

Evaluating Research Self-Efficacy in Undergraduate Students: Experience Matters

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Abstract: Beliefs about conducting research and completing major projects, such as a thesis or marketing campaign, suggest that previous experience, guidance from a mentor, and cohesive teams are particularly important in boosting the confidence to conduct research in graduate students (i.e., research self-efficacy). Although these factors are also thought to be important for undergraduate students, much less is known about undergraduate interest in research and beliefs about conducting research. The purpose of the current study was to investigate the research self-efficacy of undergraduate students attending a minority- and first-generation-serving liberal arts institution. Over 500 undergraduate students attending a small private liberal arts university in south Texas completed surveys regarding their interest in conducting research, research self-efficacy, and various research experiences. Seventy-one percent were female, 37% were freshman, and 58% majored in the Humanities and Social Sciences. Fifty-four had never had a research experience other than completing a survey, whereas 17% had completed two or more research experiences. Greater interest in research was associated with higher levels of research self-efficacy. Students reporting research experiences were confident in their abilities to conduct research overall, and students with two or more experiences reported significantly higher levels of interest in research and research self-efficacy than students who had less or no experience. Qualitative analyses elucidated reasons for the observed differences. The results emphasize the continued need to expose undergraduate students to research across classes and disciplines. Practical suggestions for implementing opportunities to experience research are provided.

Keywords: Research self-efficacy, undergraduate research experience, interest in research, Hispanic serving institution (HSI), and PUI

Self-efficacy was originally defined by Bandura (1977) as a person's belief about his or her ability to successfully perform and complete a given task or behavior. Self-efficacy influences self-confidence, which in turn affects whether or not an individual will attempt and persist at a particular task (e.g., Artino, 2012). Increasingly, research on self-efficacy is demonstrating its ubiquity across disciplines, tasks, and behaviors (e.g., sports, academics, marketing, hobbies, research) as described by Artino (2012). In past research from almost a decade ago, self-efficacy played a critical role in student academic success; students with greater self-efficacy tried more difficult activities, persisted longer, and displayed more mature and efficient techniques in academic efforts (Artino, 2012; Robbins et al., 2004). A more recent meta-analysis continues to support a moderate correlation between self-efficacy and academic performance, but a causal connection has yet to be identified (Honicke & Broadbent, 2016).

Foundationally, all disciplines incorporate research, or the act of collecting information about a topic (<https://www.merriam-webster.com/dictionary/research>). For example, a marketing firm will conduct research to institute a campaign based on previous research; a chemist will conduct new experiments informed by previous research; a philosopher will read and discuss ideas from other sources to develop a new explanation. Thus, investigating student beliefs about research and their ability to conduct it is critical for teachers and scholars to facilitate student interest and efficacy in research in any discipline.

As the application of the construct of self-efficacy grows into diverse fields such as psychology, education, and business (cf. Artino, 2012), self-efficacy has been applied to research (cf. Forester, Kahn, Hesson-McInnis, 2004), specifically research conducted by graduate students. Research self-efficacy is defined as an individual's belief in his/her ability to carry out and complete tasks associated with research (Bishop & Bieschke, 1998) and has most often been investigated among counseling psychology students (Bieschke et al., 1996; Bishop & Bieschke, 1998; Gelso et al., 1996; Hollingsworth & Fassinger, 2002; Kahn, 2001; Kahn & Scott, 1997; Love et al., 2007; Phillips & Russell, 1994). Mixed methods approaches have been utilized to better understand how research experiences influence research self-efficacy of graduate students. The quantitative results indicate that doctoral candidates report similar levels of self-efficacy regardless of the magnitude of research experience, but, as students spend more time in a graduate program, the degree of reported research self-efficacy typically increased (Gelso et al., 1996; Hollingsworth & Fassinger, 2002; but see Kahn, 2001 for an exception). Qualitatively, the emerging themes suggest that the valence of previous research experience, that is if the experience was positive or negative, influenced the students' attitudes towards research. In particular, fit with the academic research training program and one's mentor were especially predictive of research self-efficacy, with misalignments found to be particularly damaging (Bieschke et al., 1995; Bishop & Bieschke, 1998; Gelso et al., 1996; Hollingsworth & Fassinger, 2002; Kahn, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994; Schlosser & Gelso, 2001).

