The Relationships between Gender and Graduation Rates, Dissertation Methodology, GPA, and GRE Scores for Ed.D. Graduates at a Southeastern University

Jill Channing
East Tennessee State University

Sandra Lampley
University of Alabama in Huntsville

James Lampley
East Tennessee State University

This quantitative study of one doctoral department at a regional, state-supported university located in the Southeastern United States used descriptive, parametric, and non-parametric methods to determine the relationships between gender and each of the academic or graduation factors. Graduation rates were analyzed for doctoral students admitted from 2004 to 2019. Alumni data from 2004 to 2013 were analyzed for the other variables in the study to examine the transition from face-to-face to online instruction. Five hundred thirty educational leadership Ed.D. alumni were included in the study. Chi-square analyses, using crosstabs and independent samples t tests, were used to determine relationships between the test variables and gender. There were no significant differences between graduation rates, GRE scores, type of dissertation completed, area of concentration, GPAs, number of dissertation hours, or dissertation semesters to completion between female and male doctoral students for any of the variables. Female and male doctoral graduates displayed remarkably similar values on all the variables in the study. Implications for this study include graduate programs providing online options for students to increase students' access and program flexibility, actively recruiting male students to increase diversity in the programs that have low male enrollment, considering alternative admission criteria such as work and leadership experience, and striving for parity in exposure to male and female professors.

Keywords: Gender and graduate students; gender and GRE; doctoral program persistence; doctoral program completion; gender and dissertation methodology

Gender stereotypes consist of social roles encompassing various behaviors and attitudes generally considered acceptable, appropriate, or desirable for a person based on that person's biological or perceived sex. Issues arise due to gender being a limiting factor because of how particular genders are viewed and the expected responsibilities based on societal norms. Though this stereotyping can be observed in many facets of life, it is especially prominent in academic settings. These stereotypes can include strengths in a subject, expected education levels, or a general level of achievement or intelligence, for example. These views are limiting to individuals due to their implications of what one's strengths should be compared to what they actually are. The purpose of this non-experimental, quantitative study was to examine the relationships between gender and graduation rates, dissertation methodologies, GPAs, and GRE scores of Ed.D. graduates at a Southeastern University.

There are gender differences in graduation rates at all points along the high school to college to graduate school pipeline (National Center for Education Statistics, 2021). According to the National Center for Educational Statistics (NCES) report on the adjusted cohort graduation rate (ACGR), tracking on-time graduation, states' graduation rate for the 2018-2019 year ranged from 69 to 92%, with a national mean of approximately 86% (Irving et al., 2022). In 2020, the estimated dropout rate was higher for male students (6.2%) than for female students (4.4%).

Among recent high school graduates ages 16 to 24, nearly 15% more females than males matriculate into post-secondary institutions (Bureau of Labor Statistics, 2022). According to estimates, women received approximately 57.5% of the bachelor's degrees awarded in the U.S. Graduate schools exhibited the same trend (American Council on Education, 2016). The most recent national data reports that females received approximately 61.4% of the master's degrees and over half of the doctoral degrees (55.2%). Table 1 displays the four degree areas as of the 2019-20 school year (NCES, 2021).

Table 1

U.S. Graduates of Associate's, Bachelor's, Master's, and Doctoral Programs in 2019-20

	Females	% of Total	Males	% of Total	Total
Associate's Degree	625,154	61.4	393,079	38.6	1,018,233
Bachelor's Degree	1,177,168	57.7	861,263	42.3	2,038,431
Master's Degree	517,785	61.4	325,664	38.6	843,449
Doctoral Degree	104,953	55.2	85,225	44.8	190,178

Note. Source: NCES, 2021

Over the past 40 years, females have matched or outpaced males at every postsecondary level. Nationally, females have earned at least half of all associate's, bachelor's, and master's degrees since the 1981-82 school year (NCES, 2021). As of 2005, females have also earned at least half of all doctoral degrees. As of the first quarter of 2019, 29.5 million women in the labor force had at least a bachelor's degree, effectively matching the number of college-educated men (29.3 million) in the workforce (Pew Research, 2019). Doctorates earned in selected fields of

study for the 2018-19 school year and the percent of females and males in each field are presented in Table 2.

Table 2
Survey of Earned Doctorates in the U.S.: Percent of Females in 2018

Subfield of study	Total	Male	Female	% Female
All Fields	55,195	29,798	25,368	46.0
Life Sciences	12,780	5,659	7,114	55.7
Physical Sciences and Earth Sciences	6,335	4,214	2,118	33.4
Mathematics and Computer Sciences	4,030	3,043	983	24.4
Psychology and Social Sciences	8,899	3,641	5,256	59.1
Engineering	10,183	7,726	2,453	24.1
Education	4,834	1,496	3,337	69.0
Humanities and Arts	5,145	2,567	2,575	50.0
Business Management and Administration	1,481	869	609	41.1

Note. Source: National Center for Science and Engineering Statistics, Survey of Earned Doctorates

