200 evidence-based teaching approaches and are certified by Quality Matters. To satisfy course requirements, faculty engage with content, are required to implement evidence-based practices, and write rubric-aligned reflections on their implementation, including citing changes in student behaviors. Faculty who satisfy course requirements for at least 25 modules earn a Certificate in Effective College Instruction endorsed by ACE.

ACUE | Teaching Excellence

"The evaluation focuses on student impact, specifically student course evaluations and grades."

EXECUTIVE SUMMARY

Recent evaluation studies have found positive effects of the Association of College and University Educators (ACUE) credential on student engagement and course outcomes. Nearly all of those studies assessed student outcomes that occurred while faculty were earning the ACUE credential, and none were conducted at R1 institutions. To more fully understand the impact of the ACUE credential, it is important to study the continued impact after faculty have earned their credential, and to enhance the generalizability of evaluation findings, it is important to study the impact of faculty earning the ACUE credential at a variety of institution types.

The evaluation outlined in this report was conducted at the University of Nevada, Reno (UNR) a large, public, R1 university in an urban setting, where four cohorts of faculty earned their credential in effective college instruction from ACUE during the 2017-2018 academic year. The evaluation focuses on student impact, specifically student course evaluations and grades. We evaluated change in these outcomes for courses taught by faculty who earned their credential in fall 2017 and spring 2018 and for a set of matched courses taught by non-credentialed faculty.

Our evaluation found that student course evaluations among courses taught by ACUE-credentialed faculty improved over time from the earliest time point assessed to the year after faculty earned their credential. Importantly, there was no significant change over the same period among the matched courses, and courses taught by ACUE-credentialed faculty received higher student course evaluations compared to the matched courses in the year after they earned their credential. In addition, average student grades remained stable over time among courses taught by ACUE-credentialed faculty, while grades decreased over the same period among the matched courses.

"...student course evaluations among courses taught by ACUE-credentialed faculty improved over time from the earliest time point assessed to the year after faculty earned their credential.... In addition, average student grades remained stable over time..."

BACKGROUND

The Association of College and University Educators (ACUE) developed an accountability framework in order to conduct evaluations of its partnerships with colleges and universities where faculty are credentialed in effective college instruction through ACUE's courses in effective teaching practices (see MacCormack, Snow, Gyurko, & Candio Sekel, 2018). This accountability framework has six levels of evaluation, from faculty engagement through institutional outcomes. Several recent evaluation studies have found positive effects of the ACUE credential on student engagement (Level 4; Morrison, Ross, Morrison, & Reid, 2017; Morrison, Wilson, Ross, Wolf, & Latham, 2017) and course outcomes (Level 5), specifically rates of student success (Hecht, 2019; Lawner & Snow, 2018), course completion rates (Hecht, 2019; Lawner, Snow, MacCormack, & Waltje, 2019), and average grades (Hecht, 2019; Lawner & Snow, 2019; Lawner, Snow, & Burt, 2019).

Nearly all of the prior evaluations of the student impact of faculty earning the ACUE credential assess outcomes that occurred while faculty were earning the credential; only the initial studies at Miami Dade College (Morrison, Ross, et al., 2017; Morrison, Wilson, et al., 2017) and the evaluation at Rutgers University-Newark (Hecht, 2019) examined outcomes during the year after faculty earned their ACUE credential. We hypothesize that the impact of faculty earning the ACUE credential will increase during the year after faculty earn their credential, as they implement a more coherent set of evidence-based teaching practices learned from completing the course and they have the opportunity to refine the practices they implemented and reflected on during the time they were taking the course. It is also possible that effects may fade; thus, it is important to continue to examine student outcomes after faculty have earned their credential. In addition, none of the prior evaluations were conducted at R1 institutions—doctoral universities with very high research activity. To enhance the generalizability of evaluation findings, it is important to study the impact of faculty earning the ACUE credential at a variety of institution types, including those where evaluation of faculty likely focuses primarily on their research output.

The evaluation outlined in this report was conducted at the University of Nevada, Reno (UNR), a large, public, R1 university in an urban setting. The current evaluation focuses on two sets of cohorts at UNR: those that earned their credential during the fall 2017 semester and those that earned their credential during the spring 2018 semester. UNR requires faculty to complete the ACUE course during their first two years at the university, but participation is also open to faculty who have been at UNR for longer. In total, 30 faculty at UNR earned their ACUE credential during the fall 2017 semester, and 33 faculty earned their ACUE credential during the spring 2018 semester. This evaluation focused on student course evaluations and student course grades, including assessment of these outcomes while faculty were earning their credential and during the year after they earned their credential, aiming to demonstrate the continued impact of the ACUE credential, as well as to advance claims of generalizability with a research-focused doctoral university.

METHODS

Participants and Procedures

This evaluation focuses on the 30 faculty from two cohorts at UNR who earned their ACUE credential during the fall 2017 semester and the 33 faculty from two cohorts at UNR who earned their ACUE credential during the spring 2018 semester. The analyses examine change over time in courses taught by ACUE-credentialed faculty in comparison to a set of matched courses taught by non-credentialed faculty.

Matching was done at the course level by UNR's University Assessment & Accreditation Office. For each course (and as often as possible, each course section) taught by faculty in one of the ACUE cohorts, the best match course section during the same term was provided. Ideally this was another section of the same course, but when that was not possible, courses were matched with the most similar course possible, in terms of department and level. There were a few rare cases in which a course could not be matched at all and was excluded from all analyses.

When an ACUE faculty member taught multiple sections of the same course, matches were not necessarily provided for each section. When there were enough sections of the same course (or most similar course) taught by non-ACUE faculty, a one-to-one match was provided. But if there were fewer match sections available than ACUE sections, one-to-one matching at the section level was not done. In addition, due to similarity in courses taught by ACUE faculty, there were a few cases in which the same match course section was included as a match for multiple courses, including courses taught by two different ACUE faculty. In all of these cases where a single match section was effectively used as a match for multiple ACUE sections, the match section was not duplicated in the dataset.

Sections that were cross listed were collapsed across their listed sections so that they were only included once in the dataset, and such sections were only matched with a single section. This occurred most commonly with sections cross listed at the 400 and 600 level, and in many of these cases they were able to be matched with another section that was also cross listed at the 400 and 600 level.

Sections that had no course evaluation responses or no grade data were removed along with their match from the relevant dataset, and course evaluations and grades were analyzed separately so that sections that were missing one type of outcome but not the other could still be retained in analyses where they were not missing data. For example, a section that did not receive any course evaluation responses, but did have grades, would be removed from the course evaluation dataset along with its match section, but both sections would be retained in the grade dataset and used in those analyses.

Table 1: Examples of Course Matching

	ACUE section	Match section
Exact matching	PSY 499:1002	PSY 499:1001
Inexact matching	ECON 704:1001	ECON 742:1001
Duplicate matching	PHYS 181:1001 PHYS 181:1002	PHYS 151:1001 N/A
Cross-listed matching	MINE 415:1001/615:1001	MINE 418:1001/618:1001

Due to UNR's requirement that all new full-time faculty complete ACUE's Course in Effective Teaching Practices during their first two years at UNR, many of the faculty in the cohorts included in this study were not teaching at UNR during the 2016-2017 academic year. Therefore, analyses were conducted using three groups and time periods (see Table 2 for number of faculty and courses included):

- Examining change from the 2016-2017 academic year (baseline) through the 2018-2019 academic year (post-credential) for the 14 faculty from the fall cohorts who taught in 2016-2017 and their matched courses;
- Examining change from the 2017-2018 academic year (while earning the ACUE credential) to the 2018-2019 academic year (post-credential) for all 30 ACUE-credentialed faculty in the fall cohorts and their matched courses; and
- Examining change from the fall 2017 semester (baseline) through the spring 2019 semester (post-credential) for all 33 ACUE-credentialed faculty in the spring cohorts and their matched courses.

Table 2: Number of Faculty and Course Sections Included in Analyses

		ACUE-credentialed		Matched courses	
Group analyzed	Outcome	Faculty	Course sections	Faculty	Course sections
Fall 2017 ACUE-credentialed faculty who had baseline data	Course evaluations	14	136	69	129
	Grades	14	149	66	126
All Fall 2017 ACUE-credentialed faculty	Course evaluations	30	185	133	187
	Grades	30	198	121	181
All Spring 2018 ACUE-credentialed faculty	Course evaluations	33	219	92	205
	Grades	33	210	88	194

Chi-square tests found significant differences between the ACUE-credentialed faculty and the instructors of the matched courses in terms of their rank, $p < .001$, with a greater proportion of tenure-track faculty among the ACUE-credentialed group and a greater proportion of lecturers, tenured faculty, and other instructors (e.g., graduate students, administrative faculty) among the matched group (see Table 3). Therefore, faculty rank was controlled for in all subsequent analyses.

