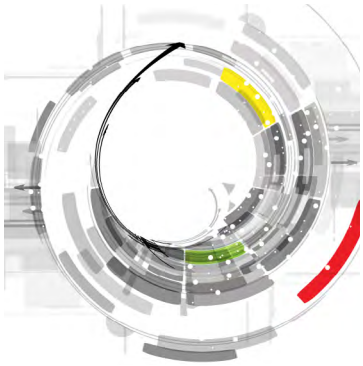
Abstract

This paper examines students' patterns of success in classes with high DFW rates at a research-intensive university. We investigated whether certain assignment types were associated with inequitable grade distributions for underrepresented minority (URM) and transfer students and whether assignment grade patterns were similar to final grade patterns. Across eight classes, 745 students' grades were analyzed from 27 assignments including tests, papers, projects, homework, and oral reports. In every class, URM students received lower final grades than non-URM students, and transfer students received lower final grades than non-transfer students. In five classes, different patterns of equity emerged across different assignment types and different groups of students. These findings support the importance of going beyond the disaggregation of final grades by disaggregating grades on individual assignments, and the need to develop institutional practices that examine the presence of equity gaps in the classroom.



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Considering the Effects of Assignment Choices on Equity Gaps

The Aspen Education and Society Program and the Council of Chief State School Officers (2017) defined equitable institutions as those in which "every student has access to the resources and educational rigor they need at the right moment in their education, despite race, gender, ethnicity, language, disability, family background, or family income" (p. 3). However, as a nation, we are failing to create equitable institutions of higher education. Many colleges and universities still require standardized scores from the SAT or ACT for entry, despite evidence that historically underserved students receive lower scores than other students (College Board, 2018; National Center for Education Statistics, 2019). Lower scores may reduce financial aid awards and discourage students from applying to or being admitted by competitive institutions (Zwick, 2019). Once students gain admission to a college, over a fifth leave without obtaining a credential (Rosenbaum et al., 2015), and over a third of students who matriculate at four-year public universities fail to graduate (Shapiro et al., 2018). A disproportionately high number of students leaving college without degrees are from underrepresented ethnic minority populations (URM) or low-income families. For URM students who transfer between institutions, the completion gaps are larger (Shapiro et al., 2018).

Transferring between institutions creates stress for students and is followed by a period of adaptation called "transfer shock" (Diaz, 1992; Fauria & Fuller, 2015). For

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example, transfer students in Texas were four times less likely to be retained after one year than non-transfer students (Fauria & Slate, 2014). Many transfer students experience a dip in grade point average (GPA) during the first or second semester at a new institution (Jacobson et al., 2017). Low grades can contribute to students' doubts about their ability to succeed. Ishitani (2008) found that transfer students with higher first semester GPAs were more likely to persist than students with lower first semester GPAs.

For many students, the first step toward leaving college can be a low or failing grade in a class.

Students who leave college without credentials have invested substantial amounts of time and money in the pursuit of higher education without any tangible benefit. Rosenbaum et al. (2015) called these students the "new forgotten half." With rapid demographic, economic, and cultural transitions, even more students will transfer between institutions of higher education and be first-generation, low-income, and students of color (McGee, 2015). Consequently, it is essential that institutions of higher education initiate practices to increase completion rates of underserved students (Association of American Colleges and Universities, 2018; Harper & Harris, 2012; Olson, 2020).

For many students, the first step toward leaving college can be a low or failing grade in a class. At our institution, we found that among students experiencing financial distress, every unit increase in GPA increased the odds the student would be retained by a factor of 1.68. Thus, closing gaps in class grades is an important element of closing gaps in college completion. Differences in college GPA are only partially explained by differences in income and prior academic preparation (Fletcher & Tienda, 2010; Lorah & Ndum, 2013). Spenner et al. (2004) found that only 40% of the variance between White and Black students' first semester grades could be explained by differences in socioeconomic background and academic preparation, leaving 60% of the gap unexplained.