Literature Review

Likely the most studied construct in graduate admissions (Woo et al., 2023), the GRE's predictive validity on doctoral students' performance and degree completion has yielded studies that present varying results. In a meta-analysis of 100 studies, including 10,000 students, on the GRE's use to predict graduate students' academic performance, Kuncel et al. (2010) Few studies have focused on the predictive validity of GRE scores in doctoral programs across disciplines. For example, Lightfoot and Doerner (2008) studied 70 doctoral criminology and criminal justice students from 1991 to 2000, finding that the students with lower GRE scores tended to take longer to graduate. Interestingly, students in this program with lower GRE scores were likelier to complete the program than those with higher scores. Despite low scores, these students are still motivated to accomplish their goals. Stock et al. (2011) found that economics doctoral students' quantitative GRE scores were related to degree completion. Like Lightfoot and Doerner (2008), Stock et al. found that GRE scores better predict whether a degree would be completed rather than accurately gauging the time to completion. This finding further suggests that graduate students often possess the appropriate motivation to earn degrees, although their times to completion vary. Malone et al. (2004) studied 168 education doctoral students, finding that the GRE predicted student success. Their analysis demonstrated that students who completed the program had higher program GPAs and overall GRE scores. However, those who did not persist

in the program had higher undergraduate GPAs and quantitative GRE scores than those who did persist and complete the program. Rockinson-Szapkiw et al.'s (2014) study of an online education doctoral program found that students' methodology choice and GRE writing scores were the strongest predictors of time to completion. These factors illustrated the students' ability to develop a dissertation project, which requires significant writing ability and persistence. Further, the research on the GRE's predictive validity suggests that graduate student applicants are a self-selected group of individuals who tend to perform well academically.

However, not all studies suggest a correlation between GRE success and subsequent success in graduate programs. In the communication field, GRE scores were not related to success factors. Feeley et al. (2005) studied 48 communication doctoral students between 1990 to 2000, finding that their verbal GRE scores were not significantly related to GPA, and overall GRE scores did not relate to degree completion. Katz et al. (2009) examined a doctoral nursing program, finding no significant correlation between GRE scores and students' GPAs. Due to the GRE being a standardized test covering multiple topics, it differs significantly from students' success in their area of study reflected by their GPAs.

Researchers have also studied gender's role in graduate students' success, persistence, and completion. Researchers found a gap between men's and women's performances on the quantitative section of the GRE (Bleske-Rechek & Browne, 2014; Herzog, 2011). According to Educational Testing Service (2022) data from GRE test takers from July 2020 to June 2021, men's mean Verbal Reasoning and Quantitative Reasoning scores were higher than women's, and women's mean Analytical Writing score was slightly higher than men's mean score. Tock and Anders Ericsson (2019) hypothesized that the gender differences in quantitative and verbal GRE scores are partly due to curricular choices related to gender bias. In other words, men tend to have curricular emphases in mathematics, and women tend to have curricular emphases in verbal disciplines.

The reasons for these curricular emphases could be related to stereotype threat rather than any inherent preference for one discipline over the other. Steele and Aronson (1995) developed the theory of stereotype threat—that the threat of a stereotype would have effects, sometimes adverse, on the individual. Steele and Aronson found that

> making African American participants vulnerable to judgment by negative stereotypes about their group's intellectual ability depressed their standardized test performance relative to White participants, while conditions designed to alleviate this threat, improved their performance, equating the two groups once their differences in SATs were controlled. (p. 808)

Spencer et al. (1999) were the first to study gender stereotype threats' effects on women's mathematics performance. They conducted studies at elite American colleges and universities, selected participants who were good at mathematics, and consistently found that women scored lower when they were told that there were gender differences on the tests. When researchers told women study participants that the tests did not produce gender differences, the women's performances improved. Stereotype threat theory is an accepted theory and demonstrates that unsupported assumptions of individuals can hinder or aid their academic performance. Researchers have tested the effects of stereotypes on women's performance on standardized tests, finding that stereotypes particularly impaired women's performance on mathematics tests (Picho et al., 2013; Pronin et al., 2004; Shapiro & Williams, 2012; Tsui et al., 2016). Mathematics

is a common subject in which gender stereotypes are prominent. Often this is enforced through peers' and instructors' comments or the male-dominated student and faculty populations in many mathematics courses.

Although stereotype threat has been established as influencing women in their academic pursuits, the impact of gender on doctoral program completion is negligible (Seagram et al., 1998; Spronken-Smith et al., 2018). Nevertheless, other studies suggest that gender influences outcomes for female graduate students. For example, studies have shown significantly higher publication output among male graduate students (Feldon et al., 2017; Pezzoni et al., 2016). Similarly, Seagram et al. (1998) found higher satisfaction and more collaborative research with faculty among men than women. Women tend to perform better in graduate programs with significant numbers of female professors. For example, Main (2018) explained that female doctoral students are more likely to complete degrees at institutions with higher proportions of female faculty. This phenomenon, explained by Kanter's theory of proportions, suggests that having a gender balance in faculty composition could address disparities in doctoral program completion (Main, 2018).

There is evidence for higher engagement in qualitative research for women than men. After assessing several journals, Plowman and Smith (2011) found an over-representation of women and an under-representation of men as authors of qualitative studies. Information processing theory has been used to explain this trend, implying that females possess inherent informational processing skills or are socialized to have such skills, making them better qualitative researchers. This is not meant to imply a lack of ability in quantitative research in a population; instead, there was limited exposure to this approach as they progressed through their education. The social identity perspective also supposes that women are likely to engage in quantitative research because they have mentors who guide them to engage in qualitative methods. The third explanation of this phenomenon lies in the "separate versus connected knowing," supposing that women are more likely to lean towards connected knowing. Connected knowing focuses on sensitivity to other people and emotions, while separate knowing focuses on objectivity without including one's emotions (Plowman & Smith, 2011).

