

Predicting Dissertation Methodology Choice Among Doctoral Candidates at a Faith-Based University

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ABSTRACT

Limited research has investigated dissertation methodology choice and the factors that contribute to this choice. Quantitative research is based in mathematics and scientific positivism, and qualitative research is based in constructivism. These underlying philosophical differences posit the question if certain factors predict dissertation methodology choice. Using the theoretical framework of intersectionality, this predictive, correlational study used archival data to determine if biological sex, ethnicity, age, or religious affiliation predicts dissertation methodology choice. A logistics regression analysis was used to review 398 doctoral dissertations and determine if any of the criterion variables predicted dissertation methodology choice. After analysis, it was determined that none of the criterion variables of biological sex, ethnicity, age, and religious affiliation were statistically significant in predicting dissertation methodology choice.

Keywords: doctoral dissertation, research methodology, quantitative research, qualitative research

INTRODUCTION

The doctoral dissertation is a capstone product among doctoral programs in many disciplines (Boote & Beile, 2005), with two main methodological choices: quantitative and qualitative. These two methodologies are fundamentally different, and there is little research that discusses how doctoral candidates choose one of these methodologies over the other. The fundamental differences between these two methodologies originate from the core of their philosophical assumptions (Guba, 1990). Quantitative research is based in positivism and focuses on empirical observation and scientific study (Sale, Lohfeld, & Brazil, 2002), whereas qualitative research is based in constructivism (Creswell, 2013).

Quantitative research, founded in the positivist paradigm, is based on empirical studies and is common in hard science fields (Sale et al., 2002). In quantitative research, the researchers study a phenomenon objectively, sample sizes are larger than in qualitative studies, and structured protocols and randomization are emphasized. Quantitative research embodies more mathematical and traditional, scientific experimental research (Sale et al., 2002). Furthermore, the philosophical assumptions of positivism drive this methodology. Positivism is, according to Creswell (2013), reductionistic, logical, and case-and-effect oriented. Individuals with a positivist belief system are deterministic, or they believe that every action is the effect of a specific antecedent that caused that consequence (Creswell, 2013).

In contrast, qualitative research is based in constructivism. Qualitative researchers have a goal of relying on participants' views, meanings, and experiences (Creswell, 2013). This methodology relies on in-depth interviews, focus groups, observations, and document reviews with a much smaller sample size than that of quantitative research. Its philosophical underpinning is constructivism. Constructivism is a paradigm in which individuals seek to understand the world. They rely on experiences of people around them, and that reality is created through individual experiences and interactions with others (Creswell, 2013). In a constructivist paradigm, it is believed that "multiple realities are constructed through our lived experiences and interactions with others" (Creswell, 2013, p. 36).

Though quantitative research has been a more traditionally used methodology among dissertation candidates, qualitative research has risen dramatically in the past 30 years (Rone, 1998) and at the same time, more women are graduating with doctoral degrees (Nelson & Coorough, 1994; U.S. Department of Education, National Center for Education Statistics, 2015). Because qualitative research may include more traditionally feminine characteristics in its research and analysis methods, such as interpersonal relationships (Creswell, 2013; Lincoln & Guba, 1985), one could surmise that qualitative research has increased in part because of the higher percentages of women completing doctoral degrees.

There is very little research regarding the choice between a quantitative or qualitative research methodology among doctoral candidates. In each methodology, which involves very different data collection methods and analysis procedures, it is unknown through current research if there are predictors for those who choose to pursue each methodology (Creswell, 2013; Sale et al., 2002). Feminist research has indicated that the positivist assumptions in quantitative research do not align with the female identity (Stanley & Wise, 1983), and other research has suggested that women have higher levels of mathematics anxiety, which could indicate that women are more likely to choose qualitative research (Cheryan, 2012; Nelson & Brammer, 2008). Individuals of African American or Hispanic ethnicities may also be more likely to choose qualitative research because various studies have shown a higher level of mathematics anxiety and poorer levels of mathematics performance among these subgroups (Bell, 2003; Bui & Alfaro, 2011; Lockhead, Thorpe, Brooks-Gunn, Casserly, & McAloon, 1985;

Onwuegbuzie & Wilson, 2003; Upadyaya & Eccles, 2014; Wilson & Milson, 1993). Non-traditional students, or students older than the average graduate student, may also chose the qualitative methodology more often based on their statistics anxiety and attitudes towards mathematics and science (Bean & Metzner, 1985; Bell, 2003; Bui & Alfaro, 2011; Jones & Watson, 1990; Lockhead et al., 1985; Onwuegbuzie & Wilson, 2003; Upadyaya & Eccles, 2014; Wilson & Milson, 1993). Finally, a candidate's religious world view may affect their choice of methodology as there appears to be an underlining conflict between scientific research that is based in positivism and a religious affiliation (Astley & Francis, 2010; Greer, 1990; Sale et al., 2002).