Although research self-efficacy has been examined infrequently with undergraduate students, positive research experiences are posited to be inherently beneficial and more effective than classroom experience and have been identified as a high impact practice (HIP) (Craney et al., 2011; Frantz, De Haan, Demetrikopoulos, & Carruth, 2006; Lopatto, 2010; Russell et al., 2007). Undergraduate research experiences are varied, and include participation in participant research pools, class projects, capstone courses, independent research projects, or summer research programs (Prince, Felder, & Brent, 2007; Russell, Hancock, & McCullough, 2007). The research experiences may include independent and task-oriented laboratories, one-on-one mentoring, professional development, or hands-on research tasks (Adedokun & Burgess, 2011; Frantz et al., 2006; Lopatto, 2010; Russell et al., 2007). Studies of undergraduate and graduate students suggest that students' preconceptions about research can negatively shape experiences with research (Adedokun & Burgess, 2011; Sizemore & Lewandowski, 2009). For example, if students believe that research is time consuming, boring, difficult, and does not involve one-on-one mentoring, they are less willing to engage in research experiences (Adedokun & Burgess, 2011; Frantz et al., 2006).

Many negative preconceptions can be altered if students interact with enthusiastic mentors, work in small groups, start research early, and believe in their ability to conduct research. In other words, negative preconceptions can be changed if students develop research self-efficacy (Adedokun & Burgess, 2011; Bieschke, Bishop, & Garcia, 1996; Craney, McKay, Mazzeo, Morris, Prigodich, & de Groot, 2011; Gelso, Mallinckrodt, & Judge, 1996; Hollingsworth & Fassinger, 2002; Hunter, Laursen, & Seymour, 2007; Lopatto, 2010; Love, Bahner, Jones, & Nilsson, 2007; Russell et al., 2007; Secret, Ford, & Rompf, 2003). When negative preconceptions are challenged and positive research experiences are experienced, increased interest in research and a desire to pursue research in the future are common outcomes (Hunter et al., 2007; Lopatto, 2010; Love et al., 2007; Secret et al., 2009). Fostering research self-efficacy appears to empower post-baccalaureate students, including counseling graduate students (Love et al., 2007; Forester et al., 2012) and medical students (Artino, 2012), to view themselves as capable of conducting research and contributing to science. This cascade of outcomes embodies the idea of reciprocal causation within self-efficacy proposed by Bandura (1977, 1997). That is, expectations about performance are informed by the cumulative effects of performances over time. Within the context of research, students who expect to be able to conduct research, will attempt to

conduct research, and if successful, will continue to attempt to pursue research opportunities. With each success, confidence and belief in their ability to conduct research increases.

Research self-efficacy is most likely influenced by interest in research (Craney et al., 2011; Lopatto, 2010; Russell et al., 2007; Secret et al., 2009). Research has shown that students interested in science in high school continue to show interest in science during college (Lopatto, 2010). Studies with counseling graduate students in which the link between interest in research and research self-efficacy has been examined suggest that the two variables are both directly and indirectly linked (Bieschke et al., 1996; Bishop & Bieschke, 1998; Kahn, 2001; Kahn & Scott, 1997). Directly, the more one is confident in research, the more interest in research exists. However, indirectly, the greater the degree of interest in research, the more research one is willing to attempt, and if successful, the more research self-efficacy increases.

The present study attempts to expand our understanding of the links between research self-efficacy and research experiences by focusing on the role of undergraduate research experiences in fostering research self-efficacy. Literature suggests that when students are exposed to research in their undergraduate career, they are more inclined to pursue graduate school in the future (Hathaway, Nagada, & Gregerman, 2002). It should then come as no surprise that students that were exposed to research in their undergraduate careers felt more prepared for graduate school as compared to students that did not (Huss, Randall, Davis, and Hansen (2002). Additionally, Wayment and Dickson (2008) found that as the amount of research experience among undergraduates increased, graduate school acceptance rate increased as well.