With the online component now being an integral part of higher education and online programs being in more demand now than they have been before (Black et al., 2019; Fuller et al., 2014; Morris et al., 2020; Xu & Xu, 2019), researchers have begun to research the role of gender in graduate student success and persistence. For example, Cross (2014) found that women who were online graduate students tended to be more "gritty," defined as "passion and persistence for long-term goals" (p. 1), and the higher levels of grit in women correlated with higher GPAs in their graduate programs (Aswini & Deb, 2017; Cross, 2014). Researchers have studied motherhood's effect on women's attrition and time-to-completion rates, finding that childrearing duties often influence women's decisions to remain in graduate programs and abilities to complete their programs in a timely fashion (Kulp, 2016; Lynch, 2008; Palermo-Kielb, 2020; Theisen et al., 2018). However, the research on gender and persistence is not consistent. Studies have found that there are no statistically significant differences in persistence between men and women in online graduate programs (Muljana & Luo, 2019; Rotar, 2022; Yukselturk & Top, 2013), while other researchers found higher attrition rates for women than men in online graduate programs (Waugh & Searle, 2014; Yasmin, 2013).

The overall estimated dropout rate for doctoral students is 50% or greater (Bowen & Rudenstine, 1992; Castelló et al., 2017; Litalien & Guay, 2015; Wollast et al., 2018). While there is no nationwide data on attrition in online doctoral programs specifically, some researchers have estimated that attrition is much higher, up to 20% higher, for these programs than the typically cited 50% attrition rate for doctoral programs overall (Angelino et al., 2007; Bawa, 2016; Ivankova & Stick, 2007). Doctoral students reported that relationships and interactions with faculty members presented the most significant challenges, often leading to attrition (Cusworth, 2001; Columbaro, 2009; Hoskins & Goldberg, 2005; Roumell & Bollinger, 2017). Online doctoral education presents additional challenges such as isolation (Ames, 2018; Yuan & Kim, 2014), lack of support (Devos et al., 2017; Erichsen et al., 2014; Kennedy & Gray, 2016), and difficulty with technology (Angelino et al., 2007; Lee et al., 2022; Lim et al., 2019; Patterson & McFadden, 2009).

Research Questions

This study was guided by the following research questions: (1) Is there a significant relationship between Ed.D. leadership students' graduation rates and gender? (2) Is there a significant relationship between Ed.D. leadership students' dissertation methodology and gender? (3) Is there a significant relationship between Ed.D. leadership students' program concentration and gender? (4) Is there a significant relationship between Ed.D. leadership students' GRE scores and gender? (5) Is there a significant relationship between Ed.D. leadership students' GPA and gender? (6) Is there a significant relationship between Ed.D. leadership students' number of dissertation hours and gender? (7) Is there a significant relationship between Ed.D. leadership students' number of semesters in dissertation hours to completion and gender? (8) How did the transition to an online program affect students' completion?

Methodology

The purpose of this quantitative case study of one doctoral educational leadership department at a regional, state-supported university was to use descriptive, parametric, and non-parametric methods to determine the relationship of several academic and graduation factors to gender. Graduation rates were analyzed for doctoral students admitted from 2004 to 2019. Alumni data from 2004 to 2013 were analyzed for the other variables in the study to examine the transition from face-to-face to online instruction. Five hundred thirty educational leadership Ed.D. alumni were included in the study. Chi-square analyses, using crosstabs, and t tests, were used to determine relationships between the test variables and gender. We used IBM SPSS Version 28 to conduct our analyses of a de-identified dataset from the university's alumni database.

The target department has been awarding Ed.D. degrees since 1972. During the program's first two years, the graduates were 100% male. The first female doctoral student graduated from the department in 1974. Male graduates continued to outnumber female graduates throughout the 1970s. By the close of the 1970s, females were approaching equality in the number of graduates (1979 graduates = 42% female). However, in 1980 female graduates out-numbered male graduates for the first time. In the following 39 years (1980-2019), female graduates have outnumbered male graduates each year. From 2004 to 2019, females comprised

65.7% of the Ed.D. graduates, and for the most recent 3-year period (2017-2019), the percentage of female graduates has been 55%, 63%, and 67%, respectively (see Table 3).

We recognize that this study has limitations and delimitations. First, we categorize gender into only two constructs—male or female. Participants in this study self-identified as either male or female on applications. Participant self-identification and social constructions of the gender binary are the reasons for the binary indications of gender in this study. We recognize that future studies may include people of diverse genders. Second, participants were selected from previous date ranges to include students who had completed, dropped out, or were currently enrolled. The date range of 2004-2013 was used to examine the period during which the program transitioned to a completely online program. Last, this study represents a case study of one doctoral educational leadership program in the Southeastern United States and may not be generalizable to other institution's programs.

Table 3
Ed.D. Degrees Awarded (2004-2019): Percent of Total by Gender

Ed.D. Graduates	N	Percent of Total
Female Graduates	348	65.7%
Male Graduates	182	34.3%
Total	530	100.0%

Findings

The first three analyses were conducted using a two-way contingency table analysis using crosstabs. We evaluated whether a statistical relationship existed between two nominal-level variables in each case.