According to Plowman and Smith (2011), there is not enough research regarding dissertation methodology choice among men, women, and various other demographic groups and why individuals pursue one type of research methodology over the other. This study seeks to add to the existing body of research and to determine if there are differences between the choice of dissertation methodology among men and women as well as the role that ethnicity, age, and religious affiliation play on a doctoral candidate's methodology choice (Borders, Wester, Fickling, & Adamson, 2015; Goodrich, Shin, & Smith, 2011; Plowman & Smith, 2011). This study hopes to provide insight into dissertation methodology choice for both men and women, and deepen the understanding of ethnicity, age, and religious affiliation in the math and science fields.

OVERVIEW OF RELATED LITERATURE

Theoretical framework.

The concept of intersectionality, which is drawn from critical theory, specifically considers the interactions of categories of differences in individual lives. This can include gender, race, and other categories of difference, which, for the purpose of this study, includes religion (Davis, 2008). Shields (2008) defined intersectionality as “social identities which serve as organizing features of social relations, mutually constitute, reinforce, and naturalize one another” (p. 302). Similarly, Collins (1998) defined intersectionality as “rather than examining gender, race, class, and nation as distinctive social hierarchies, intersectionality examines how they mutually construct one another” (p. 62). Dimensions of identity, such as gender, religion, and race are not independent additions that add up to an identity, but they are interdependent on each other (Bowleg, 2008; Warner, 2008). Crenshaw (1989) was one of the first to define intersectionality and apply it to dimensions of identity that are more than the sum of each part. Crenshaw (1989) specifically studied African American women and stated, “because the intersectional experience is greater than the sum of racism and sexism, any analysis that does not take intersectionality into account cannot sufficiently address the particular manner in which Black women are subordinated” (p. 140). Identities are formed in relation to one another, and the process of merging various identities is transformative. This merge produces an entirely new sense of self; it is not just an intersection of identities.

The focus of these aspects of identity is how they interconnect rather than just their similarities and differences (McCann & Kim, 2002). The framework of

intersectionality is based in social constructivism, which maintains that aspects of identity are constructed from aspects of social, historical, political, and cultural factors (Omi & Winant, 1994). Intersectionality supports a social identity, or an identity that is formed through social interactions and cultural factors (Shields, 2008). Multiple dimensions of identity, such as gender, race, religion, socioeconomic status, and nationality are complex social processes that intersect with each other rather than exist independently (Bowleg, 2008). Because this study involves the examining of ethnicity and gender, along with age and religion, intersectionality is an appropriate framework (Cole, 2009, Else-Quest, Mineo, & Higgins, 2013).

Quantitative and qualitative research.

There are two main methodological choices in research: quantitative or qualitative. These two methodologies are fundamentally different in their philosophical paradigms, language, and data collection methods. Quantitative research is based on positivism (Sale et al., 2002) and maintains objective reality. In contrast, qualitative researchers believe that reality subjective and is constantly changing and is created through individuals' experiences (Sale et al., 2002). The choice between each of these methodologies is a complex one with little research examining how doctoral candidates select one methodology over the other. Buchanan and Bryman (2007) discussed how the choice between research methods is "shaped by aims, epistemological concerns, norms of practice...as well as historical, political, ethical, evidential, and personal factors" (p. 483). In their discussion, they pointed out that the combination of personal characteristics in the context of choosing a research methodology are "naturally occurring and unavoidable influences" (p. 483).

Biological sex and methodology choice.

Quantitative research is based in mathematics, which is evidenced in the statistical analysis that is used to analyze data in this methodology (Sale et al., 2002). There is an abundance of research that has indicated that women have higher mathematics anxiety, lower mathematics attitudes, and are less confident than men in their mathematics abilities (Bell, 2003; Bui & Alfaro, 2011; Eccles & Wigfield, 2002; Lockhead et al., 1985; Nelson & Brammer, 2008; Onwuegbuzie & Wilson, 2003). Studies have also indicated that women have higher statistics anxiety than men (Onwuegbuzie, 1995; Zeidner, 1991), which is directly related to quantitative methodologies, because it usually requires statistical analysis. Royce and Rompf (1992) also found that women have more difficulties in statistics and in quantitative methodologies in general. Zeidner (1991) postulated that the reason that women have more statistics anxiety and difficulties is because of their prior experiences in math, including low mathematics self-efficacy, which has been theorized to be a product of gender stereotyping and low mathematics performance. These difficulties with statistics may provide insight into why Plowman and Smith (2011) found that in four different scholarly journals, women publish more qualitative studies than men and men publish more quantitative studies than women. While older research and meta-analyses is clear of the mathematics performance gap between men and women, recent research has also indicated that due to a growing gender equality across modern cultures, females have reached parity with males in mathematics performance, at least in the school-aged students studied (Hyde & Mertz, 2009).