Table 3: Rank of Faculty Included in Analyses

		ACUE-credentialed faculty			Instructors of matched courses					
Group analyzed	**Outcome**	**Lecturer**	**Tenure -track**	**Tenured**	**Lecturer**	**Tenure -track**	**Tenured**	**Other**	x^2	p
Fall 2017 ACUE-credentialed faculty who had baseline data	Course evaluations	4 (28.57%)	10 (71.43%)	-	22 (31.88%)	11 (15.94%)	29 (42.03%)	7 (10.14%)	21.51	<.001
	Grades	4 (28.57%)	10 (71.43%)	-	19 (28.79%)	10 (15.15%)	30 (45.45%)	7 (10.14%)	22.48	<.001
All fall 2017 ACUE-credentialed faculty	Course evaluations	4 (13.33%)	25 (83.33%)	1 (3.33%)	47 (35.34%)	31 (23.31%)	43 (32.33%)	12 (9.02%)	39.79	<.001
	Grades	4 (13.33%)	25 (83.33%)	1 (3.33%)	43 (35.54%)	29 (23.97%)	41 (33.88%)	8 (6.61%)	37.55	<.001
All spring 2018 ACUE-credentialed faculty	Course evaluations	3 (9.09%)	30 (90.90%)	-	39 (42.39%)	10 (10.87%)	31 (33.70%)	12 (13.04%)	72.06	<.001
	Grades	3 (9.09%)	30 (90.90%)	-	35 (39.77%)	11 (12.5%)	31 (35.23%)	11 (12.5%)	66.49	<.001

Note: All Chi-square tests reported above have 3 degrees of freedom.

Measures

Student course evaluations. The seven items from UNR's official course evaluations that are given to all regular courses (as opposed to lab or discussion sections) were averaged together to form one scale (fall 2017 cohorts with baseline data: α = .974; entire fall 2017 cohorts: α = .973; spring 2018 cohorts: α = .979). This scale includes both general questions about the course (e.g., "What was the overall quality of this course?") as well as questions about specific aspects of the course (e.g., "How well did the syllabus and the instructor convey course expectations and learning outcomes?"). Students responded to all items on a 4-point Likert scale, with higher numbers indicating more positive evaluations of the course.

Student grades. Grades were examined in terms of average course grades and DFW rates. Average course grades were calculated by converting letter grades to a 4.0 scale on which an A is 4.0, B is 3.0, and so on, and then averaging the grades of all students in a section. Since only A through F letter grades can be calculated on this scale, the average for a section excludes students who received all other grades, specifically W (withdrawn) and S (satisfactory, i.e., passed) grades. The DFW rate was calculated as the proportion of students who received Ds, Fs, and withdrew out of the total number of students in a section.

RESULTS

Data Analysis Plan

All analyses involved three-way ANCOVAs, controlling for faculty rank. However, since the analyses with the fall 2017 ACUE-credentialed faculty who had baseline data involved three years of data, those analyses were 2 (faculty) x 3 (year) x 2 (semester) factorial ANCOVAs, while analyses with other groups had only 2 years of data and were therefore 2 (faculty) x 2 (year) x 2 (semester) factorial ANCOVAs. In these initial analyses, the primary effects of interest are main effects of faculty as well as interactions between faculty and year and three-way interactions between faculty, year, and semester, both of which would indicate whether the courses taught by ACUE faculty changed over time in a way that is different from the change over time for the matched courses. Those effects are reported in the text below, and all effects are reported in Tables A1-34 in the appendix.

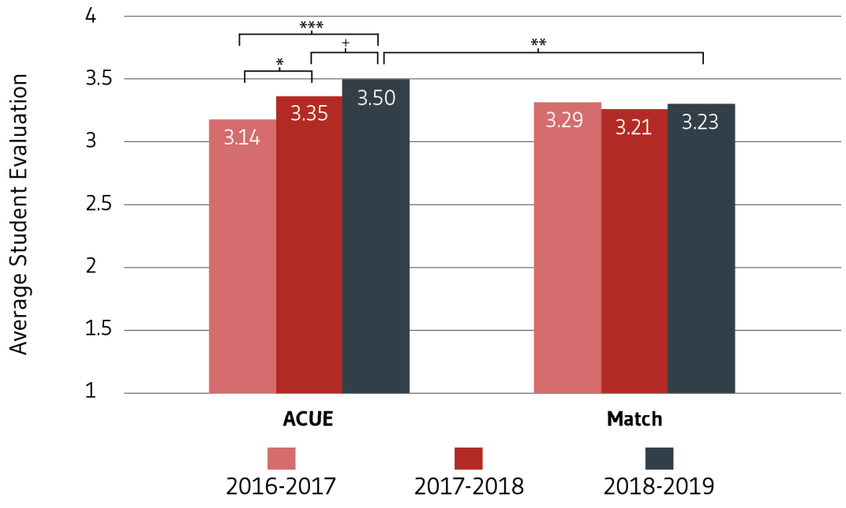
To further explore changes over time among the courses taught by ACUE-credentialed faculty relative to the match, the initial analyses were followed up by conducting two-way ANCOVAs within each faculty group and focusing on main effects of year among courses taught by ACUE-credentialed faculty and among the matched courses, as well conducting two-way ANCOVAs within each year that focused on the main effect of faculty. For the spring 2018 cohorts, these analyses were further followed up with similar ones that separated courses out by term (fall 2017, spring 2018, fall 2018, and spring 2019) and analyses that separated courses by faculty group and used term as a single factor with four levels instead of year and semester as separate factors. This was done because it was hypothesized that outcomes would improve starting in the spring 2018 term when faculty were earning their credential. This way of considering term as a single factor, instead of year and semester separately, was also used to follow up on significant interactions between year and semester. For all significant main effects for factors with more than two levels, post-hoc tests with a Bonferroni correction were conducted, which must exclude control variables.

"The primary effects of interest are main effect s of faculty as well as interactions...which would indicate whether the courses taught by ACUE faculty changed over time in a way that is different from the change over time for the matched courses."

Student Course Evaluations

Fall 2017 ACUE-credentialed faculty who had baseline data. There was a marginally significant main effect of faculty, F (1, 252) = 2.80, p = .096, with courses taught by ACUE-credentialed faculty (M = 3.43, SD = 0.38) receiving higher student evaluations than the matched courses overall (M = 3.24, SD = 0.50). However, this was qualified by a significant interaction between faculty and year, F (2, 252) = 5.05, p = .007. The three-way interaction between faculty type, year, and semester was not significant, F (2, 252) = 0.62, p = .537. Analyses on the courses taught by ACUE-credentialed faculty found a significant main effect of year F (2, 129) = 14.22, p < .001, with post-hoc tests indicating that course evaluations in 2016-2017 (M = 3.14, SD = 0.44) were significantly lower than in 2017-2018 (M = 3.35, SD = 0.31), p = .016, and 2018-2019 (M = 3.50, SD = 0.31), p < .001, and that course evaluations in 2018-2019 were marginally higher than in 2017-2018, p = .087. Analyses on the matched courses did not find a significant effect of year, F (2, 122) = 0.14, p = .872. In addition, analyses by year found that there was no effect of faculty type in 2016-2017, F (1, 71) = 1.37, p = .246, or 2017-2018, F (1, 79) = 2.04, p = .158. However, there was a significant effect of faculty type in 2018-2019, F (1, 100) = 10.69, p = .001, with courses taught by ACUE-credentialed faculty (M = 3.50, SD = 0.31) receiving higher student evaluations than the matched courses (M = 3.23, SD = 0.51); see Figure 1.

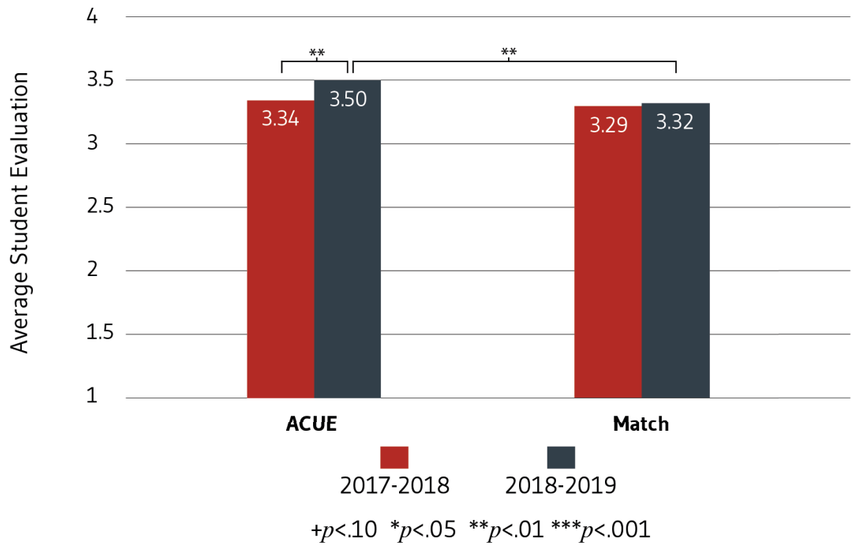
Figure 1. Course evaluations for fall 2017 ACUE-credentialed faculty with baseline data, by year and faculty type.