For Research Question 1, a two-way contingency table analysis was conducted to evaluate the relationship between gender and graduation for Ed.D. alumni. The two variables were graduation with two levels (yes or no) and gender with two levels (male or female). Graduation and gender were found not to be significantly related, Pearson $\chi2(1, N = 486) = .33$, $p = .567$. Cramer's V = .03. The analysis indicated no relationship between graduation and gender. However, female doctoral students graduated at a slightly higher rate than their male counterparts (see Table 4).

Table 4
Female-Male Representation in the Ed.D. Program (2004-2013)

Admitted Total [a]	Females (%)	Males (%)	Graduated Total	Females (%)	Males (%)	Withdrew Total	Female (%)	Males (%)
487	323 (66.3)	164 (33.7)	329	221 (67.2)	108 (32.8)	158	102 (64.6)	56 (35.4)

[a] 10 Students that are still active were included in the total

The overall graduation rate for the Ed.D. program in Educational Leadership at the participating university was 67.6% during this period (2004-13). The graduation rate for females was 68.4%, and the graduation rate for males was 65.9%. The national graduation rate is about 50.0% for all doctoral programs (NCES, 2019).

For Research Question 2, a two-way contingency table analysis was conducted to evaluate the relationship between gender and type of dissertation for Ed.D. alumni. The two variables were gender with two levels (male and female) and type of dissertation with two levels (quantitative or qualitative). Gender and type of dissertation were found not to be significantly related, Pearson $\chi2$ (1, N = 94) = .04, p = .847. Cramer's V = .07. The analysis indicated that there was not a significant relationship between gender and type of dissertation. The number and types of dissertation by gender are displayed in Table 5.

Table 5
Dissertation Type by Gender (2017-2019)

	Female	Male	All Graduates
Type of Dissertation	N (%)	N (%)	N (%)
Quantitative	43 (75.4)	28 (73.7)	71 (67.2)
Qualitative	14 (24.6)	10 (26.3)	24 (26.4)
Totals	57 (100.0)	38 (100.0)	95 (100.0)

For Research Question 3, a two-way contingency table analysis was conducted to evaluate the relationship between gender and areas of concentration for Ed.D. alumni. The two variables were gender with two levels (male and female) and areas of concentration with three levels (Higher Education Leadership, School Leadership, or Administrative Endorsement). Gender and areas of concentration were not found to be significantly related, Pearson $\chi2$ (2, N = 137) = 6.63, p = .085. Cramer's V = .22. The analysis indicated no relationship between gender and areas of concentration. Because the overall analysis was not significant (p = .085) no follow up was conducted. The totals are presented in Table 6.

Table 6
Ed.D. Concentration by Gender (Current Students)

	Female	Male	Total
	N (% within Concentration)	N (% within Concentration)	N

Higher Education Leadership	73 (66.4)	37 (33.6)	110
School Leadership	38 (67.9)	18 (32.1)	56
Administrative Endorsement	27 (77.1)	8 (22.9)	35
Overall	138 (68.7)	63 (31.3)	201

We analyzed the data using independent samples t tests for Research Questions 4 - 7. For Research Question 4, we compared GRE scores (verbal, quantitative, and analytical writing) between current female and male and recently graduated female and male doctoral students, and there were no significant differences in verbal scores ($p = .587$), quantitative scores ($p = .729$) or analytical writing scores ($p = .056$) for students that graduated in the previous three years and similar results, no statistical differences, for currents students in verbal scores ($p = .249$), quantitative scores ($p = .241$), and analytical writing ($p = .181$) scores. Female and male Ed.D. students, both current and recently graduated, had very similar scores on all three sections of the GRE.

For Research Question 5, we compared final doctoral program GPA to gender. The analysis revealed no significant difference in final GPA between male and female doctoral students ($p = (.051)$). However, females did have a slightly higher GPA (3.92) than males (3.87). For Research Question 6 and 7, the analyses displayed no significant difference in number of hours in dissertation (p = .666), and number of semesters in dissertation hours ($p = .925$). Females registered for 17.1 hours of dissertation work and males for 17.8 and females registered for 4.1 semesters of dissertation work and males 4.2 semesters.

Table 7

GPAs, Dissertation Hours, and Dissertation Semesters by Gender

Variable	Gender	N	M	SD
GPA	Male	35	3.868	.14
	Female	52	3.921	.16
Dissertation Hours	Male	35	17.80	7.37
	Female	52	17.10	7.48
Dissertation Semesters	Male	35	4.17	2.33
	Female	52	4.12	2.94

For Research Question 8, we evaluated graduation rates by gender for three-year periods, during the years that the department transitioned from 100% face-to-face (F2F) to 100% online. From 2001 to 2003 all Ed.D. classes were taught F2F and the graduation rate was about 67% for females and 59% for males. In 2007 to 2009 the program was taught with a mixture of online and

F2F classes. The graduation rates for females and males was 68% and 70% respectively. For the period from 2011 to 2013 the graduation rate was over 70% for females and over 71% for males. Online instruction seems to have benefited female Ed.D. students substantially but remarkably so for male students (59% to 71%). See Table 8 for a complete list.

Table 8
Graduation Rates by Gender During Program Transition

2001-03 F2F Delivery	2007-09 Mixed Delivery	2011-13 Online Delivery
All Students	All Students	All Students
73/114	116/169	107/150
64.0%	68.7%	71.3%
Females	Females	Females
50/75	77/113	69/98
66.7%	68.1%	70.4%
Males	Males	Males
23/39	39/56	38/52
59.0%	69.6%	73.1%

Discussion

As a result of this study, the following conclusions were drawn. From 2004 to 2019, the ratio of females to males admitted to the program was 323/164 (66.3% female). During the same period, the ratio of female to male graduates from the program was 221/108 (67.2% female). The percentage of applicants admitted to the Ed.D. program was identical for males and females (93.0%). Therefore, the large difference in the proportion of females to males graduating from the Ed.D. program was because fewer males were applying for admission.