To better understand how research experiences affect undergraduate students' self-reported interest in research and research self-efficacy, a study was conducted on the knowledge, beliefs, and importance of research of students enrolled in general psychology classes, experimental psychology classes, or prior to beginning a summer research program. Based on undergraduate enrollment metrics collected over the years, 1.2 to 1.6 million students enroll in an introductory psychology course annually (Steuer & Ham, 2008). As an elective, introductory psychology is the second most popular course for students in the United States behind English composition, a course that is typically required; 40% of all college students across majors take introductory psychology their first year (Adelman, 2004). Because of the ubiquity of enrollment in psychology courses across undergraduates, we suggest these data collected between 2013 and 2016 will allow us to assess the following hypotheses:

1. Interest in research is related to research self-efficacy in undergraduate students (Bieschke et al., 1996; Bishop & Bieschke, 1998; Kahn, 2001; Kahn & Scott, 1997; Love et al., 2007).
2. Demographic variables, such as gender, school of major, ethnicity, or class status do not influence interest in research or research self-efficacy (Lopatto, 2010).
3. The number of research opportunities that undergraduate students experience influences research self-efficacy (Lopatto, 2010; Hunter et al., 2007).
4. The nature of one's research experience (i.e., positive/negative) impacts research self-efficacy (Hunter et al., 2007; Lopatto, 2010; Love et al., 2007).

Method

Participants

Undergraduate students from a small liberal arts university in south central Texas participated in the study in partial fulfillment of a research participation requirement for students taking General Psychology or previous findings based on various regression models had indicated that, among

graduate students, relationship with mentor, positive team experiences, and experience with research training were critical factors in research self-efficacy (Bieschke et al., 1995; Bishop & Bieschke, 1998; Gelso et al., 1996; Hollingsworth & Fassinger, 2002; Kahn, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994; Schlosser & Gelso, 2001). Utilizing a regression approach that replicated the model conducted with graduate counseling students (Love et al., 2007), the results of our regression with a limited number of predictors failed to support the previous findings that working as a team predicted higher levels of reported research self-efficacy. In fact, working alone or with a group was not associated with undergraduate student confidence in conducting research. Rather, repeated experiences were important as a small positively correlated, but significant predictor, of research self-efficacy in addition to the strong, positively correlated and significant predictor of interest in research. One of the key components that emerged from the qualitative findings that complements the statistical results of the regression was the importance of student-reported, meaningful experiences with research, especially with regard to the mentor-protégée relationship (Craney et al., 2011). Although many students and professionals question the value of participating in research as a course requirement, some of the first-year students in the current study indicated in open-ended response that participating in a simple survey-based research project was a good approximation of the research process. These self-reported responses provide additional support for the justification of research participant pools, as proscribed by the American Psychological Association (APA, 2007) and supported by empirical studies (Kraut et al., 2004; Sullivan & Lashley, 2009). This qualitative information also provides evidence that encouraging students to participate in research pools across disciplines can be helpful in solidifying knowledge about research as well as possibly piquing interest in research.

Sample

Between 2013 and 2016, 579 unique surveys were administered with 503 participants completing the survey for the first time. Of first-time respondents, 71% ($n = 356$) were female, over-representing the university's equally distributed male:female ratio. Ethnicity was distributed as expected with 74% Hispanic/Latino ($n = 373$), 11% Caucasian ($n = 54$), and 7% other minorities including Asians, African Americans, and American Indians ($n = 35$). The remaining students did not identify ethnicity or endorsed several. Given the conditions under which the students were assessed, school of study and major/field of study were not evenly distributed with 57% reporting a Humanities/Social Sciences major ($n = 289$), 24% reporting a STEM major ($n = 120$), 3% reporting a Business major, and 16% reporting other ($n = 80$, most having dual majors).

Of the 579 respondents, 78 participants completed a follow-up survey within a four-month to two-year period. The follow-up sample consisted of 74% females ($n = 58$) and 26% male ($n = 20$). Half of the follow-up sample consisted of first-year or continuing first-year students ($n = 40$), 17% sophomores ($n = 13$), 18% upper-class students ($n = 14$), and 13% graduating or graduated seniors ($n = 10$). The majority of the respondents were Humanities/ Social Sciences majors (77%, $n = 60$) with 14% STEM majors ($n = 11$). The remaining participants did not identify a major.