Even when low assignment grades do not impact a student's final grade, low assignment grades can negatively impact retention by reducing a student's sense of academic self-efficacy (Montenegro et al., 2020). Academic self-efficacy describes students' beliefs about their ability to execute a course of action to successfully complete an academic task (Bandura, 1997). When students lack a sense of academic self-efficacy, they are less likely to persist to overcome academic challenges (Chemers et al., 2001; Han et al., 2017; Shen et al., 2016). Thus, even in instances in which low assignment grades do not translate directly to low course grades, when low assignment grades reduce students' sense of academic self-efficacy, there could be long-term reductions in academic success.

Because educational equity gaps represent institutional failure, improving equity requires organizational change and faculty engagement (Bensimon, 2005). To engage faculty, institutions must create cultures of inquiry in which the examination of data informs faculty-driven responses to inequities (Bensimon, 2005). Disaggregation of student learning data reveals educational equity gaps and supports the establishment of institutional cultures of inquiry (Maki, 2017). Currently, most colleges and universities only report aggregated student outcomes data, which obscures evidence of privilege-based stratification (Bauman et al., 2005; Singer-Freeman et al., 2021). To date, little research examines equity gaps within assignments. Campuses that disaggregate grades do so based on course grades. When faculty learn of equity gaps in their classes, it can be difficult for them to determine the source of the inequity. An examination of disaggregated data across different assignments in a course can provide faculty with actionable information. Identifying assignments that result in inequitable patterns of performance can lead to evidence-based assignment modifications. Demonstrating that different patterns of equity exist across different assignment types can be the first step toward engaging faculty in disaggregating assignment grades in their classes.

In the current work, we examined disaggregated grades across different assignments in classes with 50 or more enrolled students and with high numbers of D, F, or W (withdrawal) grades at a research-intensive university. This work did not involve direct contact with either students or faculty. Our goal was to determine whether grading distributions differed for URM and transfer students compared to non-URM and non-transfer students across different assignments and final grades within classes. We focused our exploratory work on large classes in which many students received grades of D, F, or W (DFW rates) because success or failure

in these classes has consequences for retention in the major and at the university. Because faculty and administrators are currently examining the role these classes play in student success, evidence of different grading distributions on assignments in these classes will help to establish the importance of disaggregating assignment grades.

Methods

Procedure

We obtained a list of 88 classes enrolling 50 or more students that had DFW rates of 30% or higher during the fall and spring semesters in 2017 and 2018. The courses that were listed included multiple sections taught by different instructors. We reviewed assignments from all sections of each course that recorded grades in the university's learning management system. The review of assignments revealed eight classes that stored grades in the learning management system and included graded assignments other than quizzes, tests, exams, or completion-based grades (such as attendance grades or assignments in which students received full credit for completion). Because we wished to examine patterns of performance across different assignment types, we excluded the 80 classes that did not offer forms of assignments other than quizzes, tests, exams, or completion-based assignments. Of the classes that did not include different forms of assignments, 42 (53%) were introductory-level classes and 57 (71%) were science, technology, engineering, and mathematics (STEM) classes. The eight remaining classes included in analyses were four introductory classes: Pre-Calculus (MATH), Introduction to Communication Theory (COMM), Network Theory II (ENGR), and Principles of Accounting (ACCT) and four advanced classes: Organic Chemistry Lab (CHEM), Design & Implementation – Object-Oriented Systems (INFO), Physiological Psychology (PSYC), and Sociology of Health and Illness (SOCY).

Even in instances in which low assignment grades do not translate directly to low course grades, when low assignment grades reduce students' sense of academic self-efficacy, there could be long-term reductions in academic success.

When a class was taught by the same instructor using the same assignments for more than one semester, we included data from all offerings between 2016 and 2018. The classes are listed in Table 1, along with the number of class offerings, percentage of students receiving final grades of D or F (DF rates), and special features of the class. We do not report withdrawal rates because this information was not available in the learning management system. As seen in Table 1, DF rates varied widely between classes ranging from 3% in ENGR to 25% in SOCY. Most of the classes were offered in the College of Liberal Arts. Several classes required completion of prerequisite courses (with a final grade of C or above) prior to enrollment.