+p<.10 *p<.05 **p<.01 ***p<.001

Entire fall 2017 cohorts. There was a significant main effect of faculty, F (1, 363) = 4.59, p = .009, with courses taught by ACUE-credentialed faculty (M = 3.43, SD = 0.36) receiving higher student evaluations than the matched courses overall (M = 3.30, SD = 0.50). The interaction between faculty and year was not significant, F (1, 363) = 1.61, p = .206, nor was the three-way interaction between faculty type, year, and semester, F (1, 363) = 0.00, p = .954. However, examining courses separately by faculty type found different effects. Among the courses taught by ACUE-credentialed faculty, there was a significant main effect of year F (1, 180) = 8.20, p = .005, with higher course evaluations in 2018-2019 (M = 3.50, SD = 0.33) than in 2017-2018 (M = 3.34, SD = 0.39). The effect of year was not significant among the matched courses, F (1, 182) = 0.29, p = .594. In addition, analyses by year found that there was not a significant effect of faculty type in 2017-2018, F (1, 157) = 0.16, p = .388, but there was a significant effect of faculty type in 2018-2019, F (1, 205) = 9.13, p = .003, with courses taught by ACUE-credentialed faculty receiving higher student evaluations (M = 3.50, SD = 0.33) than the matched courses (M = 3.32, SD = 0.49); see Figure 2.

Figure 2. Course evaluations for fall 2017 cohorts by year and faculty type



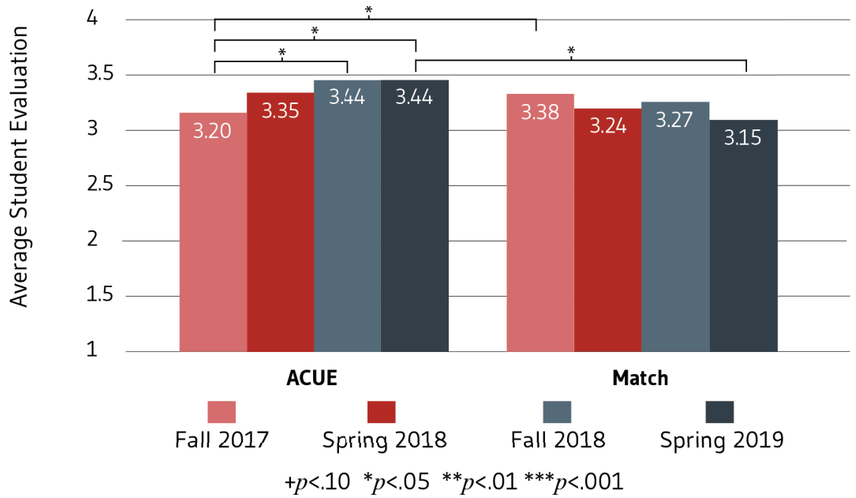
+p<.10 *p<.05 **p<.01 ***p<.001

Spring 2018 cohorts. There was a marginally significant main effect of faculty, F (1, 415) = 3.39, p = .066, with courses taught by ACUE-credentialed faculty (M = 3.35, SD = 0.44) receiving higher student evaluations than the matched courses overall (M = 3.26, SD = 0.60). However, this was qualified by a significant interaction between faculty and year, F (1, 415) = 6.81, p = .009. The three-way interaction between faculty type, year, and semester was not significant, F (1, 415) = 0.68, p = .409.

Analyses on the courses taught by ACUE-credentialed faculty found a significant main effect of year F (1, 214) = 8.48, p = .004, with higher course evaluations in 2018-2019 (M = 3.44, SD = 0.38) than in 2017-2018 (M = 3.27, SD = 0.48). The effect of year was not significant among the matched courses, F (1, 200) = 1.32, p = .252. When the analyses were conducted with term as a single four-level factor, there was a significant main effect of term among courses taught by ACUE-credentialed faculty, F (3, 214) = 4.14, p = .007. Post-hoc tests with Bonferroni corrections indicated that among courses taught by ACUE-credentialed faculty, student evaluations in fall 2017 (M = 3.20, SD = 0.48) were significantly lower than in fall 2018 (M = 3.44, SD = 0.38), p = .017, and spring 2019 (M = 3.44, SD = 0.37), p = .027. Spring 2018 evaluations (M = 3.35, SD = 0.48) were not significantly different from fall 2017, p = .405, nor fall 2018 and spring 2019, p's = 1.00. Fall 2018 and spring 2019 were not significantly different from each other, p = 1.00 (see Figure 3). The effect of term was not significant among matched courses, F (3, 200) = 1.18, p = .320.

Examining each year separately indicated that while there was not a significant effect of faculty type in 2017-2018, F (1, 205) = 0.48, p = .490, there was a significant effect of faculty type in 2018-2019, F (1, 209) = 8.76, p = .003, with courses taught by ACUE-credentialed faculty receiving higher student evaluations (M = 3.44, SD = 0.38) compared to matched courses (M = 3.22, SD = 0.70). In addition, there was a significant interaction between faculty type and semester during 2017-2018, F (1, 205) = 4.56, p = .034. Examining each term separately indicated that there was a significant effect of faculty type in fall 2017, F (1, 106) = 4.38, p = .039, with matched courses receiving higher student evaluations (M = 3.38, SD = 0.46) than courses taught by faculty who went on to earn their ACUE credential (M = 3.20, SD = 0.48). There was not a significant effect of faculty type in spring 2018, F (1, 98) = 0.95, p = .333, or fall 2018, F (1, 113) = 2.66, p = .105. However, there was a significant effect of faculty type in spring 2019, F (1, 95) = 6.56, p = .012, with courses taught by ACUE-credentialed faculty receiving higher student evaluations (M = 3.44, SD = 0.37) than matched courses (M = 3.15, SD = 0.69); see Figure 3.

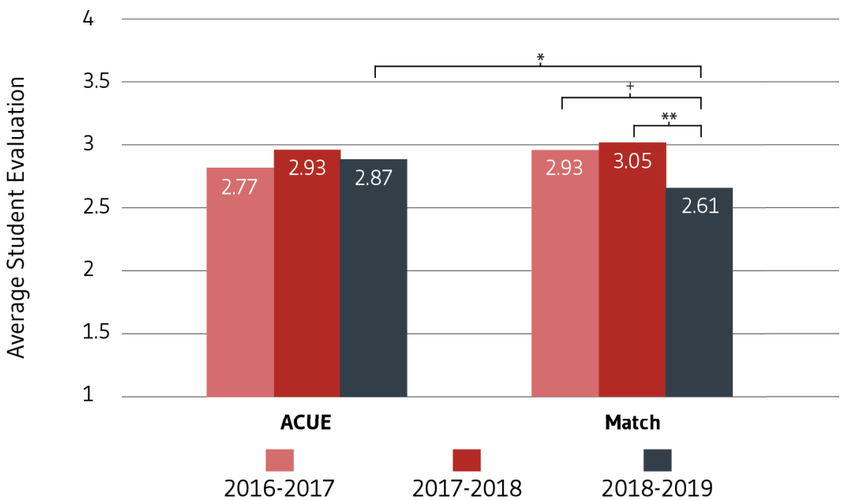
Figure 3. Course evaluations for spring 2018 cohorts by term and faculty type.



Average Student Grades

Fall 2017 ACUE-credentialed faculty who had baseline data. There was not a significant main effect of faculty type, F (1, 257) = 0.04, p = .834, but there was a marginally significant interaction between faculty type and year, F (2, 257) = 2.87, p = .059. The three-way interaction between faculty type, year, and semester was not significant, F (2, 257) = 0.50, p = .605. Analyses on the courses taught by ACUE-credentialed faculty did not show a significant effect of year, F (2, 140) = 2.05, p = .133, while analyses on the matched courses did find a significant effect of year, F (2, 116) = 5.73, p = .004. Post-hoc tests with Bonferroni corrections indicated that among match sections, grades in 2018-2019 (M = 2.61, SD = 0.65) were significantly lower than in 2017-2018 (M = 3.05, SD = 0.62), p = .004, and marginally lower than in 2016-2017 (M = 2.93, SD = 0.64), p = .063. Grades did not significantly differ between 2016-2017 and 2017-2018, p = 1.00; see Figure 4. Analyses by year indicated that there was not a significant effect of faculty type in 2016-2017, F (1, 76) = 1.15, p = .288, nor in 2017-2018, F (1, 81) = 0.54, p = .466. However, there was a significant effect of faculty type in 2018-2019, F (1, 98) = 4.21, p = .043, with courses taught by ACUE-credentialed faculty having higher average grades (M = 2.87, SD = 0.72) than matched courses (M = 2.61, SD = 0.65); see Figure 4.

