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Examining the Relationship between the Research Training Environment, Course Experiences, and Graduate Students' Research Self-Efficacy Beliefs

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Abstract

This study examined the relationship between graduate students' research training environment, course experience, and research self-efficacy beliefs. The findings of the descriptive and regression analyses suggest that graduate students' (n = 161) general research, quantitative, and qualitative research self-efficacy beliefs varied and that these beliefs were related to different aspects of the research training environment and course experiences, including their own personal research experiences. While course experience variables were significant predictors of quantitative and qualitative research self-efficacy, they were not predictive of general research methods self-efficacy. Also, while mentorship was a significant predictor of general research methods self-efficacy, it was not a significant predictor of quantitative and qualitative research self-efficacy. The implications of this study for research and graduate education are discussed.

Keywords: graduate student, professional development, research, self-efficacy, training

Introduction

Graduate programs are designed to assist students in developing the relevant knowledge and skills needed to be successful in their professional careers. While most graduate students eventually find careers after they graduate, many seeking jobs in academia report a lack of readiness (Nyguist et al., 1999). Additionally, experts across the domains of educational research (e.g., psychology, counseling, administration) have complained that numerous graduates lack the basic research skills necessary to be successful

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in their respective field's faculty positions (Zhang, 1998). While it may be possible that this lack of readiness and ability is due to graduate students not actively participating in research during the course of their graduate training (Stoltenberg et al., 2000), researchers have suggested that many graduate programs fail to incorporate these aspects of the field that would make their doctoral students marketable and capable (Adams, 2002; Boyer, 1996; Cody & Hageman, 1997).

Being successful in academia requires mastery of numerous skills. It is not the case that graduate students do not value or seek help in preparation for their future careers (Nagle, Suldo, Christenson, & Hansen, 2004). Instead, many students are unaware of the skills that they need to master (Trower, Bleak, & Newman, n.d.) and, upon graduation, realize that their prior training environment (time in the graduate program) did not help them develop the skills that they are expected to have (Meyers, Reid, & Quina, 1998). This feeling of being underprepared, even after multiple years of education, has been shown to decrease graduates' levels of confidence in their ability to successfully find and maintain a career in academia (Austin, 2003; Furniss, Blomquist, Butler, McDougall, & O'bannon, 2002; Golde & Dorey, 2001; Miller & Lambert-Shute, 2009). Being confident in one's self has tremendous implications for motivation and behavior (Bandura, 1977, 1986, 1997). In the following review of the literature we discuss the role of one's confidence to be successful in academia and related tasks (i.e., self-efficacy; Bandura, 1977, 1986, 1997), how this confidence is framed in regards to research-related tasks, what research has suggested about building an individual's self-efficacy for performing research-related tasks, and why further research in this field is necessary for enhancing the development of our graduate training programs.

The confidence that an individual has about the likelihood of being successful in his or her endeavors has been frequently studied in education. A key component of Bandura's (1986) social cognitive theory is the perception of one's ability known as self-efficacy. Bandura (1997) defined self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). Developed through lived and observed events, individuals are better able to make appraisals regarding what they believe they are capable of successfully doing (Bandura, 1977, 1997; Bong, 2006). Experiencing success and observing similar others succeed in given tasks can help to build an individual's confidence in his or her ability to successfully engage and complete a task (Bandura, 1986, 1997). Similarly, experiencing and observing failure can undermine the development of self-efficacy (Bandura, 1986, 1997). In order for lived and observed experiences to influence the development of an individual's self-efficacy beliefs, accurate attributions of the outcome are necessary. While a discussion of attribution theory and its role in Bandura's (1986) social cognitive theory is beyond the scope of this discussion, a seminal discussion can be found in the works of Bernard Weiner (1976, 1979).

In the context of career planning and preparation, positive self-efficacy beliefs influence the types of goals that are set, the perceptions about outcomes of engagements, and the level of persistence that individuals will expend (Lent, Brown, & Hackett, 1994). Forester, Kahn, and Hesson-McInnis (2004) defined self-efficacy in research as "one's confidence in successfully performing tasks associated with conducting research" (p. 4). The confidence that graduate students maintain about their ability to design studies, collect and analyze data, and write a well-organized manuscript might further influence their research-oriented goals, expectations of performing research, and the effort expended during the process.

Indeed, graduate students' research self-efficacy beliefs have been examined in regards to their influence in the development of research attitudes (e.g., Bishop & Bieschke, 1998; D. M. Szymanksi, Ozegovic, Phillips, & Briggs-Phillips, 2007) and have even been able to account for the variability in graduate student research productivity (Hollingsworth & Fassinger, 2002; Kahn & Scott, 1997; Phillips & Russell, 1994). As graduate students master various aspects of research, their levels of confidence to successfully engage and maintain a research project also increase. The increase in self-efficacy beliefs subsequently influences the attitudes that graduate students

hold toward research (Bishop & Bieshke, 1998) and the extent to which they engage in research (Kahn & Scott, 1997). Knowing how self-efficacy can promote pro-research orientations and the frequency of engagement in research-related activities, it is important to consider what the research suggests about the graduate program's role in helping students master research skills and develop their self-efficacy beliefs for engaging in research.

Previous research has suggested that courses intensely focused on research training are more likely to bolster graduate students' research self-efficacy beliefs compared to general research courses (Gelso & Lent, 2000; E. M. Szymanski, Whitney-Thomas, Marshal, & Sayger, 1994). Cross-sectional studies have further examined the professional and academic research training environments, faculty mentors, and previous research-oriented experiences (e.g., publications, conferences, presentations) with promising results (e.g., Hollingsworth & Fassinger, 2002; Kahn, 2001; D. M. Szymanksi et al., 2007). The research-training environment, composed of interpersonal and instructional factors, has shown to be a consistent predictor of graduate students' research self-efficacy beliefs (Bishop & Bieschke, 1998; D. M. Szymanski et al., 2007). That is, through the observation of models, being reinforced for producing research, practicing research, and engaging in research with others, graduate students tend to feel more self-efficacious in their abilities to successfully engage in research-oriented behaviors and tasks. Most of the research on graduate students' research self-efficacy has examined the enactive and vicarious experiences that influence personal beliefs of ability (Bishop & Bieschke, 1998; Gelso, Mallinckrodt, & Judge, 1996).