Table 1
Classes Included in the Study

Class	Sections	% DF Rates	College	Special Features
MATH	2	19%	Liberal Arts	Prerequisite for Engineering Calculus
COMM	1	16%	Liberal Arts	———
ENGR	1	3%	Engineering	3 prerequisites required for enrollment
ACCT	1	13%	Business	Flipped Delivery – students viewed lectures online at home and spent class time working on problems
CHEM	9	14%	Liberal Arts	Lab, 1 prerequisite required for enrollment
INFO	1	5%	Computing	———
PSYC	1	11%	Liberal Arts	4 prerequisites required for enrollment, online delivery
SOCY	3	25%	Liberal Arts	1 prerequisite required for enrollment

Every class included at least two different forms of graded assignments. The types of assignments included exams (cumulative finals and mid-terms), tests (covering several weeks of work), quizzes (low-stakes frequent assessments covering a single week or day of work), homework (frequent low stakes work to check for understanding and allow practice), writing (scientific lab reports, formal essays, and reading responses), group projects, in-class activities, and oral reports. The proportion of the final class grade determined by each assignment type is reported in Table 2. Tests were the most common form of assignment, followed by homework and writing. Generally, introductory classes (the first four in the table) relied more heavily on tests and homework than advanced courses which were more likely to include writing assignments, projects, activities, or an oral report.

Table 2
Proportion of Final Class Grade Determined by each Assignment

Class	Exams, Quizzes or Tests	Homework	Writing	Group Project	Class Activity	Oral Report
MATH	80%	20%				
COMM	83%		8%			
ENGR	85%	15%				
ACCT	72%	7%		14%		
CHEM	5%		95%			
INFO	50%	40%			10%	
PSYC	75%					15%
SOCY	30%	20%	30%			

Note. Rows may not total to 100% because completion-based grades were excluded.

Participants

We report the number of participants and demographic information in Table 3. We had a total sample size of 745 students which included 53% female, 47% transfer, 51% White, 23% African American, 14% Hispanic, 8% Asian, 3% two or more races, and .01% Native American. Four percent of the sample did not provide information about their race or ethnicity.

Table 3
Demographic Information

Class	Total	Female	Transfer	White	African American	Hispanic	Asian	2 or more Races	Native American	No report
MATH	109	36	20	56	23	10	13	6	1	1
COMM	146	81	93	79	35	19	3	4	0	6
ENGR	41	2	17	22	4	4	7	1	0	3
ACCT	53	13	31	30	7	11	2	1	0	2
CHEM	150	101	57	74	24	19	24	1	0	9
INFO	61	12	16	30	9	2	15	4	0	1
PSYC	54	43	37	33	15	3	1	1	0	3
SOCY	131	107	81	50	51	13	5	6	0	6
Total	745	395	352	379	169	103	62	24	1	31
%		53%	47%	51%	23%	14%	8%	3%	.01%	4%

Because many classes had limited enrollment of students from certain underserved groups, we compared URM students, which included African American, Hispanic, and Native American students (37% of total sample), to non-URM students which included White and Asian students (59% of total sample). We chose to classify both White and Asian students as non-URM because students from these groups are either well-represented or over-represented at four-year institutions of higher education in the United States when compared to their representation in the population of the United States (Monarrez & Washington, 2020). We excluded participants who did not report race or ethnicity or reported two or more races. We compared students who transferred to the university (transfer students) to students who began their studies at the university (non-transfer students).

Coding

To compare patterns of performance on different assignment types without influence of assignment weighting, we converted scores into percentages and created a single average score for each assignment type for each student. We included scores of 0 for missing assignments in average scores. For example, a single average homework score was created by totaling the number of homework points received and dividing it by the total number of possible homework points. Independent samples t-tests were conducted using SPSS to evaluate differences between URM and non-URM students and differences between transfer and non-transfer students on individual assignments and in final grades. Cohen's *d* was calculated by hand.