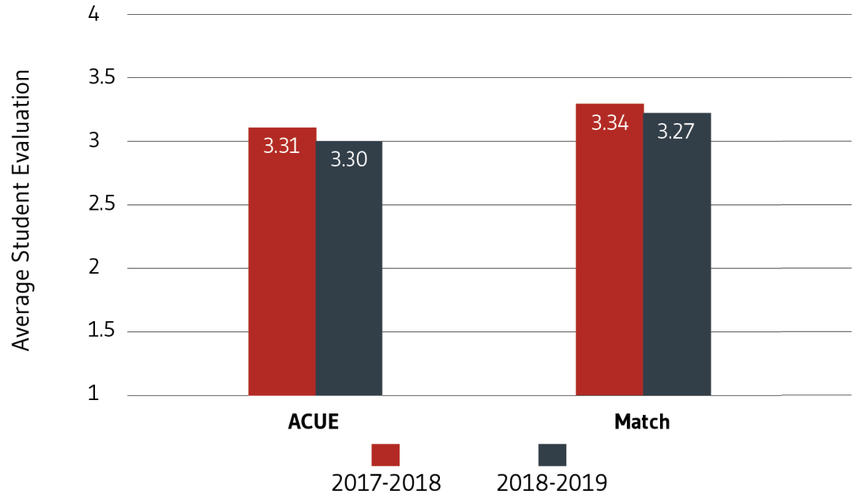
Figure 4. Average student grades for fall 2017 ACUE-credentialed faculty with baseline data, by year and faculty type.



+p<.10 *p<.05 **p<.01 ***p<.001

Entire fall 2017 cohorts. There was not a significant main effect of faculty type, F (1, 354) = 0.00, p = .989, nor was there a significant interaction between faculty type and year, F (1, 354) = 0.18, p = .670, or between faculty type, year, and semester, F (1, 354) = 0.35, p = .552. Analyses separating courses by faculty type indicated that there was not a significant main effect of year among the courses taught by ACUE-credentialed faculty, F (1, 186) = 0.98, p = .323, nor among the matched courses, F (1, 167) = 0.77, p = .381. Similarly, examining effects by year indicated that there was not a significant effect of faculty type in 2017-2018, F (1, 155) = 0.08, p = .773, nor in 2018-2019, F (1, 198) = 0.11, p = .745; see Figure 5.

Figure 5. Average student grades for fall 2017 cohorts by year and faculty type.

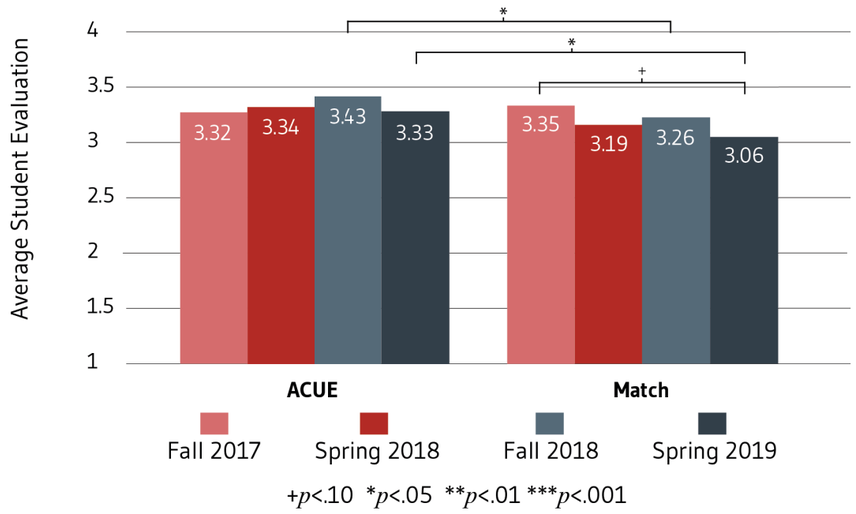


Spring 2018 cohorts. There was a significant main effect of faculty type, F (1, 385) = 8.38, p = .004, with courses taught by ACUE-credentialed faculty having higher average grades (M = 3.36, SD = 0.44) than matched courses (M = 3.22, SD = 0.58). The interaction between faculty type and year was not significant, F (1, 385) = 2.41, p = .121, nor was the interaction between faculty type, year, and semester, F (1, 385) = 0.13, p = .719.

Analyses separated by faculty type found that there was not a significant effect of year among either the courses taught by ACUE-credentialed faculty, F (1, 201) = 0.68, p = .412, or the matched courses, F (1, 183) = 1.70, p = .194. When the analyses were conducted with term as a single four-level factor, there was no effect of term among courses taught by ACUE-credentialed faculty, F (1, 201) = 0.94, p = .424. There was a marginally significant effect of term among the matched courses, F (1, 183) = 2.14, p = .097. Post-hoc tests with Bonferroni correction indicated that among match sections, grades in spring 2019 (M = 3.06, SD = 0.48) were marginally lower than in fall 2017 (M = 3.35, SD = 0.53), p = .094. There was not a significant difference between grades in fall 2017 and spring 2018 (M = 3.19, SD = 0.73), p = .989, or between fall 2018 (M = 3.26, SD = 0.52) and spring 2019, p = .593. There also was not a significant difference between fall 2018 and fall 2017 or spring 2018, nor between spring 2019 and spring 2018, p's = 1.00; see Figure 6.

Examining each year separately shows that while there was not a significant effect of faculty type in 2017-2018, F (1, 198) = 0.24, p = .376, there was a significant effect of faculty type in 2018-2019, F (1, 186) = 11.65, p = .001, with courses taught by ACUE-credentialed faculty having higher average grades (M = 3.39, SD = 0.42) than matched courses (M = 3.17, SD = 0.51). Examining each term separately showed the same pattern: The effect of faculty type was not significant in fall 2017, F (1, 101) = 0.50, p = .823, or spring 2018, F (1, 96) = 1.69, p = .196, but it was significant in fall 2018, F (1, 104) = 3.97, p = .049, and spring 2019, F (1, 81) = 7.01, p = .010. In both fall 2018 and spring 2019, courses taught by ACUE-credentialed faculty had higher average student grades (fall 2018: M = 3.43, SD = 0.40; spring 2019: M = 3.33, SD = 0.45) than matched courses (fall 2018: M = 3.26, SD = 0.52; spring 2019: M = 3.06, SD = 0.48); see Figure 6.

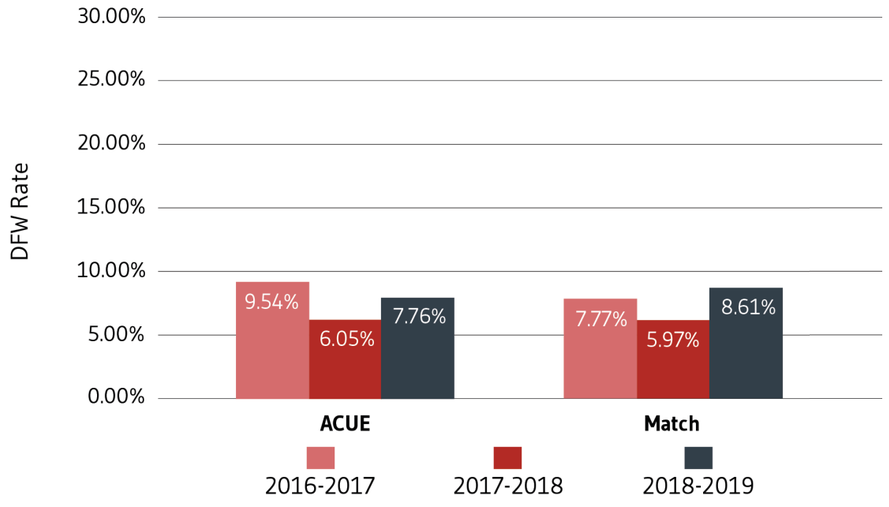
Figure 6. Average student grades for spring 2018 cohorts by term and faculty type.