There was no significant difference (p = .567) in the study's graduation rate between male and female Ed.D. graduates, which aligns with some literature on gender and its influences on doctoral program graduation (Seagram et al., 1998; Spronken-Smith et al., 2018). Additionally, no significant relationship (p = .085) was found when areas of concentration (Higher Education Leadership, School Leadership, and Administrative Endorsement) were compared to gender. Doctoral students were graduating from the different concentrations at similar rates for females and males.

In addition, there was no significant relationship (p = .847) between dissertation methodology (quantitative or qualitative) and the gender of Ed.D. graduates. Females (75%) were slightly more likely than males (74%) to complete quantitative dissertations. However, males (26%) were slightly more likely than females to complete qualitative dissertations (25%). This finding does not align with previous research that suggested that women tend to engage in qualitative research, and men tend to engage in quantitative research (Plowman & Smith, 2011). However, it does align with Rockinson-Szapkiw's (2014) findings that there was no significant difference between GRE scores and dissertation methodology choice.

The independent sample t tests revealed that there were no significant differences in verbal scores (p = .587), quantitative scores (p = .729), or analytical writing scores (p = .056)

between students who graduated in the previous three years and current students. Similarly, there were no statistically significant differences in verbal scores (p = .249), quantitative scores (p = .241), or analytical writing scores (p = .181) between the two groups. Females displayed only slightly higher mean scores for verbal (+.78 point), quantitative (+.34 point), and analytical writing (+.34 point) than males. This finding does not align with recent Educational Testing Service (2022) data, finding that males have slightly higher mean scores on quantitative and qualitative sections of the GRE. This study's male and female students had nearly equivalent mean GRE scores. This program does not have GRE cut-off scores for acceptance, so this phenomenon cannot simplistically be attributed to a cut-off score.

Three academic variables (GPA, dissertation hours, and dissertation semesters) were analyzed to determine if there were differences between female and male doctoral graduates. No significant difference (p = .857) was found between females and males for any of the analyses. In fact, female (3.843) and male (3.873) graduates displayed very similar GPAs, similar numbers of dissertation hours (females = 20.65 semester hours and male graduates = 20.00 semester hours), and slightly variable numbers of dissertation semesters (females = 5.06 semesters and males = 4.15 semesters).

During the transition from a F2F to online delivery in the Ed.D. program, it was interesting to note that female students' graduation rate increased slightly from 67% in 2001-2003 to 68% in 2007-2009 and to 70% in 2011-2013. At the same time, the graduation rate for males increased remarkably from 59% (2001-2003) to 70% (2007-2009) and 71% (2011-2013). For the doctoral students admitted from 2004 to 2013, 67.6% of all students graduated within a seven-year enrollment window. However, there was a slight difference between the graduation rate of females (68.4%) and males (65.1%). These results suggest a successful migration from F2F instruction to online instruction, with faculty providing appropriate online instruction, enabling students to complete dissertation projects effectively and efficiently.

Implications for Further Research and Practice

This study provides an example of gender parity related to several student success variables. These results contrast previous research that suggested that women tend to choose qualitative methods and men tend to choose quantitative methods, as well as research that suggested that men have higher GRE scores than women. Further research could seek to understand better the reasons for this program's gender equality in terms of persistence, success, and completion rates, as well as for higher male graduation rates after the transition to online delivery and reasons. Qualitative approaches, such as focus groups, could shed light on these issues and provide implications for practice for other doctoral programs seeking gender parity in student persistence and completion rates. Further research should explore why fewer males are applying to the Ed.D. program. Identifying any barriers or challenges preventing male students from pursuing doctoral education is essential. The finding that females were slightly more likely to complete quantitative dissertations and males were slightly more likely to complete qualitative dissertations highlights the need for further research into dissertation methodology preferences and factors that influence these preferences.

This study's results suggest many important implications for graduate educational leadership programs. Success and completion rates increased when the program transitioned to

online delivery. Although some research has indicated that online graduate program delivery is associated with lower student success rates than face-to-face delivery (Angelino et al., 2007; Bawa, 2016; Ivankova & Stick, 2007), the opposite was true in this case. Online cohorts in this study performed better and completed degrees at a higher rate than face-to-face cohorts did, suggesting that online doctoral program delivery has the potential to assist graduate students succeed and persist. Male student completion increased sharply when the program transitioned to the online format--from 59% (2001-2003) to 71% (2011-2013). Possible reasons for this are increased access to materials and faculty members, as well as course and assignment flexibility, which align with adult and working students' needs. The successful transition from face-to-face to online instruction suggests that online delivery can be an effective way to deliver doctoral education and can offer a supportive environment to all students. Institutions offering Ed.D. programs may consider offering online options to attract students who may not be able to attend on-campus programs. Additionally, institutions should provide appropriate support and resources to ensure that students can complete their dissertation projects effectively and efficiently in an online environment.