Results

Final course grades are reported as a function of URM and transfer status in Tables 4 and 5. An inspection of scores prior to data analysis revealed that in every class, URM students received lower final grades than non-URM students, and transfer students received lower final grades than non-transfer students. To determine if these differences were statistically significant, we calculated independent samples t-tests comparing final grades of URM students to non-URM students and transfer students to non-transfer students. We observed significant differences with moderate effect sizes in SOCY in which URM students received lower average grades (70%) than non-URM students (77%), $t(102) = 2.75$, $p = .01$, $d = .57$ and transfer students received lower average grades (71%) than non-transfer students (76%), $t(129) = 2.29$, $p = .02$, $d = .39$. A significant difference was observed for transfer students in ACCT $t(51) = 2.18$, $p = .04$, $d = .54$ such that transfer students received lower average grades (74%) than non-transfer students (79%).

Demonstrating that different patterns of equity exist across different assignment types can be the first step toward engaging faculty in disaggregating assignment grades in their classes.

Table 4
Non-URM and URM Student Final Grades Reported as Percentages with Corresponding t-Tests

Class	Non-URM	URM	t-test	*p*	Cohen's *d*
MATH	76% (17)	75% (14)	$t(99) = .28$	.78	.06
COMM	72% (11)	70% (12)	$t(134) = .91$	.37	.17
ENGR	55% (16)	54% (5)	$t(40) = .17$	.87	.08
ACCT	77% (9)	75% (9)	$t(48) = .74$	.46	.22
CHEM	81% (18)	76% (20)	$t(139) = 1.37$	.18	.26
INFO	90% (12)	84% (12)	$t(58) = 1.66$	.10	.50
PSYC	82% (16)	81% (14)	$t(49) = .32$	.75	.07
SOCY	77% (9)	70% (15)	$t(102) = 2.75$	.01	.57

Note. Standard deviations are reported in parentheses.

Table 5
Non-Transfer and Transfer Student Final Grades Reported as Percentages with Corresponding t-Tests

Class	Non-Transfer	Transfer	t-test	*p*	Cohen's *d*
MATH	76% (17)	75% (6)	$t(105) = .14$	.78	.06
COMM	73% (13)	69% (15)	$t(144) = 1.72$	.09	.29
ENGR	57% (14)	54% (15)	$t(43) = .66$	.51	.21
ACCT	79% (7)	74% (11)	$t(51) = 2.18$	.04	.54
CHEM	81% (17)	78% (17)	$t(137) = .94$	.35	.18
INFO	89% (13)	87% (10)	$t(59) = .65$	.52	.17
PSYC	82% (19)	80% (15)	$t(53) = .52$	.60	.12
SOCY	76% (13)	71% (13)	$t(129) = 2.29$	.02	.39

Note. Standard deviations are reported in parentheses.

Table 6
Non-URM and URM Student Quiz, Test, and Exam Grades Reported as Percentages with Corresponding t-Tests

Class	Test Type	Non-URM	URM	t-test	*p*	Cohen's *d*
MATH	FR Test	78% (15)	78% (12)	$t(99)=.12$	.81	0
	FR Exam	72% (21)	70% (21)	$t(99) =.44$	.78	.10
ACCT	MC Quiz*	83% (13)	81% (22)	$t(48) =.25$	.80	.11
	MC Exam	74% (10)	69% (14)	$t(48)=1.31$	.20	.41
COMM	MC Exam	73% (15)	71% (15)	$t(134)=.65$	.52	.13
ENGR	MC Quiz	67% (21)	62% (17)	$t(40)= .61$	.54	.26
	FR Test	53% (13)	53% (6)	$t(40)=.004$	.99	0
	FR Exam	72% (15)	65% (10)	$t(40)=1.28$	.21	.55
CHEM	MC Quiz*	78% (23)	70% (31)	$t(139)= 1.62$	.10	.29
INFO	MC Exam*	91% (9)	90% (7)	$t(58) =.39$	.70	.12
PSYC	MC Quiz*	87% (8)	83% (8)	$t(49)=1.59$	.12	.50
	MC Exam*	80% (11)	79% (12)	$t(49)= .53$	.60	.09
SOCY	MC Exam*	77% (12)	71% (11)	$t(116)= 2.71$	.01	.52

Note. Online assessments are marked with an asterisk. Standard deviations are reported in parentheses.