Measures

The study utilized the Interest in Research Questionnaire (IRQ; Bishop & Bieschke, 1998) and the Research Self-Efficacy Scale (RSES; Greeley et al., 1989). The IRQ was used to measure the level of interest towards conducting research. The IRQ contains 16 items, each of which describes different activities that pertain to conducting research. Students expressed degree of interest in several research activities on a 5-point Likert-type scale ranging from 1 (very disinterested) to 5 (very interested). A

composite score was calculated by averaging across all items; higher scores indicated higher levels of research interest. The scale was originally created to measure the research interests of counseling doctoral students. Prior research suggests the measure accurately and consistently predicts research interests based on five factors with a reliability coefficient alpha of 0.91: research outcome expectations, research self-efficacy, Holland Investigative and Artistic interests, and age (Bishop & Bieschke, 1998).

The RSES is a 51-item instrument used to assess competency in ability to accomplish research-related tasks (Greeley et al., 1989). Participants rated the degree to which they were confident in their ability to accomplish each task on a scale ranging from 0 (not confident) to 100 (totally confident). The scale was initially validated using a sample of doctoral students from numerous fields of study and was found to have contrast validity, internal consistency of .96 with Cronbach's alpha, and an overall reliability estimate of .97 (Bishop & Bieschke, 1998). Holden, and colleagues (1999) found a similar internal consistency for the RSE, with Cronbach's alphas of .94 at both pre-test and post-test. Bishop and Bieschke (1998) reported that four factors contributed to research self-efficacy: Conceptualization, Early Tasks, Presenting the Results, and Implementation.

Several items on each instrument had to be reverse-scored and summed. Higher IRQ scores indicated an increased level interest in research, and higher RSES scores indicated an increased level of self-efficacy. A number of demographic and open-ended questions were also included in the present study. Responses to open-ended questions were categorized into themes adapted from Love et al. (2007) and developed from the current sample. The themes examined included gained nothing, better understanding of research, bias towards research, exposure to future academic career, or did not complete.

Procedure

Students taking General Psychology, an experimental psychology class, or engaged in a summer research project during the study (three years) were given the opportunity to complete an online survey investigating interest in research and research self-efficacy. Students participated in the survey for either research participation credit or extra credit as determined by the university research participation pool policy. All ethical standards were met per IRB standards. Incomplete (e.g., did not complete 90% of the survey or completed it suspiciously, by indicating all 1s) or duplicate entries were removed from the analyses. Research experience was sorted into one of the following three categories: 1) no research experience, 2) one research experience, or 3) two or more research experiences. Research experiences were defined on the survey as opportunities to conduct research individually, with a faculty member, for a research methods class project, or with a student-lead research team.

Results

The data were examined for normality and homogeneity of variance prior to performing analyses. To determine if a correlation existed between the two instruments, a Pearson Correlation was performed. A MANOVA was then performed to evaluate the effects of field of study, student classification, gender, and ethnicity on the total scores for the two instruments. A second MANOVA was conducted to evaluate the effects of number of research opportunities on the scores on the two instruments. Lastly, a multiple linear regression was conducted to determine if RSES scores could be predicted from the number of research experiences and type of research projects (i.e., solo research project or group research project) participants reported. The predictors selected for the regression in the current study were selected to partially replicate the original regression reported by Love et al. (2007).

Relationship between IRQ and RSES

A Pearson correlation analysis indicated a significant positive correlation between IRQ and RSES scores, Pearson's $r(501) = 0.580, p = .002$. Participants that endorsed higher levels of interest in research also endorsed higher levels of research self-efficacy. Approximately 34% of the variance was shared between these two independently developed scales.

Demographic Analyses

The results of the four-way MANOVA indicated that only gender significantly contributed to the multivariate analysis, $F(2, 405) = 3.99, p = .019$. An examination of the one-way univariate analyses showed that this multivariate result was due to the IRQ, $F(1, 406) = 6.00, p = .015$. Females reported significantly higher interest in research than males (Table 1). All other demographic variables (i.e., school of study, student classification, and ethnicity) showed no significant effects (see Table 1).