Graduate students' self-efficacy beliefs for engaging in a diverse range of research-related activities have the potential to influence interest development, performances, and vocational decisions (Gelso & Lent, 2000; Lent et al., 1994). Within a Social Cognitive Career Theoretical Framework (SCCT; Lent et al., 1994), researchers have devised three models that explain vocational decisions, interests, and performance. While each of these models utilizes a mixture of social cognitive constructs (e.g., self-efficacy, outcome expectations, goals), they all focus heavily on the self-efficacy beliefs that an individual has about his or her research abilities to perform tasks in a given domain and context. In fact, the prevalence of self-efficacy in Bandura's social cognitive theory (1986) and SCCT has made it a construct worthy of extensive research.

In Lent and colleagues' (1994) SCCT models, social cognitive variables are modeled to explain their influence on vocational choices, the development of interests, and the performance while engaging in a variety of activities. The *choice model* describes a process in which an individual's career-oriented goals influence his or her decisions to pursue a particular career. Influenced by occupationally related self-efficacy beliefs, interests develop that lead to occupational choice goals (Brown & Lent, 2006; Lent et al., 1994). These goals, in turn, help to motivate individuals to engage in behaviors beneficial to achieving their career-related goals. The *performance model* has been used to predict and explain levels of success, quality of performances, and the persistence in confronting obstacles during career-related pursuits (Brown & Lent. 2006; Lent et al., 1994). According to this model, performance is influenced by prior ability, self-efficacy beliefs, outcome expectations, and goals (Lent et al., 1994). The *interest model* is very similar to the *choice model* with the difference being that occupational interests develop as a pattern of engagements and interpreted outcomes manifest as likes and dislikes for the individual. An individual that continually experiences failure with each engagement for a particular activity and ultimately comes to perceive failure as a consequence might be less interested to engage in that activity than someone with confidence for success and positive outcome expectations.

Previous research is replete with examples highlighting the value of positive self-efficacy beliefs in the development and preparation of graduate students (Lev, Kolassa, & Bakken, 2010; Maier & Curtin, 2005; Perepiczka, Chandler, & Becerra, 2011; Phillips & Russell, 1994; West, Kahn, & Nauta, 2007; Zajacova, Lynch, & Espenshade, 2005). Holding to the tenets of Bandura's (1986)

social cognitive theory and Lent and colleagues' (1994) social cognitive career theory, high research self-efficacy beliefs orient graduate students to establish more challenging research goals, maintain positive expectancies for their engagements, and increase the frequency of productive research behaviors (e.g., Kahn, 2001). Training in research design and methodologies has been vital in the push to increase graduate student research self-efficacy (Belar, 2000; Ramsey, Cavallaro, Kiselica, & Zila, 2002). Additionally, academic environments that support research and collaboration have also been known to bolster graduate student research self-efficacy (Hollingsworth & Fassinger, 2002; Unrau & Beck, 2004). While individual components of the academic environment have been shown to influence the development of graduate students' research self-efficacy, there has been little to no research that explains what components influence this development most and if these components are the same across the different research methodologies. To illustrate our research model, we aim to examine the predictive relationship that aspects of the training environment (e.g., graduate program and related research activities) share with graduate students' research self-efficacy beliefs. Figure 1 illustrates this predictive relationship; however, it is important to consider that we seek to examine the predictive influence on self-efficacy for research related tasks as they may be described as *general*, *quantitatively oriented*, and *qualitatively oriented.*

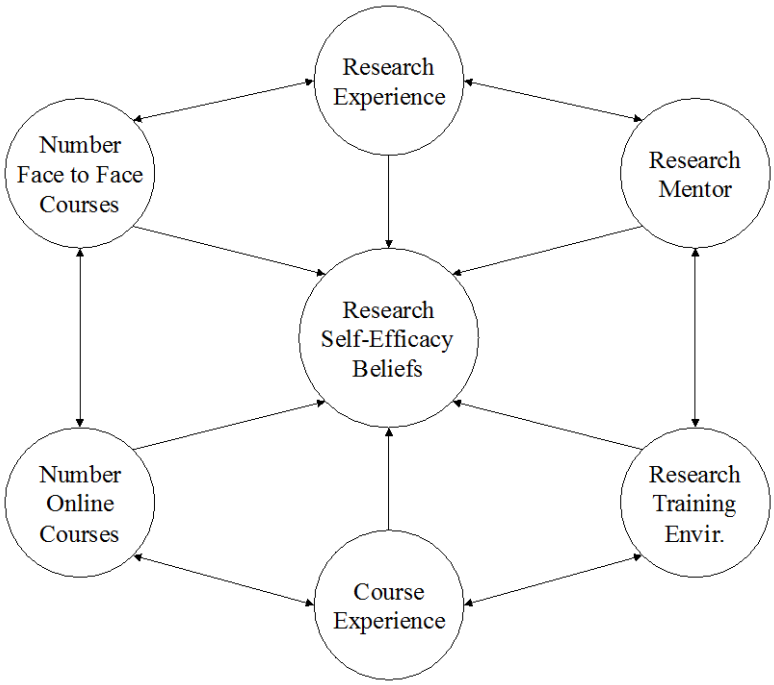

Figure 1. Theoretical model guiding current study suggests that all perimeter constructs uniquely and jointly inform the variance found within our dependent variable, *Research Self-Efficacy*. This model illustrates the expected shared relationships of the perimeter constructs and their hypothesized predictive relationships shared with research self-efficacy.