To investigate the extent to which different assignment types resulted in different grading distributions, we conducted independent samples *t*-tests comparing assignment grades of URM students to non-URM students and transfer students to non-transfer students. Every class included quizzes, tests, or exams. Quizzes included frequent low-stakes assessments

that covered a small amount of material, tests included non-cumulative assessments that were given to cover several weeks of material, and exams included cumulative mid-terms or finals. Each assessment included either multiple-choice question formats (MC) or free response question formats (FR). As seen in Tables 6 and 7, across the eight classes, three had significant grade differences, with moderate to large effect sizes. In SOCY, non-URM students received higher online multiple-choice exam grades (77%) than URM students (71%), $t(116) = 2.71$, $p = .01$, $d = .52$ and non-transfer students received higher online multiple-choice exam grades (77%) than transfer students (71%), $t(128) = 2.50$, $p = .01$, $d = .50$. In ACCT, non-transfer students received higher multiple-choice exam grades (77%) than transfer students (69%), $t(51) = 2.62$, $p = .01$, $d = .72$. In PSYC non-transfer students received higher online multiple-choice exam grades (84%) than transfer students (77%), $t(53) = 2.02$, $p = .05$, $d = .63$ and non-transfer students received higher online multiple-choice quiz grades (88%) than transfer students (84%), $t(52) = 2.58$, $p = .05$, $d = .53$

Table 7
Non-Transfer and Transfer Student Quiz, Test, and Exam Grades Reported as Percentages with Corresponding t-Tests

Class	Test Type	Non-transfer	Transfer	t-test	*p*	Cohen's *d*
MATH	FR Test	78% (15)	76% (15)	$t(105)=.51$	.78	.13
	FR Exam	72% (21)	72% (20)	$t(105)=.03$	.78	0
ACCT	MC Quiz*	87% (11)	78% (22)	$t(47)=1.90$	.06	.82
	MC Exam	77% (9)	69% (13)	$t(51) = 2.62$	.01	.72
COMM	MC Exam	73% (15)	71% (15)	$t(144) =.57$	.57	.13
ENGR	MC Quiz	70% (18)	63% (23)	$t(43) = 1.23$	.23	.34
	FR Test	53% (13)	53% (8)	$t(42) =.14$	.89	0
	FR Exam	72% (15)	71% (12)	$t(41) =.16$	.87	.07
CHEM	MC Quiz*	77% (27)	74% (24)	$t(137) =.63$	.53	.12
INFO	MC Exam*	91% (9)	89% (6)	$t(59) =.75$	.46	.26
PSYC	MC Quiz*	88% (7)	84% (8)	$t(52) = 2.58$	.05	.53
	MC Exam*	84% (10)	77% (12)	$t(53) = 2.02$	.05	.63
SOCY	MC Exam*	77% (11)	71% (13)	$t(128) = 2.50$	.01	.50

Note. Online assessments are marked with an asterisk. Standard deviations are reported in parentheses.

Five classes included homework assignments. Average homework grades are reported as a function of URM and Transfer status in Tables 8 and 9. Significant differences with moderate effect sizes were observed in SOCY in which non-URM students received higher homework (reading response) grades (78%) than URM students (72%), $t(103) = 2.24$, $p = .03$, $d = .37$ and non-transfer students received higher homework (reading response) grades (80%) than transfer students (72%), $t(129) = 2.87$, $p = .01$, $d = .52$.