DFW Rates

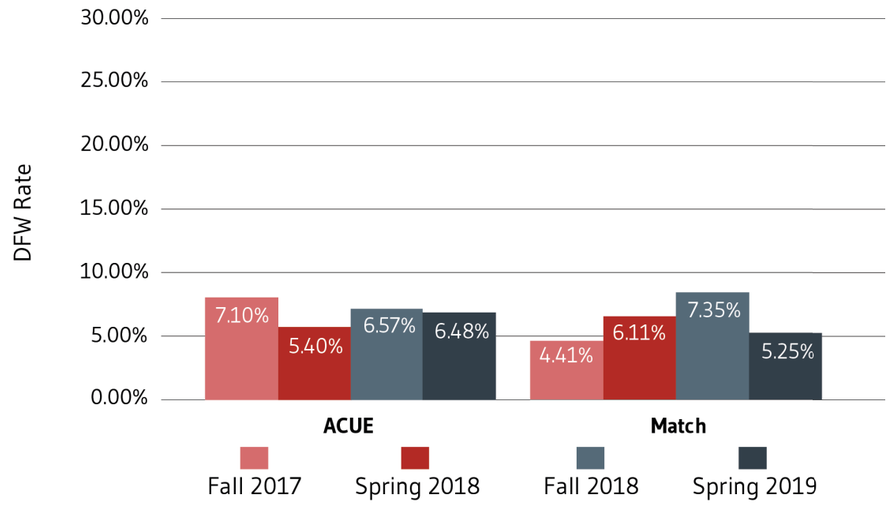
Fall 2017 ACUE-credentialed faculty who had baseline data. There was not a significant main effect of faculty type, F (1, 262) = 0.02, p = .891, nor was there a significant interaction between faculty type and year, F (2, 262) = 0.43, p = .649, or between faculty type, year, and semester, F (2, 262) = 1.44, p = .239. Analyses separating courses by faculty type found a significant effect of year among courses taught by ACUE-credentialed faculty, F (2, 142) = 4.33, p = .015; however, none of the post-hoc tests showed significant differences, p's > .10. The effect of year was not significant among matched courses, F (2, 119) = 1.34, p = .265. Examining effects by year indicated that there was not a significant effect of faculty type in 2016-2017, F (1, 76) = 0.50, p = .481, 2017-2018, F (1, 83) = 0.04, p = .849, nor in 2018-2019, F (1, 101) = 0.43, p = .516; see Figure 7.

Figure 7. DFW rates for fall 2017 ACUE-credentialed faculty with baseline data, by year and faculty type.



Entire fall 2017 cohorts. There was not a significant main effect of faculty type, F (1, 370) = 0.63, p = .430, nor was there a significant interaction between faculty type and year, F (1, 370) = 0.15, p = .698. However, there was a marginally significant interaction between faculty type, year, and semester, F (1, 370) = 3.05, p = .082. Analyses separating courses by faculty type found that there was not a significant effect of year among the courses taught by ACUE-credentialed faculty, F (1, 193) = 0.51, p = .476, nor the matched courses, F (1, 176) = 0.90, p = .343. However, there was a marginally significant interaction between year and semester among the matched courses, F (1, 176) = 3.14, p = .078. When term was used as a single, four-level factor, the effect of term was not significant among matched courses, F (3, 176) = 1.33, p = .267; see Figure 8. Examining each year separately indicated that there was not a significant effect of faculty type in either 2017-2018, F (1, 162) = 0.67, p = .415, or 2018-2019, F (1, 207) = 0.12, p = .729.

Figure 8. DFW rates for fall 2017 cohorts by semester and faculty type.

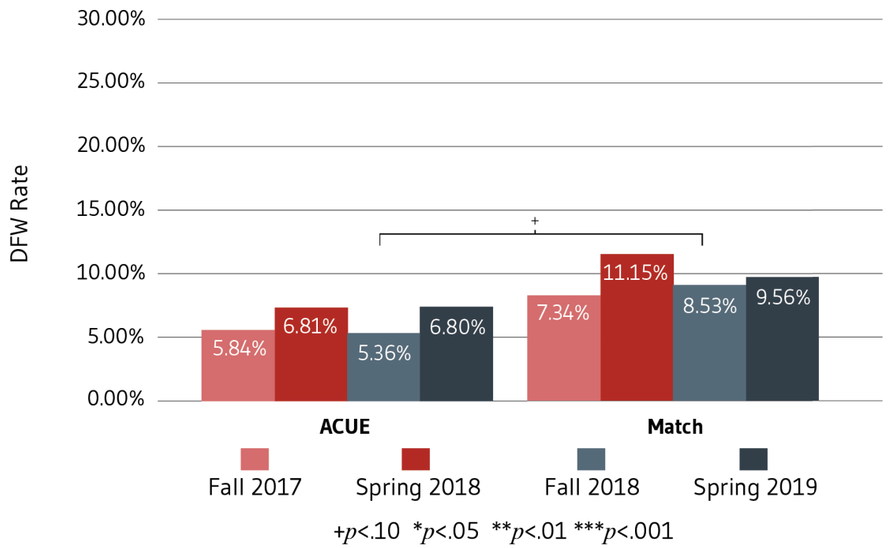


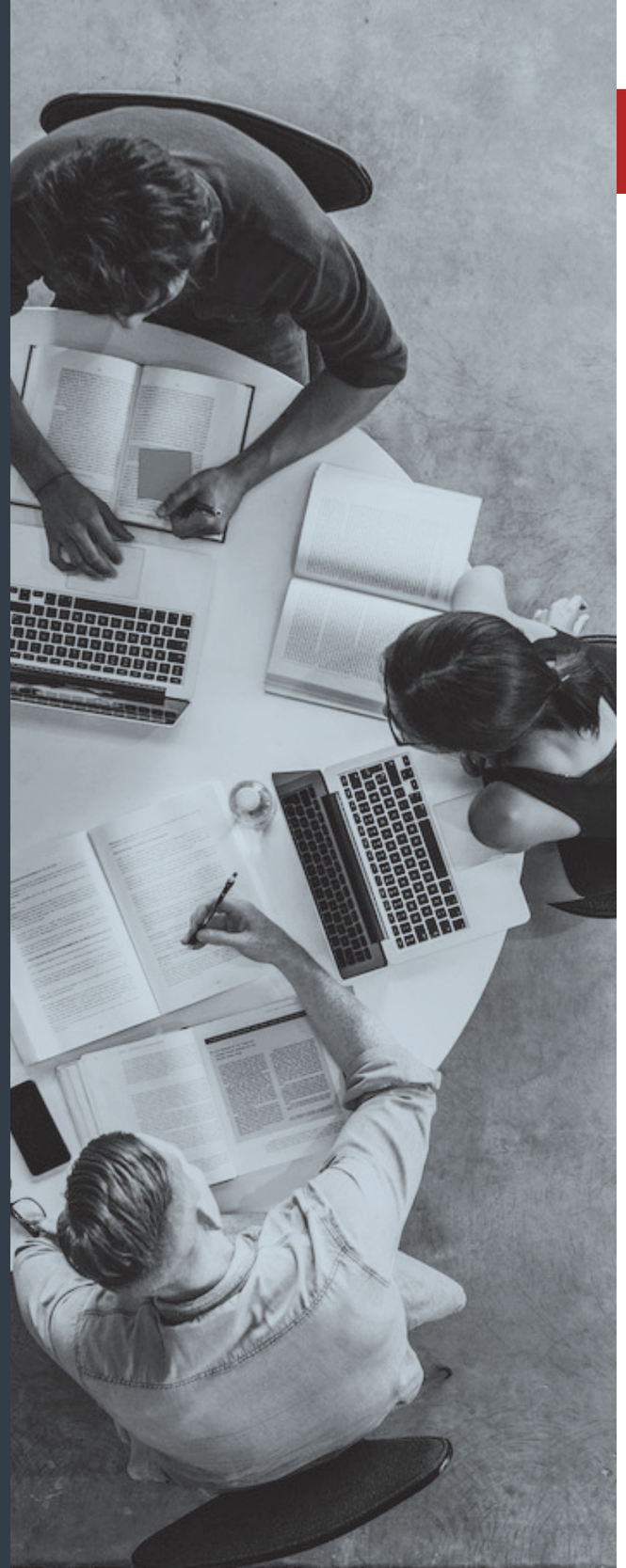
Spring 2018 cohorts. There was a significant main effect of faculty type, F (1, 395) = 8.30, p = .004, with courses taught by ACUE-credentialed faculty having lower DFW rates (M = 6.16%, SD = 8.44%) than matched courses (M = 9.11%, SD = 12.00%). The interaction between faculty type and year was not significant, F (1, 395) = 0.00, p = .996, nor was the interaction between faculty type, year, and semester, F (1, 395) = 0.61, p = .434.

Analyses separated by faculty type found that there was not a significant effect of year among either the courses taught by ACUE-credentialed faculty, F (1, 205) = 0.00, p = .991, or the matched courses, F (1, 189) = 0.01, p = .933. When the analyses were conducted with term as a single four-level factor, there was no effect of term among courses taught by ACUE-credentialed faculty, F (3, 205) = 0.64, p = .589, nor among matched courses, F (3, 189) = 0.87, p = .458.