Purpose of the Study

The purpose of this study was two fold. First, this study was designed to add to the knowledge base regarding research self-efficacy, research team experience, course experience, research training environment, and research mentorship in the context of graduate student training. Second, the researchers designed the study to have a potential institutional impact on the direction and focus of graduate education. To fulfill these purposes, this study was designed to examine the relation-

ships among research training environment and course experience variables using a survey research design to answer the following research questions:

1. What is the nature of graduate students' research training environment and course experiences?
2. What is the nature of graduate students' research self-efficacy beliefs?
3. Do research training environment and course experience variables predict graduate students' research self-efficacy beliefs?

Methods

Participants

Participants in this study were graduate students enrolled in the College of Education situated in a large university in the Southwest region of the United States. One hundred and sixty one participants volunteered to complete a face-to-face survey. The graduate students in this study were comprised of 23.1% males and 68.8% females (8.1% missing) and represented a diversity of cultural backgrounds with 51.6% White, 17.4% Asian, 13.7% Hispanic, and 5.0% Black/African American. Approximately 6.7% classified themselves as Hawaiians / Pacific Islanders, American Indians, and other (5.6% missing). Forty-five percent of the participants were pursuing a master's of education degree, 10% were pursuing a doctor of education degree, and 35% were pursuing a doctor of philosophy degree. Ten percent of the participants did not respond with the type of degree being sought. The majority of the participants came from the counselor education program (27.3%), followed by higher education and administration (18%), curriculum and instruction (8.7%), instructional technology (7.5%), and educational psychology (6.8%). The rest of the participants indicated majors from different departments across the university.

Data Collection

Participants volunteered to complete the face-to-face questionnaires during time allotted by course instructors. The study spanned a fall and spring semester to capture more participants from courses offered once a year, but designed so as not to capture student data twice. Given pragmatic and efficiency issues that arose during the first semester of data collection in the fall, revisions to the data collection procedures were modified for the spring.

In the fall semester we utilized the full questionnaire (containing all items from all constructs) with a variety of forms based upon construct randomizing techniques (e.g., to reduce data effects associated with orders of items on long questionnaires). We split the questionnaire into two parts and administered them with a two-week interval between each administration. After collecting complete student data in the fall, we realized that this procedure had severe limitations. Data collection across multiple time periods was responsible for incomplete student data due to a number of factors. Primarily, however, the missing data were influenced by students completing data at one time point and then being absent for the second (or vice versa). In order to enhance data completion rates for the spring semester, we utilized a planned missing design to systematically reduce the number of items in the questionnaire by 25% so that students could complete the questionnaire in one sitting.

To elaborate on the planned missingness approach to data collection, three versions of the questionnaire were formed using the measures, with a variant of the three-form planned missingness approach (Graham, Hofer, & MacKinnon, 1996; Little & Rhemtulla, 2013). This was implemented by dividing items from each subscale evenly into four groups (i.e., Groups X, A, B, C). To ensure more items were retained in the common (X) group, we utilized a stacking technique. Figure 2 illustrates the use of a stacking procedure to increase the number of common items and

distribute the rest through the forms. These forms were combined to create a final form containing Group X and two of the others (i.e., forms XAB, XAC, XBC). With 25% of the data missing completely at random (MCAR), the missing data points were recovered using multiple imputation in the R package, *mice* (van Buuren, 2007; van Buuren & Groothuis-Oudshoorn, 2011). Each of these forms contained all or some of the items from the measures described below.

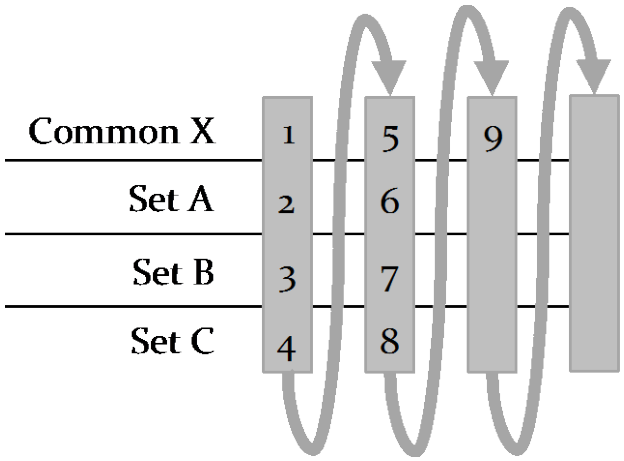

Figure 2. Using a stacking technique to distribute items of a subscale across the four groups (e.g., X, A, B, C). The stacking technique ensures priority to the common group that will be included in all three of the forms (e.g., XAB, XAC, XBC).

Research experience survey

Participants' experiences with research were measured using a 22-item questionnaire created by the researchers that asked participants to respond to prompts about a task involved in the research process. Participants placed a check next to the task to indicate that they had engaged in the task, such as "identify a research problem that can be researched scientifically" and "write a Human Subjects Proposal to obtain permission from the Institutional Review Board (IRB) to conduct your study." Prompts in the questionnaire reflected both general and specific (e.g., quantitative, qualitative) tasks involved in the research process. The number of checks can range from 0 to 22. We considered individuals with more checks to have more experience with research activities than someone with fewer checks.

Research training environment scale

Perceptions of the research-training environment were measured using the positive reinforcement of scholarly activities, low threat involvement in research activities, teaching relevant statistics and the logic of decisions, and teaching that all experiments are inevitably flawed subscales from the revised Research Training Environment Scale [RTES] (Gelso et al., 1996). Using a 5-point Likert-type scale, this 24-item adapted scale required participants to report on a scale from (1) "disagree" to (5) "agree" when responding to, statements such as "my graduate program rarely acknowledges the scholarly achievements of the students" and "I was encouraged to get involved in some aspects of research early in my graduate training." Scores can range from 5 to 120. Higher scores on the measure indicated favorable training environment. Scores on this measure were reliable as estimated by Cronbach's alpha of .81.