Three classes included writing assignments. Average writing grades are reported as a function of URM and Transfer status in Tables 10 and 11. Significant differences with moderate to large effect sizes were observed. In COMM non-URM students received higher in-class writing grades (88%) than URM students (80%), $t(134) = 2.79$, $p = .01$, $d = .43$. In SOCY

Table 8
Non-URM and URM Student Homework Grades Reported as Percentages with Corresponding t-Tests

Class	Assignment	Non-URM	URM	t-test	*p*	Cohen's *d*
MATH	Problem Sets	77% (23)	76% (23)	*t*(99)=.18	.78	.04
ACCT	Problem Sets	71% (22)	69% (27)	*t*(48)=.21	.84	.20
ENGR	Problem Sets	70% (21)	60% (17)	*t*(40)=1.24	.22	.52
INFO	Programming	91% (16)	81% (23)	*t*(58) = 1.87	.07	.51
SOCY	Reading Responses	78% (11)	72% (20)	*t*(103) = 2.24	.03	.37

Note. Standard deviations are reported in parentheses.

Table 9
Non-Transfer and Transfer Student Homework Grades Reported as Percentages with Corresponding t-Tests

Class	Assignment	Non-Transfer	Transfer	t-test	*p*	Cohen's *d*
MATH	Problem Sets	76% (24)	76% (21)	*t*(105)=.04	.78	0
ACCT	Problem Sets	74% (16)	67% (30)	*t*(51)=1.11	.27	.29
ENGR	Problem Sets	69% (18)	67% (24)	*t*(43) = .40	.69	.09
INFO	Programming	90% (20)	86% (15)	*t*(59) =.59	.56	.23
SOCY	Reading Responses	80% (15)	72% (16)	*t*(129) = 2.87	.01	.52

Note. Standard deviations are reported in parentheses.

Table 10
Non-URM and URM Student Writing Grades Reported as Percentages with Corresponding t-Tests

Non-URM and URM Student Writing Grades in Percentages with Corresponding t-Tests

Class	Assignment	Non-URM	URM	t-test	*p*	Cohen's *d*
COMM	In Class	88% (13)	80% (23)	*t*(134) = 2.79	.01	.43
CHEM	Lab Report	80% (19)	75% (21)	*t*(139)=1.35	.18	.25
SOCY	Essay	82% (7)	78% (13)	*t*(93) = 2.07	.04	.38

Note. Standard deviations are reported in parentheses.

non-URM students received higher essay grades (82%) than URM students (78%), $t(93) = 2.07$, $p = .04$, $d = .38$, and non-transfer students received higher essay grades (84%) than transfer students (77%), $t(125) = 3.95$, $p = .00$, $d = .74$.

Three classes included other forms of assignments: a group project, in-class activities, and an oral report. Average assignment grades are reported as a function of URM and Transfer status in Tables 12 and 13. A significant difference with a moderate effect size was observed in INFO in which non-URM students received higher in-class activity grades (83%) than URM students (70%), $t(58) = 2.16$, $p = .04$, $d = .60$.

Table 11
Non-URM and URM Student Writing Grades Reported as Percentages with Corresponding t-Tests

Class	Assignment	Non-transfer	Transfer	t-test	*p*	Cohen's *d*
COMM	In Class	85% (15)	85% (16)	$t(144)=.22$	.82	0
CHEM	Lab Report	80% (18)	77% (18)	$t(137)=1.03$	.31	.17
SOCY	Essay	84% (6)	77% (12)	$t(125) = 3.95$	.00	.74

Note. Standard deviations are reported in parentheses.

Table 12
Non-URM and URM Assignment Grades Reported as Percentages with Corresponding t-Tests

Class	Assignment	Non-URM	URM	t-test	*p*	Cohen's *d*
ACCT	Group Project	86% (9)	91% (9)	$t(48) = 1.90$	.06	.56
INFO	Class Activities	83% (20)	70% (23)	$t(58) = 2.16$	.04	.60
PSYC	Oral Report	97% (12)	94% (11)	$t(49) = .73$	.47	.26

Note. Standard deviations are reported in parentheses.