Table 1. Descriptive Statistics for Variables of Interest.

		N	IRQ		RSES	
			M	SE	M	SE
Gender						
	Male	147	3.11	0.08	64.28	2.15
	Female	356	3.32	0.05	62.33	1.41
Ethnicity						
	Caucasian	54	3.17	0.17	59.97	3.98
	Hispanic/LatinX	373	3.30	0.05	63.60	1.33
	Other	76	3.11	0.13	61.48	3.26
School of Study						
	SET	120	3.19	0.10	62.96	2.64
	HSS	289	3.32	0.06	61.13	1.55
	BUS	14	3.04	0.26	66.93	7.10
	Other	80	3.18	0.10	68.50	2.50
Class						
	First Year Freshmen	156	3.87	0.07	61.92	1.97
	Continuing Freshmen	28	3.15	0.21	58.75	4.77
	Sophomore	102	3.16	0.11	63.30	2.72
	Junior	72	3.08	0.13	60.67	3.42
	Senior	54	3.14	0.16	58.14	3.82
	Graduating Senior	91	3.57	0.09	70.00	2.62

Note. SET: Science, Engineering, & Technology. HSS: Humanities & Social Sciences. BUS: Business. Other: Undeclared or Dual majors.

Importance of Research Opportunities

A second MANOVA was performed to examine the effect of research opportunities on IRQ and RSES. The results indicated a significant effect for research opportunities, $F(4,996) = 14.39, p < .001, \eta_p^2 = .055$. An evaluation of the univariate ANOVAs performed for each scale indicated that research experience significantly influenced both interest in research, $F(2, 500) = 14.34, p < .001, \eta_p^2 = .05$, and research self-efficacy, $F(2, 500) = 25.16, p < .001, \eta_p^2 = .09$, individually. Follow-up Tukey post hoc

tests indicated that having one research opportunity significantly increased scores for both IRQ and RSES as compared to having no research opportunities ($p < .05$). Additionally, two or more research opportunities produced significantly higher scores for IRQ and RSES. Cohen's d effect sizes for IRQ ranged between 0.5 and 0.7 and for RSES between 0.2 and 0.6. The greatest magnitude of difference on both instruments occurred between participants with no research experiences and one research experience. Table 2 summarizes the descriptive statistics for the analyses.

Table 2. Descriptive Statistics for Research Ppportunities.

	<i>N</i>	IRQ		RSES	
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Research Opportunities					
None	269	3.06	0.07	55.50	1.86
One	149	3.35	0.06	70.22	1.39
Two or more	85	3.71	0.09	73.48	1.99

Note. All pairwise comparisons for each measure were statistically significant per Tukey post hocs ($p < .05$). IRQ Cohen's d : None-1RO = .7; 1 RO-2+RO = .5; None-2RO = .6. RSES Cohen's d : None-1RO = .6; 1 RO-2+RO = .2; None-2RO = .6.

Predicting Research Self-Efficacy

The results of a stepwise multiple linear regression with RSES as the criterion and the IRQ as the initial predictor, followed by the number of research opportunities and type of research experience (none, individual, team/group, or both individual and team/group) indicated a significant overall model, accounting for 36% of the adjusted variance, $F(4, 498) = 70.26$, $p < .001$. When IRQ was considered independently, IRQ produced a significant model (Model 1, Table 3), accounting for 34% of the adjusted variance, $F(1, 501) = 253.43$, $p < .001$. The addition of the other variables indicated that the number of experiences with research contributed significantly to the overall model (see Table 3). More experiences were associated with higher ratings of research self-efficacy as was the case with interest in research (Figure 1). The type of research experience did not influence either interest in research or research self-efficacy (Figure 2).