However, since doctoral students have not yet been studied and generally have an older average age of 42 than most educational programs, it is unknown if this sociocultural change has reached women in the older generation.

Ethnicity and methodology choice.

Research has indicated that individuals of several ethnic minorities experience stereotype threat in mathematics (Hughes, Gleason, & Zhang, 2005). In addition, African American and Hispanic individuals have higher mathematics anxiety, poorer mathematics performance, and lower science and mathematics attitudes than Caucasians or Asians (Bell, 2003; Bui & Alfaro, 2011; Lockhead et al., 1985; Onwuegbuzie & Wilson, 2003; Wilson & Milson, 1993). Lockhead et al. (1985) conducted a meta-analysis of multiple studies and found that Asian American students had higher mathematics performance than Caucasian students, both Asian American and Caucasian students had higher mathematics performance than Hispanic students, and all three of the groups had higher mathematics performances than African American students. Grigg, Donahue, and Dion (2007) examined mathematics assessments and found that Asian Americans scored highest, followed by Caucasian students. African American students and Latino students scored the lowest on these mathematics exams. Gross (1988) found that as students got older, African American and Hispanic students found science and mathematics less enjoyable than their Caucasian and Asian American counterparts. Because quantitative research is based in mathematics and positivism (Sale et al., 2002), this may indicate that those in ethnic minorities may be more likely to choose qualitative methodologies rather than quantitative.

Age and methodology choice.

Older students tend to have higher mathematics anxiety and lower attitudes towards mathematics and science compared to their younger, traditional-student counterparts (Bean & Metzner, 1985; Jones & Watson, 1990; Lockhead et al., 1985). Bui and Alfaro (2011) discovered that both statistics anxiety and attitudes toward science differed by age. Research has indicated that mathematics anxiety increases with age, attitudes toward mathematics and science decrease with age, and age is the most significant predictor of attrition in undergraduate and graduate programs (Bean & Metzner, 1985; Bell, 2003; Bui & Alfaro, 2011; Jones & Watson, 1990; Lockhead et al., 1985; Onwuegbuzie & Wilson, 2003; Upadaya & Eccles, 2014; Wilson & Milson, 1993). Age is also a defining factor in the determination of a student as traditional or non-traditional (U.S. Department of Education, National Center for Education Statistics, 2016a). Because research indicates that older, non-traditional students may face higher mathematics anxiety and lower performance in mathematics and science, it is important to examine if these factors may affect their dissertation methodology choice.

Religion and methodology choice.

To complicate the issue of methodology choice, the salience of religious affiliation may also influence the choice of dissertation methodology. For people of religious faith, embracing modern science in its entirety can be difficult. Cho (2012) described the difficulties of clashing worldviews. Scientific inquiry is based in positivism--the claim that empirical observations are considered true--which contrasts

with the theistic metaphysical beliefs of those of religious faith. Science, and more specifically, positivism, rejects any metaphysical conclusions that anything other than what can be seen exists. This rejects the existence of a superior being and directly contradicts the worldview of those with religious faith. Researchers have found that there is a negative correlation between attitudes toward science and attitudes toward religion (Astley & Francis, 2010), and in a study conducted by Francis and Greer (1999), it was found that 62% of students agreed that there is a fundamental conflict between scientific and religious claims. Keele (2012) described quantitative research as based in “hard science.” These philosophical differences between science, and thus, quantitative research methods and religious faith, could cause people of religious affiliation to reject quantitative research methods in favor of qualitative methods that encompass a more subjective analysis to embrace their differences in perspective and philosophy.

METHODS

Research design.

This study utilized a predictive correlational design to examine if the variables of biological sex, ethnicity, age, and religious affiliation help predict the choice of a quantitative or qualitative dissertation methodology among doctoral candidates. A logistic regression was used to examine the relationship between the predictor variables (biological sex, ethnicity, age, and religious affiliation) and the criterion variable, dissertation methodology choice (quantitative or qualitative). *Biological sex* was defined as male or female (American Psychological Association, 2011). *Ethnicity* was defined as the “social group a person belongs to, and either identifies with or is identified with by others, as a result of a mix of cultural and other factors including language, diet, religion, ancestry, and physical features traditionally associated with race” (Bhopal, 2004, p. 443). *Age* was defined as how old in years the candidate was at the time of the dissertation defense. *Religious affiliation* was defined as “an organized system of practices and beliefs in which people engage” (Mohr, 2006, p. 174). A quantitative method is defined as a systematic and objective method of research that utilizes numerical data to describe variables, observe relationships among variables, or determine cause and effect relationships between variables (Burns & Grove, 2005). A qualitative method is defined as a method that is “multimethod in its focus, involving an interpretive, naturalistic approach to its subject matter...qualitative researchers study things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, 1994, p. 2). No candidates in the sample completed a mixed-methods dissertation.