Table 13
Non-transfer and Transfer Student Assignment Grades Reported as Percentages with Corresponding t-Tests

Class	Assignment	Non-transfer	Transfer	t-test	*p*	Cohen's *d*
ACCT	Group Project	86% (12)	89% (8)	$t(51)=1.05$	.30	.29
INFO	Class Activities	81% (23)	80% (15)	$t(59) =.12$	.90	.05
PSYC	Oral Report	93% (16)	96% (10)	$t(53) =.82$	.93	.23

Note. Standard deviations are reported in parentheses.

Discussion

We began this work with the goal of demonstrating the importance of disaggregating assignment and final grades as a first step towards identifying patterns of performance in different student populations. We investigated whether certain assignments were associated with grade distributions in which URM or transfer students received lower grades than non-URM or non-transfer students. Both URM students and transfer students have been shown to be underserved by institutions of higher education (Bensimon, 2005; Nuñez & Yoshimi, 2017). We hypothesized that differing grade distributions in which students from underserved groups receive lower grades than those from other groups are evidence of educational equity gaps. Further, we hypothesized that examining assignments with uneven distributions of grades will engage faculty in a culture of equity in which changes to assignment design might be a route to improving equity in educational attainment.

We found a great deal of variability in the patterns of performance that emerged from final grades and individual assignment grades. In four of the eight classes, different patterns of performance emerged across individual assignments and final grades. These results support the importance of considering patterns of performance on assignments to clarify and address educational equity gaps. In every class, we found URM students received lower final grades than non-URM students and transfer students received lower final grades than non-transfer students. There were several instances in which these differences had moderate effect sizes despite not reaching conventional levels of significance. Strikingly, of the 27 assignments analyzed across eight classes, non-URM students received higher average grades than URM students in 23 assignments (85%), and non-transfer students received higher average grades than transfer students in 21 assignments (78%). For both URM and transfer students, significant differences were observed in six assignments (22%).

Structuring assignments so that content is equally familiar to all students reduces educational equity gaps by limiting the effects of prior knowledge and privilege.

Given the prevalence of assignment grade distributions that favored students from well-served groups over students from underserved groups, it is likely that small, non-significant, grade differences across several assignments did contribute to significant differences in final grades. Accordingly, we believe that even non-significant grade differences should be considered by faculty who are interested in improving equity in their classes. Additionally, we posit that inequitable patterns of assignment grades matter even in instances in which these grades do not contribute to low final grades. Low assignment grades matter because assignment grades provide students with information about how they are viewed by faculty in a discipline (Singer-Freeman & Bastone, 2019b). Low grades communicate a lack of success, which may become part of the student's academic sense of self, reducing feelings of academic self-efficacy and the student's sense of belonging. A diminishment in any of these areas can reduce persistence within a major or within an institution (Chemers et al., 2001; Han et al., 2017; Shen et al., 2016; Singer-Freeman & Bastone, 2019a, 2019b; Singer-Freeman et al., 2019).

There are several methods for creating equitable assessments. One is to accept that the transmission of knowledge is not a neutral activity (Montenegro & Jankowski, 2020) and consider positionality and agency at each phase of the assessment cycle (Heiser et al., 2017). Life experiences, privilege, and biases can influence the types of questions that are asked, what is viewed as a correct response, and the types of assessment methodologies that are selected. Each of these factors can contribute to educational equity gaps (Cumming & Dickson, 2007; Stowell, 2004). Montenegro and Jankowski (2017; 2020) suggest that when instructors dictate how students will demonstrate learning, it privileges certain types of learning over others. They encourage adopting differentiated assignments to allow students to select assignment structures that best demonstrate their mastery. Although providing students with a choice of assignments may be an effective way to increase equity, it can be impractical and make uniform grading difficult (Singer-Freeman et al., 2019, 2021).