Table 3. Coefficients from Regression Model with Research Self-Efficacy Scale as Criterion.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	β	<i>t</i>	<i>p</i>
1	(Constant)	13.86	3.22		4.29	<.001
	IRQAVG	15.04	.94	.58	15.91	<.001
2	(Constant)	13.57	3.22		4.21	<.001
	IRQAVG	14.07	0.95	.54	14.71	<.001
	Individual	-1.00	3.15	-.01	-0.31	.751
	Group	-0.09	2.79	-.00	-0.03	.973
	Research Opportunities	5.64	1.29	.16	4.36	<.001

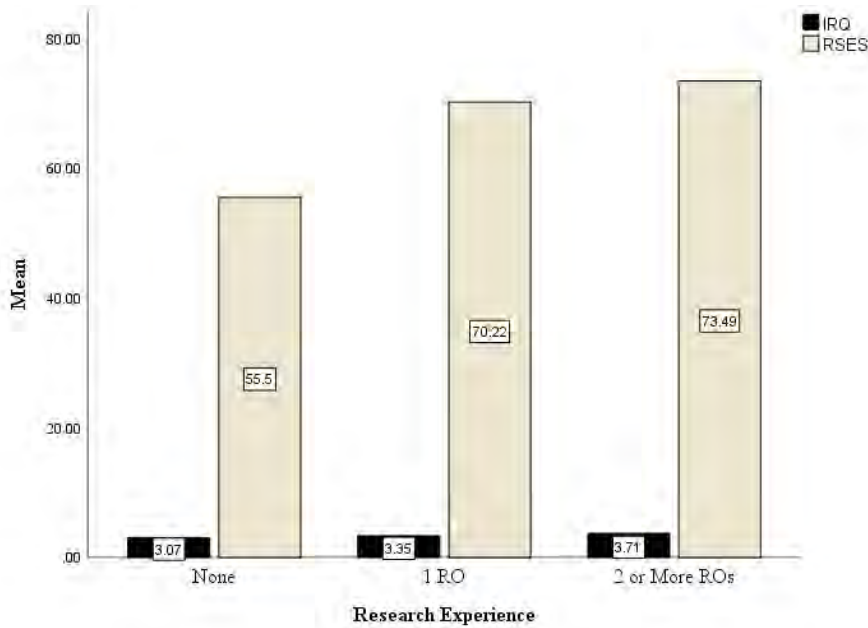


Figure 1. Means for IRQ and RSES per number of research experiences reported by participants. Means for IRQ (black bars-percents) and RSES (grey bars-5pt scale) per number of research experiences reported by participants: none, 1 research opportunity, or 2 or more research opportunities.

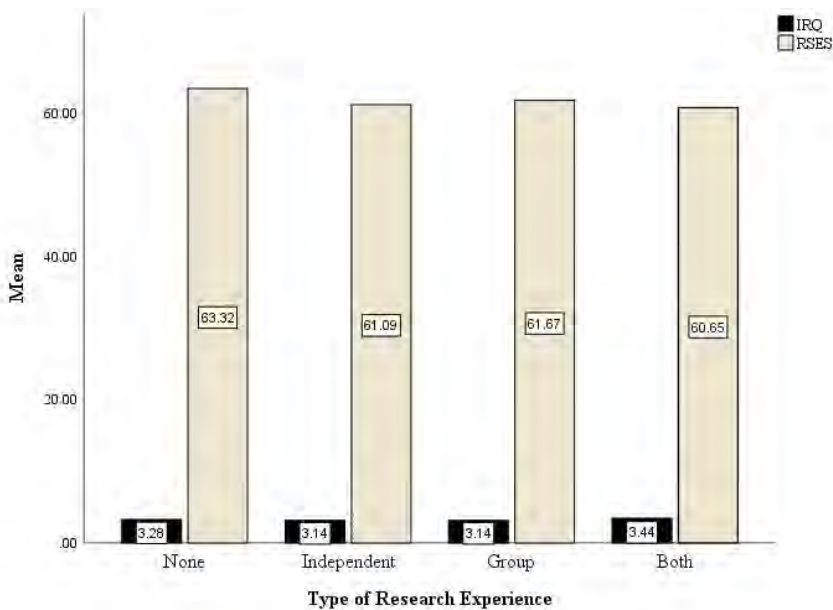


Figure 2. Means for IRQ and RSES per type of research experiences reported by participants. The means for each scale (RSES-percent; IRQ-5pt Likert) used to evaluate the effect of the type of experience with research participants reported, including no research (None), individual experiences (Independent), group experiences (Group), or both individual and group experiences (Both).