Analyses separated by year found a marginally significant effect of faculty type in 2017-2018, F (1, 203) = 3.68, p = .056, with courses taught by ACUE-credentialed faculty having lower DFW rates (M = 6.31%, SD = 8.86%) than matched courses (M = 9.21%, SD = 13.98%). Similarly, there was a significant effect of faculty type in 2018-2019, F (1, 191) = 5.41, p = .021, with courses taught by ACUE-credentialed faculty having lower DFW rates (M = 6.00%, SD = 8.02%) than matched courses (M = 9.00%, SD = 9.52%). Examining each term separately found that the effect of faculty type was not significant in fall 2017, F (1, 103) = 1.11, p = .295, spring 2018, F (1, 99) = 2.45, p = .121, or spring 2019, F (1, 85) = 1.86, p = .176. There was a marginally significant effect of faculty type in fall 2018, F (1, 105) = 3.58, p = .061, with courses taught by ACUE-credentialed faculty having lower DFW rates (M = 5.36%, SD = 7.50%) than matched courses (M = 8.53%, SD = 9.73%); see Figure 9.

Figure 9. DFW rates for spring 2018 cohorts by semester and faculty type.





DISCUSSION

Among courses taught by ACUE-credentialed faculty, student course evaluations improved over time from the earliest time point assessed—whether it was a true baseline or while faculty were earning their credential—to the year after faculty earned their credential, including improvement from the year faculty were earning their credential to the following year in all three sets of analyses. Among the group of faculty with a full year of baseline data, student course evaluations improved from the baseline year to the year in which faculty earned their credential, with additional improvement from the year they earned their credential to the following year. Importantly, there was no significant change over the same period among the matched courses, such that courses taught by ACUE-credentialed faculty received higher student course evaluations compared to the matched courses in the year after they earned their credential in all three sets of analyses. Average student grades remained stable over time among courses taught by ACUE-credentialed faculty, while grades decreased over the same period among the matched courses. As a result, in two of the three sets of analyses, courses taught by ACUE-credentialed faculty outperformed the matched courses in the year after faculty earned the ACUE credential. The pattern for DFW rates was not as strong, though DFW rates were low overall, with a great deal of variability, making it more difficult to show significant differences. The only differences found were for the spring 2018 cohorts. In this set of analyses, the courses taught by ACUE-credentialed faculty had lower DFW rates than the matched courses, primarily in the year after faculty earned their ACUE credential.

These results supplement prior findings on the impact of the ACUE credential on student course evaluations (Morrison, Ross, et al., 2017; Morrison, Wilson, et al., 2017), student grades (Hecht, 2019; Lawner & Snow, 2019; Lawner, Snow, & Burt, 2019), and DFW rates (Lawner & Snow, 2018). However, this study extends the prior findings by demonstrating increased impact in the year after faculty earned their credential and

establishing positive student impact of the ACUE credential at an R1 institution. In addition, this is the first evaluation study of the ACUE credential to show a positive impact on both student course evaluations and grades, fully connecting Levels 4 and 5 of ACUE's evaluation framework (MacCormack et al., 2018). Furthermore, this evaluation addresses concerns about impacts in prior studies being partly due to self-selection since the majority of faculty in this evaluation were required to complete the ACUE course.

One limitation of this evaluation is the limited demographic data available. No demographic information was available on students, and thus analyses could not control for students' class year, for example, which could have impacted outcomes, nor could we examine whether effects were greater for some subgroups of students. For faculty, we were able to control for faculty rank, which is particularly important given that many of the ACUE-credentialed faculty were new at UNR, but we could not account for total years of teaching experience. Another limitation is that not all of analyses included a baseline timepoint, making it more difficult to understand the full improvement that occurred. In addition, the analyses in the current study do not account for the nested nature of the data, which could affect statistical significance. However, since instructors teach multiple courses and many courses have multiple sections taught by different faculty, it is unclear whether sections should be nested within instructors or vice versa.

While this study goes beyond the timeframe of most past evaluations of the ACUE credential, it is still important for future research to continue to study longer term student outcomes, including those that occur more than one year after faculty earn their credential,

"...this study extends the prior findings by demonstrating increased impact in the year after faculty earned their credential and establishing positive student impact of the ACUE credential at an R1 institution."

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APPENDIX

Table A1: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Faculty With Baseline Year Only

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	1.29	1	1.29	7.13	.008
ACUE	0.51	1	0.51	2.80	.096
Year	1.27	2	0.64	3.50	.032
Semester	0.96	1	0.96	5.28	.022
ACUE x Year	1.83	2	0.92	5.05	.007
ACUE x Semester	0.48	1	0.48	2.67	.104
Year x Semester	0.02	2	0.01	0.06	.942
ACUE x Year x Semester	0.23	2	0.11	0.62	.537
Error	45.71	252	0.18		

Table A2: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	0.75	1	0.75	6.72	.011
	Year*	3.18	2	1.59	14.22	<.001
	Semester	1.49	1	1.49	13.33	<.001
	Year x Semester	0.19	2	0.10	0.86	.426
	Error	14.44	129	0.11		
Match	Faculty rank	0.73	1	0.73	2.85	.094
	Year	0.07	2	0.04	0.14	.872
	Semester	0.04	1	0.04	0.15	.703
	Year x Semester	0.07	2	0.03	0.13	.878
	Error	31.09	122	0.26		

*Post-hoc tests with Bonferroni correction indicate that among ACUE sections, course evaluations in 2016-2017 were significantly lower than in 2017-2018, $p = .016$, and 2018-2019, $p < .001$, and that course evaluations in 2018-2019 were marginally higher than in 2017-2018, $p = .087$.

Table A3: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2016-2017	Faculty rank	1.25	1	1.25	6.27	.015
	ACUE	0.27	1	0.27	1.37	.246
	Semester	0.43	1	0.43	2.15	.147
	ACUE x Semester	0.34	1	0.34	1.72	.194
	Error	14.11	71	0.20		
2017-2018	Faculty rank	0.06	1	0.06	0.36	.553
	ACUE	0.34	1	0.34	2.04	.158
	Semester	0.27	1	0.27	1.62	.207
	ACUE x Semester	0.28	1	0.38	1.68	.198
	Error	13.29	79	0.17		
2018-2019	Faculty rank	0.41	1	0.41	2.30	.132
	ACUE	1.91	1	1.91	10.69	.001
	Semester	0.29	1	0.29	1.60	.209
	ACUE x Semester	0.00	1	0.00	0.01	.931
	Error	17.90	100	0.18		

Table A4: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Entire Sample

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	0.04	1	0.04	0.21	.646
ACUE	1.29	1	1.29	6.80	.009
Year	0.87	1	0.87	4.59	.033
Semester	0.61	1	0.61	3.21	.074
ACUE x Year	0.30	1	0.30	1.61	.206
ACUE x Semester	0.01	1	0.01	0.06	.803
Year x Semester	0.17	1	0.17	0.89	.345
ACUE x Year x Semester	0.00	1	0.00	0.00	.954
Error	68.71	363	0.19		

Table A5: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Entire Sample, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	0.18	1	0.18	1.40	.238
	Year	1.03	1	1.03	8.20	.005
	Semester	0.23	1	0.23	1.83	.178
	Year x Semester	0.08	1	0.08	0.65	.421
	Error	22.58	180	0.13		
Match	Faculty rank	0.00	1	0.00	0.01	.944
	Year	0.07	1	0.07	0.29	.594
	Semester	0.39	1	0.39	1.54	.217
	Year x Semester	0.10	1	0.10	0.39	.532
	Error	46.00	182	0.25		

Table A6: ANOVA Table for Analysis of Course Evaluations Among Fall 2017 Cohorts, Entire Sample, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	0.00	1	0.00	0.01	.914
	ACUE	0.16	1	0.16	0.75	.388
	Semester	0.62	1	0.62	2.97	.087
	ACUE x Semester	0.01	1	0.01	0.04	.839
	Error	32.95	157	0.21		
2018-2019	Faculty rank	0.10	1	0.10	0.59	.445
	ACUE	1.59	1	1.59	9.13	.003
	Semester	0.08	1	0.08	0.47	.493
	ACUE x Semester	0.01	1	0.01	0.03	.862
	Error	35.70	205	0.17		

Table A7: ANOVA Table for Analysis of Course Evaluations Among Spring 2018 Cohorts

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	0.12	1	0.12	0.46	.500
ACUE	0.92	1	0.92	3.39	.066
Year	0.12	1	0.12	0.44	.506
Semester	0.06	1	0.06	0.22	.641
ACUE x Year	1.84	1	1.84	6.81	.009
ACUE x Semester	1.07	1	1.07	3.96	.047
Year x Semester	0.11	1	0.11	0.40	.527
ACUE x Year x Semester	0.18	1	0.18	0.68	.409
Error	112.02	415	0.27		