Participants and setting.

The participants in this archival study were education doctoral candidates from a large, private, faith-based university in the southeast with an Ed.D. (Doctor of Education) degree. To determine the effect of biological sex, ethnicity, age, and religious affiliation on dissertation methodology choice among doctoral candidates, data were analyzed for the criterion variable, dissertation methodology choice (quantitative or qualitative). After two cases were removed due to incomplete data, the sample included 388 dissertations. There were 199 quantitative dissertations and 189 qualitative dissertations included in the study. There were 257 female students in the sample and 131 male students. Ethnic

breakdown included 286 Caucasian students, 38 African American students, eight Hispanic students, four Asian students, six American Indian students, and 46 students with no ethnicity specified. There were 198 non-traditional aged dissertation authors and 190 traditional-aged dissertation authors. There were 187 students who identified with a religion and 201 who did not identify with a faith. The demographics of the sample in each group can be seen in Table 1.

Table 1

Frequencies for Predictor Variables for Dissertation Methodology

Predictor Variable	Quant. Diss. (<i>n</i> = 199)	Qual. Diss. (<i>n</i> = 189)
Biological sex		
Female	132	125
Male	67	64
Ethnicity		
Caucasian	143	143
Af. American	23	15
Hispanic	2	6
Asian	3	1
Am. Indian	3	3
Not specified	25	21
Age		
Non-traditional	95	103
Traditional	104	86
Religious affiliation		
No rel. aff.	101	100
Rel. aff.	98	89

Notes. Af. American = African American, Quant. Diss. = Quantitative Dissertation, Qual. Diss. = Qualitative Dissertation, Rel. aff. = Religious affiliation.

The Ed.D. degree at this university is a blended or hybrid program, requiring both online and residential doctoral courses. Considering the university setting is a faith-based institution, it could be expected that students at this university were affiliated with a religion. However, this cannot be assumed. In Uecker’s (2008) study, it was found that students at faith-based schools are more likely than students at secular schools to believe that religious faith is important in daily life, but not all students at faith-based schools identify as affiliated with a religion. Although religious schools do reinforce religious faith, religious schooling is not a definitive predictor of religious faith or affiliation (Uecker, 2008). In this study, if the dissertation candidate indicated his or her religious affiliation on the application to the university, it was an assumption that religious faith is

a salient identity role, which is supported by Jones and McEwen's (2000) multi-dimensional identity theory. Although doctoral candidates who did not indicate their religion on their university application still may have a religious affiliation, it was not considered a salient identity trait for the purposes of this study (Jones & McEwen, 2000).

There were 590 dissertations that were written by Ed.D. candidates at this university between the years of 2012-2016 as determined by the records of the School of Education. In 2011, a new system was implemented for dissertation candidates in which a research consultant was assigned to each candidate to review his or her methodology and analysis to ensure he or she met the university requirements. The dissertations accepted by the university's School of Education are traditional in nature and consist of five chapters: Introduction, Literature Review, Methods, Results, and Conclusions. Both qualitative and quantitative methods are accepted for the dissertation requirement, and the School of Education's Dissertation Handbook states that for quantitative studies, a candidate can choose experimental, quasi-experimental, causal-comparative, and correlational designs. For qualitative studies, a candidate can choose phenomenological, grounded theory, case study, historical, and ethnographic designs. Any other research designs require special permission from the administration of the program.

Data collection.

Archival, descriptive data were used for this study. Data were gathered using Banner INB and the Digital Commons database. Banner INB was hosted on the university's network and uses online forms to both enter and search information in the database. First, admissions counselors enter demographic information about students as they apply for the university. Throughout a student's program, academic advisors, financial aid employees, and employees of the registrar's office enter information in a student's profile. The student's profile includes his or her birthdate, ethnicity, religious affiliation, contact information, and grades from courses taken. Digital Commons, a publication database, houses faculty- and student-edited scholarly journals, works from university faculty, and student theses and dissertations. Digital Commons is hosted on the university library's website, and it is maintained by the library's staff. Once a candidate successfully defends his or her dissertation and the committee has approved the final manuscript, the candidate is required to send the final dissertation to the library staff for publication in Digital Commons. The library staff reviews dissertations for copyright purposes and uploads the dissertation as a PDF file into the Digital Commons database.