Qualitative Responses

Seventy-eight students within the study completed the qualitative questions. The free-response section encouraged students to expand qualitatively on what they gained from their research experience. The results indicated that 29% ($n = 23$) gained a better understanding of research, 13% ($n = 10$) gained exposure towards their future career, and 1% ($n = 1$) had a bias towards research (see Table 4). The majority indicated that the research experience was not applicable, indicating they had no research experience.

Table 4. Corresponding Themes for “What Students Gained from Conducting Research” and Example Responses.

Emergent Theme	Verbatim Example
Gained better understanding of research	<p>“I have gained knowledge of how to design a study and perform various experimental procedures, and complete statistical analysis.”</p> <p>“Gained knowledge of experimental design, hypothesis formulation/testing, research ethics, experimental analysis, and how to write a scientific research paper.”</p>
Gained exposure towards their future career	<p>“It solidified my future goals because it made me realize that I like to conduct research.”</p> <p>I have learned that research is interesting, but not what I want to focus my career on because it can be a lonely field. I want to pursue research in a different way, but now I have the means to do so.</p>
Had a bias towards research	<p>“I didn't learn anything. I just answered questions.”</p> <p>“The only experience I have are surveys that I have taken, so there is no real influence on my future.”</p>

One hundred seventy students responded to a second qualitative section. This section encouraged students to expand on their future-plans after graduation. The results indicated that 31% ($n = 55$) would continue to graduate school as one student indicated “I plan to study the field of Psychology as I apply to Graduate School as well as attain my PhD. Within the broad field of psychology, I would like to pursue business, specifically marketing and advertising.” Almost half of the sample did not have any future plans (48%, $n = 81$), as indicated by responses such as “I am currently uncertain for the most part” or “I want to be either a social worker or family or children counselor.” Of the small number of upper classmen with confirmed job offers (1%, $n = 3$), responses included having a job offer but not including the type of job. Finally, 13% ($n = 21$) of the sample had ambiguous responses that could not be categorized consistently but included responses such as, “NA” or “I know *the school* and the psychology department here have really helped me”. The remaining 7% ($n = 11$) of the sample mentioned miscellaneous post-graduation goals.

Discussion

Previous research found greater graduate student interest in research to be associated with greater research self-efficacy and vice versa (Bieschke et al., 1996; Bishop & Bieschke, 1998; Kahn & Scott, 1997). The results of the current study replicated the finding with undergraduate students attending a Hispanic-serving, primarily undergraduate institution. Based mostly from students participating in a research pool associated with an introductory psychology class, students from different majors reporting greater interest in research also reported higher levels of research self-efficacy. The relationship was influenced by the amount of research experience, with one opportunity being significantly better than none, and two or more opportunities significantly better than one opportunity. The finding supports previous research with counseling doctoral students where confidence in research ability was positively correlated with year in the doctoral program (Bieschke et al., 1996; Bishop & Bieschke, 1998; Kahn & Scott, 1997; Phillips & Russell, 1994) as well as previous research with undergraduate students (reviewed by Craney et al., 2011; Hunter et al., 2007). Whether the research opportunity was completing a research study through a research participant pool or a hands on activity associated with a course or a summer research opportunity, exposure to and reflection on the aspects of research is critical for undergraduate students, regardless of their major discipline. Skills such as conducting internet-based research, library database use, critically questioning validity of sources, synthesizing information across multiple sources, designing studies, collecting data, analyzing data, or drawing conclusions for practical applications or future questions can be acquired through a variety of structured class assignments and research laboratory activities.