Mentor effectiveness scale

Perceptions of the effectiveness of research mentors were measured using an adapted form of the Mentor Effectiveness Scale (Berk, Berg, Mortimer, Walton-Moss, & Yeo, 2005). Using a 6-point

Likert-type scale, this 12-item scale required participants to rate their level of agreement using a scale from (1) "strongly disagree" to (6) "strongly agree." Participants responded to prompts such as, "my research mentor is accessible" and "my research mentor demonstrates content expertise in my area of need." Scores can range from 12 to 72. Higher scores on the scale indicate higher levels of good relationship with mentors. Scores on this measure were reliable as estimated by Cronbach's alpha of .97.

Course experience questionnaire

Perceptions of course experiences were measured using the Course Experience Questionnaire (Ramsden, 1991; Wilson, Lizzio, & Ramdsen, 1997). Using a 6-point Likert-type scale, this 23-item scale asked participants to respond on a scale from (1) "strongly agree" to (6) "strongly disagree" to prompts about good teaching, appropriate assessments, clear goals and standards, generic skills, and appropriate workload. Before analysis, codes were reversed so that higher scores were an indication that graduate students were satisfied with course experience. Scores can range from 23 to 138. Scores on this measure were reliable as estimated by Cronbach's alpha of .86.

Research coursework completion questionnaire

The researchers created a questionnaire to identify the number of the research methods and statistics courses that graduate students completed prior to this study. This short questionnaire provided a list of courses offered in each of the three major areas (e.g., general research methods, quantitative research methods, and qualitative research methods) in the college of education and also blank spaces for the participant to fill in courses that may have been completed outside of the college or university. The participants responded to the questionnaire by indicating the courses taken and specifying whether it was taken in a face-to-face setting or online. Higher scores indicate more research methods and statistics courses graduate students have taken.

Research self-efficacy inventory

Research self-efficacy was measured using three of the four independent scales of the Research Self-Efficacy Inventory (RSEI) (Siwatu & Pasupathy, 2012). The three scales used were the (1) General Research Self-Efficacy Scale (GRSE), (2) Quantitative Research Self-Efficacy Scale (QnRSE), and (3) Qualitative Research Self-Efficacy Scale (QlRSE). All items were measured on a scale from (0) "No Confidence At All" to (100) "Completely Confident" in response to questions that asked, "How confident are you that you can… [insert task]?"

The GRSE consists of 10 items in which participants were asked to rate how confident they are in their ability to execute general research tasks associated with Creswell's (2002) six steps in the research process. These processes include identifying a research problem, reviewing the literature, specifying a purpose, collecting data, analyzing and interpreting data, and reporting the results of the study. Participants' responses to each of the 10 items were summed to generate a total score. Total scores could range from 0 to 1000. Participants with higher scores on the scale are more confident in their ability to design and conduct a research study compared to those with lower scores. Prior uses of the GRSE have averaged an internal consistency of .93. This study corroborated that finding with a Cronbach alpha of .90.

The QnRSE consists of 13 items in which participants were asked to rate how confident they are in their ability to carry out tasks associated with designing and conducting a quantitative research study. Participants' responses to each of the 13 items were summed to generate a total score. Total scores could range from 0 to 1300. Participants with higher scores on the scale are more confident in their ability to design and conduct a quantitative research study compared to those with lower scores. Prior use of the QnRSE yielded an internal consistency of .98. This study corroborated that finding with a Cronbach alpha of .95.

The QlRSE consists of 8 items in which participants were asked to rate how confident they are in their ability to carry out tasks associated with designing and conducting a qualitative research study. Participants' responses to each of the eight items were summed to generate a total score. Total scores could range from 0 to 800. Participants with higher scores on the scale are more confident in their ability to design and conduct a qualitative research study compared to those with lower scores. Prior use of the QlRSE yielded an internal consistency of .96. This study corroborated that finding with a Cronbach alpha of .92.

Results

The Nature of Graduate Students' Training Environment and Course Experiences

Complexity of sampling frame and response influence

Given the diversity of the participants that completed our questionnaires, it is important to consider how a participant's level of study might influence response patterns. More specifically, it would be naïve to believe that no differences existed between master and doctoral students. Additionally, the potential for response difference between levels of doctoral work are also possible as the Ed. D. and Ph. D. programs are quite different at the university where participants were sampled. To determine whether the diversity of degrees influenced response patterns, a series of ANOVAs were conducted with each of the predictors and outcomes. While potentially inflating the Type I error rate by not utilizing an alpha adjustment procedure, we did not consider it to be problematic if multiple differences emerged. In this instance, adjusting alpha levels and potentially finding no significant differences might do more harm in understanding how students respond to prompts about their experiences in research and coursework.

In understanding how students responded to the independent variables, results from the ANOVA models suggested that Ph. D. students responded with significantly higher frequencies of online courses for general, quantitative, and qualitative research methods courses than their master student peers. No significant differences were found between Ph. D. and Ed. D. students. For face-to-face courses, Ph. D. and Ed. D. students responded with higher frequencies of courses taken in quantitative and qualitative research methods than their master student peers. In regards to research experiences, Ph. D. and Ed. D. students had significantly more experience than their master student peers ($F(2,141) = 21.075$, $p < 0.001$; $\Delta M_{EdD=Med} = 6.81$, $\Delta M_{PhD=Med} = 6.04$). For course experiences, level of student was only significant for quantitative research methods courses, where M. Ed. students reported slightly better course experiences than their Ph. D. peers ($F(2,141) = 3.281$, $p < 0.05$; $\Delta M = 0.22$). Regardless of the level of study, responses did not differ when asked about research mentors. Finally, level of study was also meaningful for the dependent variables, research self-efficacy beliefs in general and quantitative research methods ($F(2,141) = 15.470$, $p < 0.001$; $F(2,141) = 20.859$, $p < 0.001$). More specifically, Ph. D. and Ed. D. students responded with much higher levels of research self-efficacy than their master student peers ($\Delta M_{Quant*PhD-MEd} = 13.76$, $\Delta M_{Quant*EdD-MEd} = 32.36$, $\Delta M_{Gen*PhD-MEd} = 12.07$, $\Delta M_{Gen*EdD-MEd} = 20.61$). Additionally, Ed. D. students reported significantly larger self-efficacy beliefs than their Ph. D. peers ($\Delta M_{Quant} = 18.60$, $\Delta M_{Gen} = 8.54$). Table 1 summarizes the results from the ANOVA analyses.