Further practical implications for institutions offering Ed.D. programs include actively recruiting male students to increase diversity in the programs that have low male enrollment. This may involve outreach efforts to undergraduate and master's degree programs and offering targeted support for students during the application process. Consistent and careful faculty mentoring can also assist programs in retraining students, particularly male students (Bukko et al., 2019).

The finding that there were no significant differences in GRE scores between male and female graduates suggests that the GRE is an effective measure for graduate admissions. However, admission decisions should not be based solely on GRE scores. Institutions may want to consider alternative measures of potential success, such as past academic performance and work and leadership experience.

Further, the finding that there was no significant difference in graduation rates between male and female graduates suggests that gender is not a significant factor in doctoral program completion at this site. During the last 20 years, this program's faculty composition was approximately 50% male and 50% female. Exposure to male and female professors may benefit students and reduce stereotype threat, leading to gender parity regarding student methodology selection, persistence, success, and completion.

References

American Council on Education. (2016, January 15). *New report looks at the status of women in higher education.* https://www.acenet.edu/News-Room/Pages/New-Report-Looks-at-the-Status-of-Women-in-Higher-Education.aspx

Ames, C., Berman, R., Casteel, A. (2018). A preliminary examination of doctoral student retention factors in private online workspaces. *International Journal of Doctoral Studies, 13*, 79-107. https://doi.org/10.28945/3958

Angelino, L. M., Williams, F. K., & Natvig, D. (2007). Strategies to engage online Students and reduce attrition rates. *Journal of Educators Online, 4*(2). http://files.eric.ed.gov/fulltext/EJ907749.pdf

Aswini, S., & Deb, A. (2017). Flourishing among postgraduate students: The role of resilience, meaningfulness and grit. *Indian Journal of Community Psychology, 13*(1), 24-37.

Bawa, P., (2016). Retention in online courses exploring issues and solutions – A literature review. *SAGE Open*, *6*(1), 1–11. https://doi.org/10.1177/2158244015621777

Black, D., Bissessar, C., & Booklaky, M. (2019). Online education as an opportunity equalizer: The changing canvas of online education. *Interchange, 50*(3), 423–443. https://doi.org/10.1007/s10780-019-09358-0

Bleske-Rechek, A., & Browne, K. (2014). Trends in GRE scores and graduate enrollments by gender and ethnicity. *Intelligence, 45*, 25–34.

Bowen, W. G., & Rudenstine, N. L. (1992). *In pursuit of the Ph.D.* Princeton University Press.

Bukko, D., Cardenas, J. M. M., & Coletto, R. (2019). Ripple effects. *Journal of Transformative Leadership & Policy Studies, 8*(1), 7-29.

Bureau of Labor Statistics (2022, April 26). *College enrollment and work activity of recent high school and college graduates—2021* [Press release]. https://www.bls.gov/news.release/pdf/hsgec.pdf

Castelló, M., Pardo, M., Sala-Bubaré, A., & Suñe-Soler, N. (2017). Why do students consider to drop out of doctoral degrees? Institutional and personal factors. *Higher Education, 74*(6), 1053–1068. https://eric.ed.gov/?id=EJ1159564

Cross, T. M. (2014). The gritty: Grit and non-traditional doctoral student success. *Journal of Educators Online, 11*(3), 1–30.

Cusworth, S. (2001). *Orientation and retention of counselling PhD students: A qualitative study*. [Paper presentation]. American Psychological Association Conference, San Francisco, CA, United States.

Devos, C., Boudrenghien, G., Van der Linden, N., Azzi, A., Frenay, M., Galand, B., & Klein, O. (2017). Doctoral students' experiences leading to completion or attrition: A matter of sense, progress and distress. *European Journal of Psychology of Education, 32*(1), 61-77. https://doi.org/1031007/s10212-016-0290-0

Educational Testing Service. (2022). *A snapshot of the individuals who took the GRE® General Test.* United States: Educational Testing Service. Retrieved from https://www.ets.org/pdfs/gre/snapshot-test-taker-data-2021.pdf

Erichsen, E. A., Bolliger, D. U., & Halupa, C. (2014). Student satisfaction with graduate supervision in doctoral programs primarily delivered in distance education settings. *Studies in Higher Education, 39*(2), 321-338.

http://doi.org/10.1080/03075079.2012.709496

Feeley, T. H., Williams, V. M, & Wise, T. J. (2005). Testing the predictive validity of the GRE exam on communication graduate student success: A case study at University of Buffalo. *Communication Quarterly, 53*(2), 229–245. https://doi.org/10.1080/01463370500090209

Feldon, D. F., Peugh, J., Maher, M. A., Roksa, J., & Tofel-Grehl, C. (2017). Time-to-credit gender inequities of first-year PhD students in the biological sciences. *CBE - Life Sciences Education, 16*(1), 1–9. http://dx.doi.org/10.1187/cbe.16-08-0237

Fry, R. (2019, June 20). U.S. women near milestone in the college-educated labor force. *Pew Research Center.* https://www.pewresearch.org/fact-tank/2019/06/20/u-s-women-near-milestone-in-the-college-educated-labor-force/

Fuller, J. S., Risner, M. E., Lowder, L., Hart, M., & Bachenheimer, B. (2014). Graduates' reflections on an online doctorate in educational technology. *Techtrends, 58*(4), 73-80. http://doi.org/10.1007/s11528-014-0771-4http://doi.org/10.1080/10665684.2011.529791