Procedures.

Appropriate approvals were also granted by the university Institutional Review Board (IRB) before data analysis began. A sample of 388 completed dissertations were used in this study from the years 2012-2016 after two cases were removed due to incomplete data. Upon examining each dissertation, the researchers first looked to see if the words "quantitative" or "qualitative" appeared in the abstract. If so, the researchers categorized the dissertation in a column on an Excel sheet with dummy coding. If neither of the words "quantitative" or "qualitative" appeared in the abstract of the dissertation, the researchers looked for the terms "statistical method" or "non-statistical method." If "statistical method" was used, the researchers categorized the dissertation as quantitative.

If “non-statistical method” was used, the researchers categorized the dissertation as qualitative. Next, the researchers looked for the words “experimental,” “quasi-experimental,” “causal-comparative,” or “correlational.” If any of these words were used in the abstract, the researchers categorized the dissertation as quantitative. If these words were not mentioned in the abstract, the researchers looked for the words “phenomenology,” “grounded theory,” “case study,” “historical,” or “ethnographic.” If any of these words were used in the abstract, the researchers categorized the dissertation as qualitative. If none of these key words were found in the abstract of the dissertation, the researchers examined the methodology chapter of the dissertation to determine if statistical analysis was used as the main form of data analysis. If statistical analysis was used as the main form of data analysis, the dissertation was categorized as quantitative. If the main form of data collection and analysis was interviews, observations, or focus groups, the dissertation was categorized as qualitative. While viewing each dissertation, the researchers also noted the page length of the dissertation as well as the specific methodology (experimental, quasi-experimental, causal-comparative, correlational, phenomenology, grounded theory, case study, historical, or ethnographic).

Biological sex was determined based on the candidate’s self-reported sex, male or female, listed on the candidate’s profile in the university’s administrative database. Ethnicity was also determined based on the candidate’s self-reported profile in the university’s administrative database. The candidate’s age was determined by subtracting the birthdate listed on the university’s administrative database from the year the candidate’s dissertation was defended. According to the U.S. Department of Education (2010), the average age of a student in an Ed.D. program is 42.3 years old. The National Center for Education Statistics (2015) defined a non-traditional student as a student above the average age of the program. Thus, any student aged 43 years and older and above was categorized as a non-traditional student, and any student with an age under 42 years and younger was categorized as a traditional student.

Data analysis.

Descriptive statistics were calculated for each of the predictor variables (biological sex, ethnicity, age, and religious affiliation) and criterion variable (quantitative or qualitative). Table 1 includes a complete listing of the descriptive statistics and demographic characteristics of the students who chose quantitative and qualitative dissertations.

A logistic regression analysis was used to test the effect of biological sex, ethnicity, age, and religious affiliation on dissertation methodology choice among doctoral candidates in the School of Education at a faith-based university. A Wald ratio was reported for the logistic regression model. Cox and Snell’s and Nagelkerke’s statistics were used to measure the strength of the model. Logistic regression was used because the criterion variable was categorical and dichotomous (Gall, Gall, & Borg, 2007).

In addition to the logistic regression analysis, which determined the correlation between the criterion variable (dissertation methodology choice) and the predictor

variables (biological sex, ethnicity, age, and religious affiliation), odd ratios were also calculated to determine the chance that each of the predictor variables had on predicting the methodology chosen.

RESULTS

Results for null hypothesis.

A binary logistic regression analysis was used to test the relationship between the predictor variables (biological sex, ethnicity, age, and religious affiliation) and the criterion variable (dissertation methodology) at a 95% confidence level. Because each of the variables were categorical, they were each dummy-coded. Data screening was conducted and the appropriate assumptions tests were conducted before running the logistic regression (see Warner, 2008). All assumptions were met. The results of the binary logistic regression were not statistically significant, $\chi^2(8) = 6.34, p = .61$. The model was extremely weak according to Cox and Snell's ($R^2 = .016$) and Nagelkerke's ($R^2 = .022$) parameters. There was no statistically significant, predictive relationship between dissertation methodology choice (quantitative or qualitative) and the predictor variables (biological sex, ethnicity, age, religious affiliation). Thus, the researchers failed to reject the null hypothesis.

The researchers further investigated the variable coefficients. For the variable of biological sex, the Wald ratio was not statistically significant, $\chi^2(1) = .01, p = .91$. This result indicated that dissertation methodology choice between male and female candidates was not statistically significant. The odds ratio for biological sex was 1.03 indicating that women were 1.03 times more likely to choose a quantitative methodology than men. However, this relationship was too small to be considered statistically significant, as indicated by the Wald statistic.