Table 1. *Role of Degree Level in Determining Response Patterns*

Construct	*F* – value	*p*	η^2	Group Comparison	Difference	*p*
Research Self-Efficacy – Gen	15.470	< .001	.180	Ph. D. – M. Ed.	12.07	< .001
				Ph. D. – Ed. D.	- 8.54	Non
				Ed. D. – M. Ed.	20.61	< .001
Research Self-Efficacy – Quant	20.859	< .001	.228	Ph. D. – M. Ed.	13.76	< .001
				Ph. D. – Ed. D.	- 18.60	< .01
				Ed. D. – M. Ed.	32.36	< .001
Research Self-Efficacy – Qual	0.984	Non	-	-	-	-
Research Mentor	2.678	Non	-	-	-	-
Research Training Environment	5.433	< .01	.072	Ph. D. – M. Ed.	0.22	< .005
				Ph. D. – Ed. D.	0.07	Non
				Ed. D. – M. Ed.	0.16	Non
Course Experience – Gen	0.985	Non	-	-	-	-
Course Experience – Quant	3.281	< .050	.044	Ph. D. – M. Ed.	- 0.22	< .05
				Ph. D. – Ed. D.	- 0.03	Non
				Ed. D. – M. Ed.	- 0.19	Non
Course Experience – Qual	0.527	Non	-	-	-	-
Research Experience	21.075	< .001	.230	Ph. D. – M. Ed.	6.04	< .001
				Ph. D. – Ed. D.	- 0.77	Non
				Ed. D. – M. Ed.	6.81	< .001
Face-to-Face Courses – Gen	2.393	Non	-	-	-	-
Face-to-Face Courses – Quant	36.845	< .001	.343	Ph. D. – M. Ed.	1.39	< .001
				Ph. D. – Ed. D.	- 0.05	Non
				Ed. D. – M. Ed.	1.44	< .001
Face-to-Face Courses – Qual	12.941	< .001	.155	Ph. D. – M. Ed.	0.54	< .001
				Ph. D. – Ed. D.	0.05	Non
				Ed. D. – M. Ed.	0.49	< .050
Online Courses – Gen	3.185	< .050	.043	Ph. D. – M. Ed.	0.22	< .050
				Ph. D. – Ed. D.	0.17	Non
				Ed. D. – M. Ed.	0.05	Non
Online Courses – Quant	11.626	< .001	.142	Ph. D. – M. Ed.	0.47	< .001
				Ph. D. – Ed. D.	0.23	Non
				Ed. D. – M. Ed.	0.24	Non
Online Courses – Qual	9.369	< .001	.117	Ph. D. – M. Ed.	0.41	< .001
				Ph. D. – Ed. D.	0.22	Non
				Ed. D. – M. Ed.	0.19	Non

Research experience survey

Participants in this study had a mean score of 9.76 (*SD* = 6.55) on the Research Experience Survey. Participants' scores on the scale ranged from 0 to 22. Based on the descriptive analysis,

graduate students have more research experience in identifying a research problem that can be researched scientifically and writing a literature review about a particular research topic. On the other hand, graduate students have little research experience in analyzing qualitative data using a software program, implementing strategies to enhance the trustworthiness of a qualitative study, and conducting appropriate qualitative analysis to answer specific research questions.

Research training environment scale

Participants had a mean score of 79.94 (*SD* = 9.22) on the Research Training Environment Scale with total scores ranging from 55 to 114. The item-specific means ranged from 2.17 to 3.80 and suggest that graduate students' research training environment was from *moderately good to good*. The item-specific means suggest that graduate students mostly agreed with the following statements: (1) I get the impression from my training that, although a single study does not revolutionize thinking in the scientific community, such a study can contribute a useful piece to an unfolding body of knowledge (*M* = 3.80, *SD* = .86), (2) Students here are encouraged to at least begin thinking about one or more topics upon which they would like to conduct programmatic research (*M* = 3.67, *SD* = .94), and (3) My graduate program rarely acknowledges the scholarly achievements of the students (*M* = 3.66, *SD* = 1.13). On the other hand, graduate students mostly disagreed with the following statements: (1) Statistics courses here are taught in a way that is insensitive to students' level of development as researchers (*M* = 2.17, *SD* = 1.58), (2) Much of the research in which we become involved prior to the thesis is organized in a way that is highly anxiety provoking to students (*M* = 2.81, *SD* = .88), and (3) I have gotten the impression in my graduate training that my research work has to be of great value in the field to be worth anything (*M* = 2.83, *SD* = .92).

Mentor effectiveness scale

Participants in this study had a mean score of 63.97 (*SD* = 6.42) on the Mentor Effectiveness Scale. Participants' scores on the scale ranged from 12 to 72. The item-specific means ranged from 4.84 to 5.53 and suggest that graduate students' relationship with their mentors ranged from *good* to *very good*. The item-specific means suggest that graduate students agreed most with the following characteristics of their mentors: (1) demonstrating professional integrity (*M* = 5.53, *SD* = .49), (2) being accessible (*M* = 5.47, *SD* = .71), (3) motivating me to improve my work product (*M* = 5.43, *SD* = .62), (4) answering my questions satisfactorily (*M* = 5.21, *SD* = .74), and (5) challenging me to extend my abilities (*M* = 5.22, *SD* = .72).

Course experience questionnaire

Participants in this study had a mean score of 92.62 (*SD* = 14.29) on General Research Method courses, a mean score of 92.89 (*SD* = 13.78) in Quantitative Research Method courses, and a mean score of 98.63 (*SD* = 13.58) in Qualitative Method courses. Participants' scores on the scale ranged from 57 to 131 in GRM, from 53 to 127 in QTRM, and from 59 to 133 in QLRM. Graduate students found certain characteristics to be salient throughout their experiences, indicated by their levels of agreement.