Other approaches to increasing equity in assignments have examined ways specific forms of assessment might misrepresent the abilities of certain student groups (Sleeter, 2004) or be culturally inappropriate to underserved students (Cahill et al., 2004). We and others have begun to explore whether specific features of assignments might increase or reduce equity gaps (Harackiewicz et al., 2015; Singer-Freeman & Bastone, 2018, 2019a, 2019b, 2021;

Singer-Freeman et al., 2019, 2021; Steele & Aronson, 1995; Stiggins & Chappuis, 2005). In our work, we found that assignments often vary along two dimensions: utility value and inclusive content (Singer-Freeman et al., 2019). Utility value describes the extent to which students perceive work to have value (Eccles et al., 1983). Assignments can be professionally, academically, or personally useful. Experimental and applied work have established that increasing the utility value of assignments reduces educational equity gaps (Harackiewicz et al., 2015; Singer-Freeman & Bastone, 2019a, 2021; Singer-Freeman et al., 2019; 2021). Inclusive content describes material that is equally accessible to all students (Gay, 2010). If examples are drawn from the dominant culture, they are less accessible to students from other cultures. Structuring assignments so that content is equally familiar to all students reduces educational equity gaps by limiting the effects of prior knowledge and privilege. Providing clear and detailed instructions and grading rubrics makes content more inclusive by eliminating the benefits of prior preparation from other classes (Gay, 2010; Singer-Freeman et al., 2019, 2021). We hypothesize that increasing assignments' perceived utility value and inclusive content has the potential and power to mitigate equity gaps.

Improving equity requires faculty engagement in a culture of inquiry in which the examination of data informs responses to inequities (Bensimon, 2005; Maki, 2017). We believe the data presented in this paper are an example of the kinds of data that can be shared with faculty and students as a starting place for conversations about increasing equity in classes. As faculty review patterns of equity and inequity at the assignment level and discuss their assignments with students, they will be able to make informed changes to assignments that will increase equity. In some instances, assignments that evoke equity gaps may examine similar competencies as alternative assignments that do not evoke inequity. In these cases, faculty might consider replacing assignments that result in equity gaps with more equitable methods of assessment. In other instances, assignments that result in equity gaps may be revealing incomplete mastery of an essential learning outcome. In these cases, it might be important to consider whether all students have equal access to educational resources and prior learning. For example, if transfer students are struggling to demonstrate mastery in an area, it might be worth considering whether the course is assuming levels of prior preparation that transfer students may lack.

Limitations and Future Directions

There were some limitations of the current work. Because this work was exploratory, we did not discuss the assignments with either students or faculty. Having relied on class syllabi and materials available in the learning management system to classify assessments, we cannot know the extent to which students viewed the assignments as being high in inclusive content or utility value and how those perceptions might have impacted student performance. Having established the importance of disaggregating assignment grades in this work, we are currently working directly with students to examine whether their views of assessments predict equity gaps. Because we did not partner with faculty, we cannot establish if the assessments with equity gaps were evaluating the same learning as assessments without equity gaps.

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Finally, we did not evaluate the long-term effects of equity gaps on students. There is evidence of completion gaps in higher education (Shapiro et al., 2018). In future work, it will be important to examine how academic self-efficacy, identity, and sense of belonging are impacted by low assignment grades and whether low course and assignment grades increase the likelihood students will leave a major or fail to complete a degree.

Conclusion

The current work found frequent equity gaps for both URM and transfer students. Importantly, equity gaps appeared to be more common in multiple-choice tests and formal writing than in other assignment types. Because patterns of equity gaps differed between final course grades and individual assignment grades, faculty should consider disaggregating grades on individual assignments. Because patterns of equity gaps varied within assignment types, future research should investigate whether specific features of assignments such as utility value and inclusive content influence the size of equity gaps. We believe that assessment professionals play a critical role in this work. Encouraging the disaggregation of student

outcomes data can be the first step toward establishing a culture of inquiry in which faculty, students, and assessment professionals explore how assignments are contributing to inequities in higher education. These considerations can direct learning improvements that are sensitive to the needs of every student rather than the needs of the average student.

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