The researchers also investigated the predictor variable of ethnicity. Overall, the predictor variable of ethnicity was not statistically significant, $\chi^2(5) = 3.97, p = .55$. In addition, none of the Wald ratios for any ethnic groups were statistically significant. For students with a Caucasian ethnicity, the Wald ratio was not statistically significant, $\chi^2(1) = .96, p = .33$. The odds ratio for Caucasian students was .69, indicating that Caucasian students were .69 times more likely to choose a quantitative methodology. For students with an African American ethnicity, the Wald ratio was not statistically significant, $\chi^2(1) = .35, p = .56$. The odds ratio for African American students was 1.21, indicating that African American students were 1.21 times more likely to choose a quantitative methodology. For students with a Hispanic ethnicity, the Wald ratio was not significant, $\chi^2(1) = .188, p = .67$. The odds ratio for Hispanic students was .821, indicating that Hispanic students were .821 times more likely to choose a quantitative methodology. For students with an Asian ethnicity, the Wald ratio was not significant, $\chi^2(1) = 2.16, p = .14$. The odds ratio for Asian students was 3.59, indicating that Asian students were 3.59 times more likely to choose a quantitative methodology. For students with an American Indian ethnicity, the Wald ratio was also not significant, $\chi^2(1) = .43, p = .51$. The odds ratio for American Indian students was .46, indicating that American Indian students were .46 times more likely to choose a quantitative methodology. Finally, for students who did not specify their ethnicity, the Wald ratio was also not significant, $\chi^2(1) = .03, p$

= .855. The odds ratio for students who did not specify their ethnicity was 1.17, indicating that not specify students were 1.17 times more likely to choose a quantitative methodology.

The researchers also examined age, and for this variable, the Wald ratio was also not statistically significant for this variable, $\chi^2(1) = 1.24, p = .27$. This result indicated that there was no significant relationship in dissertation methodology choice between traditional students (42 and younger) and non-traditional students (age 43 and older). The odds ratio for age was 1.26, indicating that traditional students were 1.26 times more likely to choose a quantitative methodology than non-traditional students. However, this relationship was too small to be considered statistically significant, as indicated by the Wald statistic.

Finally, the researchers investigated religious affiliation. For the variable of religious affiliation, the Wald ratio was not statistically significant, $\chi^2(1) = .17, p = .68$. This result indicated that there was no significant difference in dissertation methodology choice between students who are affiliated with a religion and those who are not affiliated with a religion. The odds ratio for religious affiliation was 1.09, indicating that students with no religious affiliation were 1.09 times more likely to choose a quantitative methodology than students with a religious affiliation. However, this difference was too small to be considered statistically significant, as indicated by the Wald statistic.

DISCUSSION

The purpose of this archival, predictive correlational study was to examine the effect of biological sex, ethnicity, age, and religious affiliation on dissertation methodology choice among doctoral candidates in the School of Education at a faith-based university. Research suggests that qualitative research embodies more feminine characteristics such as a focus on interpersonal relationships and an underlying constructivist approach (Creswell, 2013; Lincoln & Guba, 1985), but research has also indicated that women are over-represented as authors of qualitative studies (Plowman & Smith, 2011). Plowman and Smith (2011) studied published research journal studies, not dissertations, and although their study was published in 2011, the data they collected was from a 22-year period from 1986-2008. In the present study, when looking at candidates' dissertations, men and women were equally as likely to conduct a quantitative or qualitative study. This was in contradiction to Plowman and Smith's (2011) findings. This may be explained due to an overall increase in qualitative research within recent years and because women may now be more willing to overcome any math anxiety.

As Rone (1998) indicated, qualitative research has been steadily increasing since 1980, quickly becoming a research method used as often as the more traditional quantitative method, especially in the social science and education fields. Because this study collected data from 2012-2016, it includes much more recent data. This study's data was also collected from only Ed.D. doctoral candidates, which is one of the fields where qualitative research is most popular (Rone, 1998). It is possible that qualitative research is continuing to rise in popularity and is becoming a more often used methodology for both genders.

Regarding math anxiety and women, a dissertation is usually divided into five chapters: introduction, literature review, methods, analysis, and discussion. Even though a quantitative methodology is based in a positivist philosophical approach (Sale et al., 2002) which differs from the qualitative constructivist approach (Creswell, 2013), three of the five chapters of the dissertation are structured and written the same in both qualitative and quantitative studies (Bloomberg & Volpe, 2015). Although research has shown that women have higher levels of math anxiety than men and pursue degrees in mathematical fields at a much lower percentage than men (Cheryan, 2012; Nelson & Brammer, 2008), because the quantitative dissertation only includes math-related concepts in two of the five chapters, women may be more willing to overcome any math anxiety for just two chapters of a dissertation than they would be for a career or advanced degree in a math-related field. Recent research has also indicated that due to a growing gender equality across modern cultures, females have reached parity with males in mathematics performance, at least in the school-aged students studied (Hyde & Mertz, 2009). Even though this has not been examined in doctoral programs, it is possible that the sociocultural factors in the United States have contributed to equality among both genders of all ages in mathematics performance.