For general research methods courses, they were predominantly in agreement that it was easy to know the standard of work that was expected (M = 4.92, SD = 1.26), I usually had a clear idea of the goals (M = 4.49, SD = 1.25), and the instructor made a real effort to effort to understand my difficulties (M = 4.43, SD = 1.46). For quantitative methods courses, graduate students were predominantly in agreement that it was easy to know the standard of work that was expected (M = 4.93, SD = 1.07), the instructor motivated me to do my best work (M = 4.78, SD = 1.14), and I usually had a clear idea of the goals (M = 4.61, SD = 1.35). For qualitative methods courses, graduate students were predominantly in agreement that the instructor made expectations clear

from the beginning of class (M = 4.95, SD = 1.12), the instructor normally gave me helpful feedback on how I was doing (M = 4.86, SD = 1.25), and my instructor was good at explaining things (M = 4.76, SD = 1.23).

Research coursework completion questionnaire

At the time of data collection, graduate students reported having completed 0 to 3 general research methods courses (M = 0.49, SD = 0.66), 0 to 5 quantitative research methods courses (M = 0.89, SD = 1.27), and 0 to 4 qualitative research methods courses (M = 0.41, SD = 0.82). The data suggests that there is a great variation in research courses taken by graduate students. Most research courses graduate students have taken are quantitative research courses. Graduate students reported taking fewer qualitative research courses, which might explain why graduate students do not have experience with qualitative research.

The Nature of Graduate Student Research Self-Efficacy Beliefs

Graduate students rated their general research self-efficacy from 0 to 968 (M = 617.92, SD = 186.31), quantitative research self-efficacy from 0 to 1246 (M = 653.98, SD = 292.66), and qualitative research self-efficacy from 0 to 740 (M = 373.99, SD = 170.21). To compare the results across the scales on the original 100-point scale, we calculated strength indexes (mean scores). Strength indexes ranged from 0 to 96.8 (M = 61.79, SD = 18.63) for GRSE, 0 to 95.85 (M = 50.31, SD = 22.51) for quantitative research self-efficacy, and 0 to 92.5 (M = 46.75, SD = 21.28) for qualitative research self-efficacy. The results suggest a wide range of self-efficacy beliefs for graduate students, ranging from no confidence to complete confidence. The data suggest that comparatively speaking, graduate students had moderately high self-efficacy beliefs in general research methods and were less confident in their abilities to engage in tasks related to quantitative and qualitative research methods. Table 2 summarizes the nature of graduate student self-efficacy beliefs by highlighting the items that received the highest and lowest self-efficacy appraisals for each of the scales.

Table 2. *Lowest and Highest Levels of Research Self-Efficacy*

	Lowest Research Self-Efficacy	Highest Research Self-Efficacy
General Research Methods	• Write a Human Subjects Proposal to obtain permission from the Institutional Review Board (IRB) to conduct your study. • Select an appropriate research design that will answer specific research questions. • Analyze data to provide answers to existing research questions. • Collect data using techniques that are suitable in answering research questions. • Write a research report documenting the findings of a research study.	• Search an electronic database for existing literature about a particular research topic. • Write a literature review about a particular research topic. • Identify a research problem that can be researched scientifically • Write research questions for a study that you are designing. • Draw conclusions on the basis of the findings of a research study.
Quantitative Research Methods	• Perform an analysis to establish an instrument's reliability. • Conduct a statistical analysis (e.g. correlation, ANOVA) using a statistical software program (e.g. SPSS).	• Select the appropriate sampling procedure to use in a quantitative study. • Locate resources that will help me interpret a printout containing the results of a statistical analysis."

	• Conduct a reliability analysis using a statistical software program (e.g. SPSS). • Use different statistical methods of data analysis (e.g. t-test, ANOVA) appropriate for hypothesis testing. • Implement strategies to enhance the accuracy of the conclusions that are drawn from the findings of a quantitative study.	• Collect quantitative data using techniques that are suitable in answering research questions." • Create a data file using a statistical software program (e.g. SPSS)." • Write a research report documenting the results of a quantitative study.
Qualitative Research Methods	• Analyze qualitative data using a software program (e.g. NVivo, NUD*IST). • Implement strategies to enhance the trustworthiness of a qualitative study. • Conduct the appropriate qualitative analyses to answer specific research questions. • Implement the appropriate sampling procedure after data collection has begun in a qualitative study.	• Write a research report documenting the findings of a qualitative study. • Select an appropriate qualitative research design to use in a study. • Implement the appropriate sampling procedure before collecting data in a qualitative study. • Collect data using techniques that are suitable in answering research questions within a qualitative study.

Predicting Graduate Student Research Self-Efficacy Beliefs

To better understand the role of research training environment and course experience variables in predicting graduate students research self-efficacy beliefs, three multiple regression analyses were conducted. For each analysis, the predictor variables were scored on the following measures: Research Experience Survey, Research Training Environment Scale, Mentor Effectiveness Scale, Course Experience Questionnaire, and Research Coursework Completion Questionnaire (i.e., number of research courses completed online or face-to-face). The criterion variable in each analysis was scores on the GRMSE, QnRSE, and QlRSE measures, respectively. For each analysis, a preliminary examination (e.g., casewise diagnostics, inspection of the normal probability plot and scatter plot) did not indicate any violations of the assumptions of multiple regression. In addition, correlation coefficients were computed to detect any variables that were highly correlated. The absence of highly correlated variables confirmed that multicolinearity was not a concern. A summary of each regression model is presented in Table 3 and described below.

The first multiple regression analysis conducted examined whether research training environments, research mentorship, research experience, course experiences, the number of general research methods courses taken online and face-to-face predicted graduate students' general research self-efficacy. Using a multiple regression model, a significant model emerged (F (6, 142) = 24.15, $p < .0001$), accounting for 51% of the variance in graduate students' general research self-efficacy. Within this model, research experience ($\beta = .56$, $p < .001$), research training environment ($\beta = .27$, $p < .001$), and research mentorship ($\beta = .15$, $p < .05$) made a significant contribution to the prediction of graduate students' general research self-efficacy. Failing to make significant contributions were course experience and the number of research courses taken online or face-to-face.