Hamrick, F. A., Schuh, J. H., & Shelley, M. C. (2004). Predicting higher education graduation rates from institutional characteristics and resource allocation. *Education Policy Analysis Archives, 12*(19), 1-23. https://doi.org/10.14507/epaa.v12n19.2004

Hoskins, C. M., & Goldberg, A. D. (2005). Doctoral student persistence in counselor education programs: Student-program match. *Counselor Education and Supervision, 44*, 175-187. http://doi.org/10.1002/j.1556-6978.2005.tb01745.x

Irwin, V., De La Rosa, J., Wang, K., Hein, S., Zhang, J., Burr, R., Roberts, A., Barmer, A., Bullock Mann, F., Dilig, R., & Parker, S. (2022). *Report on the condition of education 2022* (NCES 2022-144). U.S. Department of Education, National Center for Education Statistics. https://nces.ed.gov/pubs2022/2022144.pdf

Ivankova, N. V., & Stick, S. L. (2007). Students' persistence in a distributed doctoral program in educational leadership in higher education: A mixed methods study. *Research in Higher Education*, *48*(1), 93. https://www.learntechlib.org/p/76216/

Katz, J. R., Chow, C., Motzer, S. A., & Woods, S. L. (2009). The graduate record examination: Help or hindrance in nursing graduate school admissions. *Journal of Professional Nursing, 25*(6), 369-372.

Kennedy, E., & Gray, M. (2016). 'You're facing that machine but there's a human being behind it': Students' affective experiences on an online doctoral programme. *Pedagogy, Culture & Society, 24*, 417–429. https://doi.org/10.1080/14681366.2016.1175498

Kulp, A. M. (2016). The effects of parenthood during graduate school on PhD recipients' paths to the professoriate: A focus on motherhood. *New Directions for Higher Education, 2016*(176), 81–95. https://doi.org/10.1002/he.20211

Kuncel, N. R., Wee, S., Serafin, S., & Hezlett, S. A. (2010). The validity of the Graduate Record Examination for master's and doctoral programs: A meta-analytic investigation. *Educational and Psychological Measurement, 70*(2), 340-352. https://doi.org/10.1177/0013164409344508

Kumar, S., Johnson, M. L., & Hardemon, T. (2013). Dissertations at a distance: Students' perceptions of online mentoring in a doctoral program. *Journal of Distance Education, 27*(1). http://www.ijede.ca/index.php/jde/article/view/835/1481

Lee, K., Zawacki-Richter, O., & Sari, B. C. (2022). A systematic literature review on technology in online doctoral education, *Studies in Continuing Education*, https://doi.org/10.1080/0158037X.2022.2135499

Lightfoot, R. C., & Doerner, W. G. (2008). Student success and failure in a graduate criminology/criminal justice program. *American Journal of Criminal Justice, 33*(1), 113–129. https://doi.org/10.1007/s12103-007-9029-4

Lim, J., Covrig, D., Freed, S., de Oliveira, B., Ongo, M., & Newman, I. (2019). Strategies to assist distance doctoral students in completing their dissertations. *International Review of Research in Open and Distributed Learning, 20*(5), 192-210. https://doi.org/10.19173/irrodl.v20i5.4532

Litalien, D., & Guay, F. (2015). Dropout intentions in PhD studies: A comprehensive model based on interpersonal relationships and motivational resources. *Contemporary Educational Psychology, 41*, 218-231. http://doi.org/10.1016/j.cedpsych.2015.03.004

Lynch, K. K. (2008). Gender roles and the American academe: A case study of graduate student mothers. *Gender & Education*, *20*(6), 585–605.

Main, J. B. (2018). Kanter's theory of proportions: Organizational demography and PhD completion in science and engineering departments. *Research in Higher Education, 59*(8), 1059–1073. http://dx.doi.org/10.1007/s11162-018-9499-x

Malone, B. G., Nelson, J. S., & Nelson, C. V. (2004). Academic and affective factors contributing to degree completion of doctoral students in educational administration. *The Teacher Educator, 40*(1), 33–55.

Morris, N. P., Ivancheva, M., Coop, T., Mogliacci, R., & Swinnerton, B. (2020). Negotiating growth of online education in higher education. *International Journal of Educational Technology in Higher Education, 17*(48). https://doi.org/10.1186/s41239-020-00227-w

Most, D. E. (2008). Patterns of doctoral degree completion: A longitudinal analysis. *Journal of College Student Retention: Research, Theory & Practice, 10*(2), 171–190. https://doi.org/10.2190/CS.10.2.d

Muljana, P. S., & Luo, T. (2019). Factors contributing to student retention in online learning and recommended strategies for improvement: A systematic literature review. *Journal of Information Technology Education: Research, 18*, 19-57. https://doi.org/10.28945/4182

National Center for Education Statistics. (2021). Digest of Education Statistics. https://nces.ed.gov/programs/digest/d21/tables/dt21_318.10.asp

National Center for Science and Engineering Statistics. (2019). Survey of Earned Doctorates in the U.S. https://ncses.nsf.gov/pubs/nsf20301/assets/report/nsf20301-report.pdf

Palermo-Kielb, K. (2020). *Factors affecting the successful completion of online graduate programs among single mothers.* [Doctoral dissertation, Walden University]. Scholar Works.

Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration, 12*(2). http://www.westga.edu/~distance/ojdla/summer122/patterson112.html

Pew Research. (2019). Women in Labor force. https://www.pewresearch.org/fact-tank/2019/06/20/u-s-women-near-milestone-in-the-college-educated-labor-force/

Pezzoni, M., Mairesse, J., Stephan, P., & Lane, J. (2016). Gender and the publication output of graduate students: A case study. *Journal of Experimental Social Psychology, 40(2), 152–168.* http://dx.doi.org/10.1371/journal.pone.0145146

Picho, K., Rodriguez, A., & Finnie, L. (2013). Exploring the moderating role of context on the mathematics performance of females under stereotype threat: A meta-analysis. *Journal of Social Psychology, 153*, 299–33. http://dx.doi.org/10.1080/00224545.2012.737380

Plowman, D., & Smith, D. (2011). The gendering of organizational research methods: Evidence of gender patterns in qualitative research. *Management Department Faculty Publications, 60.* https://digitalcommons.unl.edu/managementfacpub/60

Pronin, E., Steele, C. M., & Ross, L. (2004). Identity bifurcation in response to stereotype threat: Women and mathematics. *Journal of Experimental Social Psychology, 40*: 152–68. http://dx.doi.org/10.1016/s0022-1031(03)00088-x

Rockinson-Szapkiw, A. J., Bray, O. R., & Spaulding, L. S. (2014). Examining the predictive validity of GRE scores on doctoral education: Students' success and methodology choices in the dissertation process. *Journal of College Student Retention: Research, Theory & Practice, 16*(2), 203–217.

Rotar, O. (2022). A missing theoretical element of online higher education student attrition, retention, and progress: A systematic literature review. *SN Social Sciences, 2*(12), 278. https://doi.org/10.1007/s43545-022-00550-1

Roumell, E., & Bollinger D. (2017). Experiences of faculty with doctoral student supervision in programs delivered via distance. *Journal of Continuing Higher Education, 65*, 82-93.

Seagram, B. C., Gould, J., & Pyke, S. W. (1998). An investigation of gender and other variables on time to completion of doctoral degrees. *Research in Higher Education, 39*(3), 319–335. https://doi.org/10.1023/A:1018781118312

Shapiro, J., & Williams, A. (2012). The role of stereotype threats undermining girls' and women's performance and interest in STEM fields. *Sex Roles, 66*(3-4), 175–83. https://10.1007/s11199-011-0051-0

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*(1), 4–28. https://doi.org/10.1006/jesp.1998.1373

Spronken-Smith, R., Cameron, C., & Quigg, R. (2018). Factors contributing to high PhD completion rates: A case study in a research-intensive university in New Zealand. *Assessment & Evaluation in Higher Education, 43*(1), 94-109. http://dx.doi.org/10.1080/02602938.2017.1298717

Steele, C. M., & Aronson, J. A. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*(5)*,* 797–811. https://doi.org/10.1037/0022-3514.69.5.797

Stock, W. A., Siegfried, J. J., & Finegan, T. A. (2011). Completion rates and time-to-degree in economics PhD programs. *American Economic Review: Papers & Proceedings,101*(3), 176-187.

Theisen, M. R., McGeorge, C. R., & Walsdorf, A. A. (2018). Graduate student parents' perceptions of resources to support degree completion: implications for family therapy programs. *Journal of Feminist Family Therapy, 30*(1), 46-70. https://doi.org/10.1080/08952833.2017.1382650

Tock, J. L., & Anders Ericsson, K. (2019). Effects of curricular emphasis in college on the GRE and its impact on the gender gap in performance. *Contemporary Educational Psychology, 56,* 40-54. https://doi.org/10.1016/j.cedpsych.2018.11.003

Tsui, M., Xu, X., Venator, E., & Wang, Y. (2016). Stereotype threat and gender: Math performance in Chinese college students. *Chinese Sociological Review, 48*(4), 297–316. http://dx.doi.org/10.1080 /21620555.2016.1166339

Waugh, M., & Searle, J. S. (2014). Student persistence and attrition in an online M.S. program: Implications for program design. *International Journal on E-learning, 13*(1), 101–121.

Wollast, R., Boudrenghien, G., Van der Lindin, N., Galand, B., Roland, N., Devos, C., De Clercq, M., Klein, O, Azzi, A., & Frenay, M. (2018). Who are the doctoral students who drop out? Factors associated with the rate of doctoral degree completion in universities. *International Journal of Higher Education, 7*(4), 143-156. https://doi.org/10.5430/ijhe.v7n4p143

Woo, S. E., LeBreton, J. M., Keith, M. G., & Tay, L. (2023). Bias, fairness, and validity in graduate-school admissions: A psychometric perspective. *Perspectives on Psychological Science, 18*(1), 3–31. https://doi.org/10.1177/17456916211055374

Xu, D., & Xu, Y. (2019). *The promises and limits of higher education: Understanding how distance education affects access, cost, and quality.* American Enterprise Institute. https://files.eric.ed.gov/fulltext/ED596296.pdf

Yasmin, D. (2013). Application of the classification tree model in predicting learner dropout behavior in open and distance learning. *Distance Education, 34*(2), 218–231.

Yuan, J., & Kim, C. (2014). Guidelines for facilitating the development of learning communities in online courses. *Journal of Computer Assisted Learning, 30*(3), 220-232. http://doi.org/10.1111/jcal.12042

Yukselturk, E. & Top, E. (2013). Exploring the link among entry characteristics, participation behaviors and course outcomes of online learners: An examination of learner profile using cluster analysis. *British Journal of Educational Technology, 44*(5), 716-728.