Ethnicity and methodology choice.

In this study, ethnicity was not found to be a statistically significant predictor of dissertation methodology choice. Although previous research has found that several ethnic minorities experience more stereotype threat, higher mathematics anxiety, and lower mathematics attitudes than Caucasians or those of Asian descent (Bell, 2003; Bui & Alfaro, 2011; Lockhead et al., 1985; Onwuegbuzie & Wilson, 2003; Upadaya & Eccles, 2014; Wilson & Milson, 1993), this study did not find that this translated into more qualitative dissertation methodologies for candidates of any specific ethnic minority. Previous research has also indicated that individuals of an ethnic minority tend to avoid math and science majors (Tobias, 1976). However, much of the research in this area is outdated, and although avoidance of careers and major areas of study in the mathematics field is documented in prior research, in this study, individuals of some ethnic minorities were just as likely to complete quantitative dissertations as individuals of Caucasian descent. This could be an indication of the mathematics anxiety, achievement, and attitudes gaps closing, or it could be indicative that these candidates were able to overcome their anxiety regarding the two chapters of the dissertation related to mathematics.

Age and methodology choice.

Although statistics anxiety is higher in older, non-traditional students compared to traditional students (Baloglu, 2003), in this study non-traditional students were just as likely to choose a quantitative dissertation methodology as traditional students. In Baloglu's study, it was found that older students had higher statistics anxiety than younger students, but older students had more positive attitudes towards statistics than younger students. Baloglu noted that older students recognized the value and usefulness of statistics. Even though the non-traditional candidates' statistics anxiety may have been higher based on previous research, there was not a statistically significant relationship

between their methodology choice and age. As previously mentioned, two of the five dissertation chapters include statistical analyses in a quantitative dissertation. It could be that non-traditional students understand the value of statistics and the quantitative methodology and persist through any statistics anxiety in the chapters in the dissertation that require statistics.

Religion and methodology choice.

In this study, religious affiliation was not found to be a statistically significant predictor of dissertation methodology choice. Even though quantitative methodologies are based in positivism, which conflicts with the worldview of most religions, candidates at this university with a religious affiliation were not less likely to choose a quantitative dissertation methodology. It could be that using a positivist approach in a dissertation is separate from an individual's personal, religious worldview. As Taber, Billingsley, Riga, and Newdick (2011) found, some students believe that science, which is both positivist and focused on empirical and quantitative studies, supports their faith. Taber et al. (2011) also found that many students compartmentalize science and religion. This could be the case for the candidates in this study; the choice of a quantitative methodology that is based in positivism is compartmentalized from their religious affiliation. Thus, their positivist, quantitative study is unrelated to and compartmentalized from their religion and personal, theistic worldview. In this study candidates who identified with a religious affiliation were just as likely to choose a quantitative dissertation methodology as those who did not.

Overrepresentation of women.

One finding in this study was the much higher number of female candidates completing the Ed.D. program at this university compared to male candidates. There were 257 women and 131 men in the random sample, indicating that the number of women who completed a dissertation as part of the Ed.D. program almost doubled the number of men in the program in the years 2012-2016. Although this is a particularly large gender gap, there is evidence in research that women now represent a majority of college students. According to the National Center for Educational Statistics (U.S. Department of Education, National Center for Education Statistics, 2016b), in 2016, there were 11.7 million female students attending college and only 8.8 million male students. This is a gender-gap reversal from the 1970s, where approximately 58% of all college students were male (Bae, Choy, Geddes, Sable, & Snyder, 2000).

Because this research only involved Ed.D. candidates, women could also be overrepresented in the Ed.D. program because of the higher number of women in the education field. Women make up 76% of teachers (U.S. Department of Education, National Center for Education Statistics, 2015) and 65% of public, K-12 school principals (U.S. Department of Labor, Bureau of Labor Statistics, 2015). According to Perry (2013), women completed 68% of education doctoral degrees. Women also completed 52% of all doctoral degrees in 2012; thus, women are completing more doctoral degrees than men both overall and in the education field (Perry, 2013). The percentage of women completing education doctoral degrees compared to men (68%) is higher than the percentage of women who are K-12 school administrators, but lower than the percentage

of women who are employed as K-12 teachers (76%). Although this study found a higher number of women completing the Ed.D. program, more research is needed to determine why women have shifted to completing doctoral degrees at a higher rate than men; in the 1990s, women completed approximately 49% of all education doctoral degrees (Nelson & Coorough, 1994), which is significantly less than the current 68% (Perry, 2013).