The second multiple regression analysis conducted examined whether research training environments, research mentorship, course experiences, the number of quantitative research methods courses taken online and face-to-face predicted graduate students' quantitative research self-efficacy. Using a simultaneous regression model, a significant model emerged (F (6, 142) = 21.29, $p < .0001$), accounting for 47% of graduate students' quantitative research self-efficacy.

Within this model, research experience (β = .46, $p < .001$), research training environment (β = .21, $p < .01$), and the number of face-to-face (β = .13, $p < .05$) and online courses taken (β = .13, $p < .05$) made a significant contribution to the prediction of graduate students' quantitative research self-efficacy. Failing to make significant contributions were research mentorship and course experience.

The third multiple regression analysis conducted examined whether research training environments, research mentorship, course experiences, the number of qualitative research methods courses taken online and face-to-face predicted graduate students' qualitative research self-efficacy. Using a simultaneous regression model, a significant model emerged (F (6, 142) = 10.30, $p < .0001$), accounting for 30% of graduate students' qualitative research self-efficacy. Within this model, research experience (β = .40, $p < .001$), the number of online (β = -.18, $p < .05$) and face-to-face courses taken (β = .17, $p < .05$) made a significant contribution to the prediction of graduate students' qualitative research self-efficacy. Failing to make significant contributions were research training environment, research mentorship, and course experience.

Table 3. *Predictors of Graduate Student General, Quantitative, and Qualitative Research Self-Efficacy*

	Standardized β Weights by Model		
Variable	GRMSE	QnRSE	QlRSE
Constant			
Research experience	0.56***	0.46***	0.40***
Research training environment	0.27***	0.21**	0.14
Research mentor	0.15*	0.11	0.10
Course experience	-0.07	0.04	0.07
Number of Online courses	0.05	0.13*	-0.18*
Number of Face-to-face courses	-0.02	0.13*	0.17*
R^2	0.51	0.47	0.30
F	24.15***	21.29***	10.30***

Note: *p<0.05, **p<0.01, **p<0.001

Discussion

In this study we sought to add to the knowledge base surrounding graduate students' research self-efficacy beliefs and their experiences with research teams, coursework, research training, and mentorship. We approached this objective by examining the nature of graduate students' research self-efficacy beliefs for general, quantitative, and qualitative research methods. We further examined the influence of different aspects of graduate education on students' research self-efficacy beliefs. Employing descriptive and inferential techniques, we were not only able to represent the self-efficacy beliefs of graduate students to engage in a variety of research methods, but we were also able to determine which aspects of their graduate education, including research training and coursework, had the largest influence on those beliefs.

In answering the research questions, interesting findings emerged. From the examination of research self-efficacy beliefs, self-efficacy indices (SI) suggested that the sample of graduate students was comprised of individuals with widely diverse beliefs about their ability to succeed in

research and the experiences that ultimately helped to develop those beliefs. When observing students' self-efficacy appraisals across the different research methods, trends suggested that research self-efficacy beliefs tended to decline from general research methods (SI = 61.79) to more specific techniques in quantitative (SI = 50.31) and qualitative methods (SI = 46.75). More specifically regarding research self-efficacy beliefs, while there was wide variability within different groups of students from different levels of study (e.g., M. Ed., Ed. D., and Ph. D.), there were meaningful differences between these groups. In fact, for quantitative and general research methods, Doctoral students were more likely to have higher self-efficacy appraisals than their peers in the masters' programs. Additionally, Ed. D. students tended to have higher research self-efficacy appraisals than their Ph. D. peers. While these higher appraisals maybe be due to the higher confidence associated with a professionally employed student (e.g., principals, teachers, administrators), it is also possible that these higher appraisals do not match their skills.

The mismatch in self-efficacy appraisal and skill level has been a commonly investigated problem in self-efficacy research known as miscalibration (Bandura, 1997). Individual's appraisals of ability (as measured through self-efficacy beliefs) are likely to be miscalibrated when they are not fully aware of the necessary prerequisites for success in a given task, which can be brought on by a lack of lived or observed experience and inappropriate feedback regarding those experiences (Bandura, 1997; Schunk & Pajares, 2009). While we were unable to account for the appraisal differences between Ed. D. and Ph. D. students, future research should aim to determine if Ed. D. students maintain higher appraisals for research self-efficacy beliefs and if these beliefs are calibrated with their abilities or if they are, indeed, misaligned.

The diversity in our sample not only prompted differential response patterns for research self-efficacy beliefs, but they also revealed differences in responses to the independent variables. More specifically, doctoral students reported more online and face-to-face research courses, more research experiences, and higher appraisals of the research-training environment. Given the nature of doctoral programs, these reported differences were not unexpected. However, even in the face of differential response patterns, these independent variables still predicted research self-efficacy beliefs for general, quantitative, and qualitative research methods. Given prior research in the field that has examined these predictors independently and on a single, combined form of research self-efficacy, being able to disaggregate the effects of these predictors, together and contextually relevant, on self-efficacy beliefs for general, quantitative, and qualitative research methods build upon prior research.

Results from our analyses suggested that self-efficacy beliefs for general, quantitative, and qualitative research methods shared unique predictive relationships with the independent variables. The only variable to share a common predictive trend was the research-training environment, which suggested a positive increase in self-efficacy beliefs for students who believed their training environment supported and promoted research and independence. Additionally, students who maintained that their research mentor was available to support and provide guidance for personal and shared projects were more likely to have higher self-efficacy beliefs for general research methods. This was not necessarily the case for self-efficacy beliefs for quantitative and qualitative research methods. Instead, students that completed more online and face-to-face quantitative research methods courses were more likely to report higher self-efficacy beliefs for methods associated with quantitative research. The number of completed research methods courses had mixed effects for self-efficacy beliefs in quantitative research. More specifically, students that completed more face-to-face courses were more likely to have higher self-efficacy beliefs; however, students that completed more online courses were more likely to have lower self-efficacy beliefs. This negative association warrants further investigation in future research endeavors.