Table A8: ANOVA Table for Analysis of Course Evaluations Among Spring 2018 Cohorts, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	0.33	1	0.33	1.76	.186
	Year	1.56	1	1.56	8.48	.004
	Semester	0.35	1	0.35	1.91	.168
	Year x Semester	0.29	1	0.29	1.60	.208
	Error	39.43	214	0.18		
Match	Faculty rank	0.03	1	0.03	0.08	.773
	Year	0.48	1	0.48	1.32	.252
	Semester	0.80	1	0.80	2.22	.138
	Year x Semester	0.01	1	0.01	0.01	.908
	Error	72.36	200	0.36		

Table A9: ANOVA Table for Analysis of Course Evaluations Among Spring 2018 Cohorts, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	0.39	1	0.39	1.69	.195
	ACUE	0.11	1	0.11	0.48	.490
	Semester	0.01	1	0.01	0.03	.871
	ACUE x Semester	1.05	1	1.05	4.56	.034
	Error	50.00	205	0.23		
2018-2019	Faculty rank	0.02	1	0.02	0.05	.817
	ACUE	2.72	1	2.72	8.76	.003
	Semester	0.18	1	0.18	0.58	.446
	ACUE x Semester	0.19	1	0.19	0.62	.433
	Error	64.74	209	0.31		

Table A10: ANOVA Table for Analysis of Course Evaluations Among Spring 2018 Cohorts, Split by Faculty Type, Using Term as a Single Factor

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	0.33	1	0.33	1.76	.186
	Term*	2.29	3	0.76	4.14	.007
	Error	39.43	214	0.18		
Match	Faculty rank	0.03	1	0.03	0.08	.773
	Term	1.28	3	0.43	1.18	.320
	Error	72.36	200	0.36		

*Post-hoc tests with Bonferroni correction indicate that among ACUE sections, course evaluations in fall 2017 were significantly lower than in fall 2018, p = .017, and spring 2019, p = .027. Spring 2018 evaluations were not significantly different from fall 2017, p = .405, nor fall 2018 and spring 2019, p's = 1.00. Fall 2018 and spring 2019 were not significantly different from each other, p = 1.00.

Table A11: ANOVA Table for Analysis of Course Evaluations Among Spring 2018 Cohorts, Split by Term

Term	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Fall 2017	Faculty rank	0.25	1	0.25	1.16	.284
	ACUE	0.96	1	0.96	4.38	.039
	Error	23.13	106	0.22		
Spring 2018	Faculty rank	0.14	1	0.14	0.58	.450
	ACUE	0.23	1	0.23	0.95	.333
	Error	23.86	98	0.24		
Fall 2018	Faculty rank	0.18	1	0.18	0.59	.446
	ACUE	0.82	1	0.82	2.66	.105
	Error	34.65	113	0.31		
Spring 2019	Faculty rank	0.34	1	0.34	1.10	.298
	ACUE	2.04	1	2.04	6.56	.012
	Error	29.59	95	0.31		

Table A12: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Faculty With Baseline Year Only

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	3.26	1	3.26	8.72	.003
ACUE	0.02	1	0.02	0.04	.834
Year	3.32	2	1.66	4.45	.013
Semester	2.41	1	2.41	6.44	.012
ACUE x Year	2.14	2	1.07	2.87	.059
ACUE x Semester	0.03	1	0.03	0.09	.762
Year x Semester	0.83	2	0.41	1.11	.332
ACUE x Year x Semester	0.38	2	0.19	0.50	.605
Error	95.98	257	0.37		

Table A13: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	6.54	1	6.54	19.61	<.001
	Year	1.37	2	0.68	2.05	.133
	Semester	1.41	1	1.41	4.23	.042
	Year x Semester	0.05	2	0.03	0.08	.927
	Error	46.66	140	0.33		
Match	Faculty rank	0.51	1	0.51	1.29	.259
	Year*	4.50	2	2.25	5.73	.004
	Semester	1.38	1	1.38	3.50	.064
	Year x Semester	0.85	2	0.43	1.08	.342
	Error	45.54	116	0.39		

*Post-hoc tests with Bonferroni correction indicate that among match sections, grades in 2018-2019 were significantly lower than in 2017-2018, p = .004, and marginally lower than in 2018-2019, p = .063. Grades did not significantly differ between 2016-2017 and 2017-2018, p = 1.00.

Table A14: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2016-2017	Faculty rank	0.37	1	0.37	1.09	.301
	ACUE	0.39	1	0.39	1.15	.288
	Semester	0.45	1	0.45	1.31	.255
	ACUE x Semester	0.01	1	0.01	0.02	.891
	Error	26.11	76	0.34		
2017-2018	Faculty rank	0.58	1	0.58	1.69	.197
	ACUE	0.18	1	0.18	0.54	.466
	Semester	0.14	1	0.14	0.40	.529
	ACUE x Semester	0.06	1	0.06	0.18	.674
	Error	27.74	81	0.34		
2018-2019	Faculty rank	2.89	1	2.89	6.81	.010
	ACUE	1.78	1	1.78	4.21	.043
	Semester	3.06	1	3.06	7.22	.008
	ACUE x Semester	0.43	1	0.43	1.01	.318
	Error	41.55	98	0.42		

Table A15: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Entire Sample

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	1.28	1	1.28	5.60	.019
ACUE	0.00	1	0.00	0.00	.989
Year	0.22	1	0.22	0.97	.327
Semester	0.02	1	0.02	0.07	.785
ACUE x Year	0.04	1	0.04	0.18	.670
ACUE x Semester	0.14	1	0.14	0.61	.435
Year x Semester	0.49	1	0.49	2.12	.146
ACUE x Year x Semester	0.08	1	0.08	0.35	.552
Error	81.13	354	0.23		

Table A16: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Entire Sample, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	4.19	1	4.19	20.62	<.001
	Year	0.20	1	0.20	0.98	.323
	Semester	0.04	1	0.04	0.20	.652
	Year x Semester	0.09	1	0.09	0.42	.519
	Error	37.84	186	0.20		
Match	Faculty rank	0.04	1	0.04	0.18	.674
	Year	0.19	1	0.19	0.77	.381
	Semester	0.13	1	0.13	0.53	.467
	Year x Semester	0.34	1	0.34	1.42	.234
	Error	40.33	167	0.24		

Table A17: ANOVA Table for Analysis of Average Grades Among Fall 2017 Cohorts, Entire Sample, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	0.64	1	0.64	3.12	.079
	ACUE	0.02	1	0.02	0.08	.773
	Semester	0.14	1	0.14	0.70	.404
	ACUE x Semester	0.00	1	0.00	0.02	.903
	Error	31.79	155	0.21		
2018-2019	Faculty rank	0.65	1	0.65	2.60	.109
	ACUE	0.03	1	0.03	0.11	.745
	Semester	0.39	1	0.39	1.58	.210
	ACUE x Semester	0.25	1	0.25	1.00	.320
	Error	49.33	198	0.25		

Table A18: ANOVA Table for Analysis of Average Grades Among Spring 2018 Cohorts

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	0.75	1	0.75	2.90	.089
ACUE	2.16	1	2.16	8.38	.004
Year	0.07	1	0.07	0.27	.601
Semester	1.31	1	1.31	5.08	.025
ACUE x Year	0.62	1	0.62	2.41	.121
ACUE x Semester	0.56	1	0.56	2.17	.142
Year x Semester	0.19	1	0.19	0.74	.389
ACUE x Year x Semester	0.03	1	0.03	0.13	.719
Error	99.17	385	0.26		

Table A19: ANOVA Table for Analysis of Average Grades Among Spring 2018 Cohorts, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	3.54	1	3.54	19.75	<.001
	Year	0.12	1	0.12	0.68	.412
	Semester	0.14	1	0.14	0.77	.383
	Year x Semester	0.21	1	0.21	1.18	.279
	Error	36.00	201	0.18		
Match	Faculty rank	0.06	1	0.06	0.18	.678
	Year	0.56	1	0.56	1.70	.194
	Semester	1.61	1	1.61	4.89	.028
	Year x Semester	0.02	1	0.02	0.07	.787
	Error	60.32	183	0.33		

Table A20: ANOVA Table for Analysis of Average Grades Among Spring 2018 Cohorts, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	0.37	1	0.37	1.21	.272
	ACUE	0.24	1	0.24	0.79	.376
	Semester	0.26	1	0.26	0.86	.355
	ACUE x Semester	0.45	1	0.45	1.49	.224
	Error	59.76	198	0.30		
2018-2019	Faculty rank	0.38	1	0.38	1.81	.180
	ACUE	2.47	1	2.47	11.65	.001
	Semester	1.21	1	1.21	5.70	.018
	ACUE x Semester	0.16	1	0.16	0.73	.393
	Error	39.41	186	0.21		

Table A21: ANOVA Table for Analysis of Average Grades Among Spring 2018 Cohorts, Split by Faculty Type, Using Term as a Single Factor

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	3.54	1	3.54	19.75	<.001
	Term	0.50	3	0.17	0.94	.424
	Error	36.00	201	0.18		
Match	Faculty rank	0.06	1	0.06	0.18	.678
	Term*	2.11	3	0.70	2.14	.097
	Error	60.32	183	0.33		

*Post-hoc tests with Bonferroni correction indicate that among match sections, grades in spring 2019 were marginally lower than in fall 2017, p = .094. No other comparisons were significant, p's > .10.