Rise of qualitative research.

The results of this study indicated that the use of qualitative research may be on the rise, just as previous studies have suggested (Nelson & Coorough, 1994). In 1973, only 7% of dissertations utilized a qualitative methodology, and other researchers found in 1980-1993, as low as 3% of dissertations used qualitative research (Nelson & Coorough, 1994; Wick & Dirkes, 1973). In a study that used a sample of Ed.D. dissertations from 1998-2002, Kontorski and Stegman (2006) found that 28.87% of Ed.D. dissertations were qualitative, and similarly, Benson, Chik, Gao, Huang, and Wang (2009) found that 22% of articles published in education journals were qualitative in design between the years 1997 and 2006. Rone (1998) found that qualitative methodologies were increasing and expected them to continue to increase in popularity. Flinders and Richardson (2002) suggested that qualitative research grew so quickly in the 1990s and early 21st century that “it is difficult to find a more prominent trend in the field of education” (p. 1159). It is believed that a change in cultural and political worldviews may be a reason that qualitative research has risen in popularity; the postmodern culture shift has caused more interest in subjective human views, or verbal data, rather than just empirical, positivist studies using numerical data (Alasuutari, 2010; Flinders and Richardson, 2002).

Limitations of the study.

All of the doctoral candidates in this study were from one university. As Kitch and Fonow (2012) found in their study, some schools have a tendency to have a “signature” methodology. Since this study only examined one university’s Ed.D. program, it is possible that in this particular university, one methodology may be more encouraged than the other, which would skew the results of this study. Thus, the results of this study may not be generalizable to all Ed.D. programs.

Not all students in this study indicated a religious affiliation. Upon application to the university, students filled out a survey indicating their religious affiliation, and included as options were many different religions, denominations, an “Other” category, and a “None” category. However, many students declined to answer this particular question. The lack of answer of this question could have skewed the sample for religious affiliation in this study. Some students may have felt uncomfortable sharing their affiliation and did not answer, even if they were affiliated with a religion.

CONCLUSIONS

The null hypothesis for this study was not rejected, as there was no significant relationship between dissertation methodology choice and biological sex, ethnicity, age, and religious affiliation. This research contributes to the knowledge base of methodology

choice. Plowman and Smith (2011) provided a study that looked in-depth at the methodology choices of men and women in various professional journals. Although this study contradicts the results of that study, it answers the call for additional research in this area. This study is also the first known study that examines the combination of biological sex, ethnicity, age, and religious affiliation in the context of methodology choice. Although much research has examined these variables regarding mathematics anxiety, attitudes, and achievement, this study is unique in that it examines the combination of these variables in the context of dissertation methodology choice. Using intersectionality as a framework, this study considers the interactions of these dimensions of identity and the relationship that they have on methodology choice. Research that studies intersectionality in relationship to methodology choice is lacking, and this study adds to the knowledge base of intersectionality and the dimensions of identity that affect choices of individuals.

As Flynn, Chasek, Harper, Murphy, and Jorgensen (2012) discussed, the dissertation process is extremely important in doctoral programs. The dissertation allows candidates to become self-directed learners, develops candidates into researchers, and allows for new developments in various fields of study. As Flynn et al. (2012) also noted, the dissertation phase of a doctoral program is where candidates are most at risk of dropping out of the program. The lack of research in the dissertation is problematic, especially considering the importance of the dissertation in doctoral programs. This study adds to the knowledge base of the dissertation process and provides a starting point for other areas that need more research.

The finding of a high number of female students in Ed.D. programs has implications for higher education. This higher-education gender gap reversal has several implications for higher education administration and researchers. As Bae et al. (2000) discussed, the gains of women in education should be celebrated, including their higher rates of persistence, application, and achievement in higher education, but higher education administrators should make it a priority for their programs to attract both men and women and assist both men and women to succeed while completing these programs.

RECOMMENDATIONS FOR FURTHER RESEARCH

There are several areas related to this study where future research is recommended. Because this study only examined dissertations from one university, it would be beneficial for similar studies to be conducted at other universities. In addition, the high number of women in this Ed.D. program and in higher education in general is an area that calls for more research. Studies that focus on men in Ed.D. programs would be beneficial for university administration to understand their motivations for entering the program. In addition, studies focusing on female students and their motivation for completing an Ed.D. program in the context of human capital theory could investigate whether underlying economic reasons exist for the reverse-gender gap.

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