Limitations

Our study is not without limitations. In the administration of our questionnaires, participation was limited only to those courses whose instructors would allow us to enter and collect data. While our sample size was sufficient for the research questions and analyses, our data collection was biased toward quantitative research methods courses, as they tended to have larger enrollment numbers and, by way of course catalog, have more variety and sections than qualitative research methods courses. Being able to target and collect data from online courses would not have only increased the overall sample size, but might have also allowed us to collect more information from participants in online qualitative research courses that could have helped to better understand why their traditional on-campus peers suggested these online environments were detrimental to their self-efficacy beliefs in qualitative research methods.

A limitation of our analyses and generalizations is that this study's inferential techniques were correlational in nature. While the relationships were based upon a sound framework as proposed in Bandura's (1986) social cognitive theory and Lent and colleagues (1994) social cognitive career theory, generalizing and suggesting causality can be quite limited. Controlling the experiences of graduate students and tracking their self-efficacy beliefs from entry until graduation would provide stronger evidence for the causal nature of these lived and observed experiences. Additionally, without asking the graduate students about their research self-efficacy beliefs we are left to analyze them at face value (Wyatt, 2012). Future studies should incorporate a qualitative phase to give students the opportunity to explain their appraisals and the extent to which the hypothesized predictors influenced their self-efficacy beliefs. This approach as this has had success in other areas of self-efficacy research (Siwatu, Chesnut, Young, & Alejandro, 2015).

Finally, due to issues of class selection and sampling, students from different levels of study from within the college of education and across the university were participants in our study. While we were able to obtain a wide range of graduate students, it has been well documented in this study that the responses to the questionnaires exhibited patterns based upon different groupings. While we were only able to examine the level of degree (e.g., M. Ed., Ed. D., and Ph. D.), it is possible that students from different departments and colleges within the university might have responded differentially. Future studies should aim to increase the sample size and reinvestigate whether differences in research self-efficacy exist within and between levels of study and departments. For example, do traditional students in an educational psychology program report higher self-efficacy beliefs than their peers in the counseling psychology program?

Implications

Based upon Bandura's (1994) social cognitive theory and Lent and colleagues (1994) social cognitive career theory, the likelihood for graduate students to engage in research is influenced by personal interest, environmental constraints, self-efficacy beliefs, and outcome expectations. As graduate students, many hold high interest in engaging in research in their future careers. Others, however, may still be unaware of their future career endeavors or envision a career as an educational practitioner where they do not believe research will be a pivotal component. From this study, we found that graduate students research self-efficacy beliefs are a function of the opportunities afforded to them through coursework, research teams and mentors, and the support that faculty provide to help break down barriers to students being able to gain knowledge and develop the confidence necessary to be successful in future research engagements. With this knowledge, we propose a few ways this information can benefit graduate student education.

In the examination of the predictors of research self-efficacy, personal research experiences proved to be the most influential. As expected by theories on self-efficacy development (Bandura, 1977, 1997), enactive (i.e., lived) experiences provide the strongest source of information

upon which individuals make appraisals about their abilities. Providing opportunities in class and in research projects to work with more advanced researchers (faculty and graduate students), graduate students can gain the exposure and experience necessary to test their knowledge of quantitative and qualitative research methods while interpreting their successes and failures with a more accurate measurement device (e.g., a more knowledge other).

Research mentorship, while a positive predictor of all research self-efficacy, was only significant in predicting self-efficacy beliefs for general research techniques. While prior research has suggested this association in relative isolation (e.g., Hollingsworth & Fassinger, 2002), it is important to recognize that even in the presence of many other predictors research mentorship can provide the experiences and appropriate feedback necessary to build the skills and knowledge that will help students move from periphery participation to more autonomous roles (Lave & Wenger, 1991). While not every graduate student will have access to a faculty advisor or mentor, the mentorship and support provided by other faculty members in the pursuit of a degree provides graduate students with a venue for practice and constructive feedback. By strengthening graduate student-faculty relationships, more opportunities arise for aspiring researchers to learn the general practices and procedures for conducting a study. This, in turn, increases graduate students' confidence to conduct research autonomously in the future.

Future Research

Future studies investigating the sources of graduate students' self-efficacy beliefs should look into the construction of face-to-face and online research methods courses and the influence that these media have on the encoding and interpretation of research experiences. For example, our study found that online courses negatively influenced graduate students' research self-efficacy beliefs to utilize qualitative research techniques. What is it about the nature of qualitative research methods, as taught in an online environment, that lead graduate students to doubt their abilities? Issues regarding the effectiveness of online qualitative research methods courses and their development need to be further examined.

Additionally, future research should further investigate the rationales and sources of information guide graduate students' appraisals of their research self-efficacy beliefs. According to Wyatt (2012) and Klassen, Tze, Betts, and Gordon (2011), the sole use of measures to interpret and draw implications for self-efficacy beliefs requires many assumptions, some of which may be incorrect. Because of this, we need to further explore the participants' perceptions of their research abilities and the sources of information that helped to inform them.

Conclusion

In conclusion, the experiences necessary to develop graduate student research self-efficacy is something that graduate programs need to focus on if they are to graduate individuals who are both competent and confident to engage in original and groundbreaking research when they transition into research careers. For interests to blossom in a profession dedicated to research, the graduate environment needs to expose students to the types of mastery, vicarious, and persuasive experiences that can facilitate powerful self-efficacy beliefs and positive outcome expectations (Brown & Lent, 2006).

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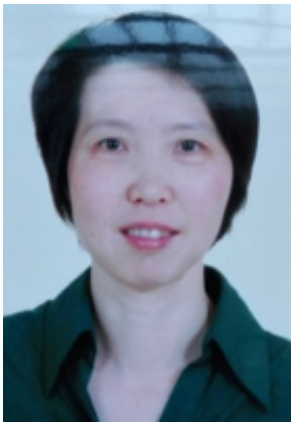

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