Table A22: ANOVA Table for Analysis of Average Grades Among Spring 2018 Cohorts, Split by Term

Term	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Fall 2017	Faculty rank	0.35	1	0.35	1.42	.236
	ACUE	.01	1	0.01	0.50	.823
	Error	24.91	101	0.25		
Spring 2018	Faculty rank	0.07	1	0.07	0.18	.671
	ACUE	0.61	1	0.61	1.69	.196
	Error	34.80	96	0.36		
Fall 2018	Faculty rank	0.98	1	0.98	4.86	.030
	ACUE	0.80	1	0.80	3.97	.049
	Error	21.06	104	0.20		
Spring 2019	Faculty rank	0.01	1	0.01	0.06	.803
	ACUE	1.54	1	1.54	7.01	.010
	Error	17.73	81	0.22		

Table A23: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Faculty With Baseline Year Only

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	1449.89	1	1449.89	22.02	<.001
ACUE	1.25	1	1.25	0.02	.891
Year	465.63	2	232.82	3.54	.031
Semester	644.23	1	644.23	9.78	.002
ACUE x Year	57.12	2	28.56	0.43	.649
ACUE x Semester	14.24	1	14.24	0.22	.642
Year x Semester	58.00	2	29.00	0.44	.644
ACUE x Year x Semester	189.68	2	94.84	1.44	.239
Error	17253.76	262	65.85		

Table A24: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	2055.43	1	2055.43	32.22	<.001
	Year*	552.90	2	276.45	4.33	.015
	Semester	580.84	1	580.84	9.11	.003
	Year x Semester	93.41	2	46.71	0.73	.483
	Error	9058.64	142	63.79		
Match	Faculty rank	384.43	1	384.43	6.35	.013
	Year	162.56	2	81.28	1.34	.265
	Semester	217.70	1	217.70	3.60	.060
	Year x Semester	153.41	2	76.71	1.27	.285
	Error	7205.15	119	60.55		

*Post-hoc tests with Bonferroni correction show no significant differences, p's > .10.

Table A25: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Faculty With Baseline Year Only, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2016-2017	Faculty rank	266.79	1	266.79	3.88	.053
	ACUE	34.44	1	34.44	0.50	.481
	Semester	191.03	1	191.03	2.79	.099
	ACUE x Semester	36.29	1	36.29	0.53	.469
	Error	5207.68	76	68.52		
2017-2018	Faculty rank	197.06	1	197.06	4.27	.042
	ACUE	1.69	1	1.69	0.04	.849
	Semester	96.61	1	96.61	2.09	.152
	ACUE x Semester	51.18	1	51.18	1.11	.295
	Error	3829.28	83	46.14		
2018-2019	Faculty rank	1182.72	1	1182.72	14.89	<.001
	ACUE	33.74	1	33.74	0.43	.516
	Semester	487.69	1	487.69	6.14	.015
	ACUE x Semester	108.51	1	108.51	1.37	.245
	Error	8021.12	101	79.42		

Table A26: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Entire Sample

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	423.55	1	423.55	6.25	.013
ACUE	42.40	1	42.40	0.63	.430
Year	60.60	1	60.60	0.89	.345
Semester	23.15	1	23.15	0.34	.559
ACUE x Year	10.23	1	10.23	0.15	.698
ACUE x Semester	11.45	1	11.45	0.17	.681
Year x Semester	45.39	1	45.39	0.67	.414
ACUE x Year x Semester	206.43	1	206.43	3.05	.082
Error	25084.54	370	67.80		

Table A27: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Entire Sample, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	821.81	1	821.81	10.87	.001
	Year	38.62	1	38.62	0.51	.476
	Semester	28.92	1	28.92	0.38	.537
	Year x Semester	30.26	1	30.26	0.40	.528
	Error	14596.73	193	75.63		
Match	Faculty rank	68.17	1	68.17	1.20	.275
	Year	51.41	1	51.41	0.90	.343
	Semester	1.35	1	1.35	0.02	.878
	Year x Semester	178.49	1	178.49	3.14	.078
	Error	10021.38	176	56.94		

Table A28: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Entire Sample, Split by Faculty Type, Using Term as a Single Factor

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	821.81	1	821.81	10.87	.001
	Term	103.98	3	34.66	0.46	.712
	Error	14596.73	193	75.63		
Match	Faculty rank	68.17	1	68.17	1.20	.275
	Term	226.91	3	75.64	1.33	.267
	Error	10021.38	176	56.94		

Table A29: ANOVA Table for Analysis of DFW Rates Among Fall 2017 Cohorts, Entire Sample, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	24.57	1	24.57	0.41	.525
	ACUE	40.36	1	40.36	0.67	.415
	Semester	0.22	1	0.22	0.00	.952
	ACUE x Semester	124.32	1	124.32	2.06	.153
	Error	9789.96	162	60.43		
2018-2019	Faculty rank	536.58	1	536.58	7.33	.007
	ACUE	8.83	1	8.83	0.12	.729
	Semester	84.40	1	84.40	1.15	.284
	ACUE x Semester	79.19	1	79.19	1.08	.300
	Error	15156.99	207	73.22		

Table A30: ANOVA Table for Analysis of DFW Rates Among Spring 2018 Cohorts

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Faculty rank	34.52	1	34.52	0.32	.570
ACUE	885.51	1	885.51	8.30	.004
Year	5.56	1	5.56	0.05	.820
Semester	340.33	1	340.33	3.19	.075
ACUE x Year	0.00	1	0.00	0.00	.996
ACUE x Semester	38.83	1	38.83	0.36	.547
Year x Semester	32.64	1	32.64	0.31	.581
ACUE x Year x Semester	65.52	1	65.52	0.61	.434
Error	42159.05	395	106.73		

Table A31: ANOVA Table for Analysis of DFW Rates Among Spring 2018 Cohorts, Split by Faculty Type

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	1716.50	1	1716.50	26.87	<.001
	Year	0.01	1	0.01	0.00	.991
	Semester	119.58	1	119.58	1.87	.173
	Year x Semester	4.63	1	4.63	0.07	.788
	Error	13094.58	205	63.88		
Match	Faculty rank	70.69	1	70.69	0.49	.485
	Year	1.02	1	1.02	0.01	.933
	Semester	267.42	1	267.42	1.85	.175
	Year x Semester	96.51	1	96.51	0.67	.415
	Error	27311.81	189	144.51		

Table A32: ANOVA Table for Analysis of DFW Rates Among Spring 2018 Cohorts, Split by Year

Year	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
2017-2018	Faculty rank	149.83	1	149.83	1.12	.292
	ACUE	493.14	1	493.14	3.68	.056
	Semester	312.24	1	312.24	2.33	.128
	ACUE x Semester	108.85	1	108.85	0.81	.368
	Error	27194.01	203	133.96		
2018-2019	Faculty rank	22.13	1	22.13	0.29	.594
	ACUE	419.67	1	419.67	5.41	.021
	Semester	68.49	1	68.49	0.88	.349
	ACUE x Semester	2.55	1	2.55	0.03	.856
	Error	14827.61	191	77.63		

Table A33: ANOVA Table for Analysis of DFW Rates Among Spring 2018 Cohorts, Split by Faculty Type, Using Term as a Single Factor

Faculty Type	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
ACUE	Faculty rank	1716.50	1	1716.50	26.87	<.001
	Term	123.08	3	41.03	0.64	.589
	Error	13094.58	205	63.88		
Match	Faculty rank	70.69	1	70.69	0.49	.485
	Term	376.70	3	125.57	0.87	.458
	Error	27311.81	189	144.51		

Table A34: ANOVA Table for Analysis of DFW Rates Among Spring 2018 Cohorts, Split by Term

Term	Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*
Fall 2017	Faculty rank	223.36	1	223.36	3.05	.084
	ACUE	81.11	1	81.11	1.11	.295
	Error	7532.27	103	73.13		
Spring 2018	Faculty rank	4.86	1	4.86	0.03	.876
	ACUE	485.09	1	485.09	2.45	.121
	Error	19583.35	99	197.81		
Fall 2018	Faculty rank	39.77	1	39.77	0.53	.467
	ACUE	267.14	1	267.14	3.58	.061
	Error	7840.83	105	74.68		
Spring 2019	Faculty rank	158.28	1	158.28	1.98	.164
	ACUE	149.21	1	149.21	1.86	.176
	Error	6810.86	85	80.13		

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