Expanding upon the work with graduate and undergraduate students (Bieschke et al., 1996; Bishop & Bieschke, 1998; Craney et al., 2011; Frantz et al., 2006; Kahn & Scott, 1997; Phillips & Russell, 1994; Russell et al., 2007; Secret et al., 2009), the current study also investigated the effects of several demographic variables including student classification, gender, ethnicity, and broad field of study (i.e., STEM, Liberal Arts, Business, etc.). As expected, no significant effects emerged for any of the demographic variables with a sample of predominantly Humanities/Social Science majors. Although not statistically significant, an examination of the mean scores, however, supports previous qualitative work indicating that students pursuing a degree in a STEM tended to report more interest in research than those pursuing a degree in another area, such as students in the humanities or arts (Craney et al., 2011; Lopatto, 2010). We find this trend interesting as research is also needed in the humanities. For example, conducting qualitative research on various topics, locating and analyzing various texts, or testing new techniques in art, music, or dance are all aspects of research although experts in these areas may not commonly use the term. In the current study, the participants from the Business (BUS) school reported the lowest levels of interest in research as compared to students from the Humanities/Social Sciences (HSS) and the Science, Engineering, and Technology (SET) schools. While the pattern may reflect the limited number of business majors completing the survey, the trend may correspond to different approaches to research across the three schools at the institution at which the current study was conducted and at many other institutions. The SET and HSS schools rely heavily on teaching research and conducting research due to the nature of the disciplines, whereas the BUS school emphasizes application of the disciplines, rather than research. Thus, students in SET and HSS are often encouraged to conduct research and are required to take research classes while students in BUS are encouraged to find internships. Given the small number of participants from business school majors in the current study and the large sample of first year participants, it is possible that this perception may be inaccurate and connected to year of study or represent a preconception about research as discussed by Adedokun and Burgess (2011). Future research could target business majors to determine their perceptions of conducting research, interest in conducting research, and participation in research. Additionally, instructors within the discipline could emphasize the skills

relevant to a career in business such as to investigate a company as a possible investment, to develop entrepreneurial skills, to develop marketing strategies, or to test processes.

Previous findings based on various regression models had indicated that, among graduate students, relationship with mentor, positive team experiences, and experience with research training were critical factors in research self-efficacy (Bieschke et al., 1995; Bishop & Bieschke, 1998; Gelso et al., 1996; Hollingsworth & Fassinger, 2002; Kahn, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994; Schlosser & Gelso, 2001). Utilizing a regression approach that replicated the model conducted with graduate counseling students (Love et al., 2007), the results of our regression with a limited number of predictors failed to support the previous findings that working as a team predicted higher levels of reported research self-efficacy. In fact, working alone or with a group was not associated with undergraduate student confidence in conducting research. Rather, repeated experiences were important as a small positively correlated, but significant predictor, of research self-efficacy in addition to the strong, positively correlated and significant predictor of interest in research. One of the key components that emerged from the qualitative findings that complements the statistical results of the regression and previous findings was the importance of student-reported, meaningful experiences with research, especially with regard to the mentor-protégée relationship (Craney et al., 2011; Love et al., 2007). Although many students and professionals question the value of participating in research as a course requirement, some of the first-year students in the current study indicated in open-ended responses that participating in a simple survey-based research project was a good approximation of the research process. These self-reported responses provide additional support for the justification of research participant pools, as proscribed by the American Psychological Association (APA, 2007) and supported by empirical studies (Kraut et al., 2004; Sullivan & Lashley, 2009). This qualitative information also provides evidence that encouraging students to participate in research pools across disciplines can be helpful in solidifying knowledge about research as well as possibly piquing interest in research.

Perhaps even more importantly, as reported in the open-ended responses by the undergraduate participants in this study, more directed research experience, whether through a formal class or a summer research experience, is related to research skill acquisition, an increased appreciation or respect for research, and a clarification of career goals. These gains have also been observed with other studies investigating the impact of research on undergraduates (cf. Craney et al., 2011; Hunter et al., 2007; Lopatto, 2010). Although somewhat limited in responses to the question about what they gained from research experience in the current study (less than 20% of the participants provided responses), the anecdotal responses corroborated those reported previously (Adedokun & Burgess, 2011; Craney et al., 2011; Lopatto, 2010; Table 4).

One interesting trend was the relatively higher levels of research self-efficacy reported by first- and second-year students when compared to upper-level students, excluding graduating seniors. Given that participation in the survey reported here was the only exposure to research for most of the first- and second-year students, it is possible that the trend is related to a false sense of self-efficacy or lack of knowledge about the research process. In other words, students with little to no knowledge of research may feel more competent than students who are actively engaged in the acquisition of research skills and better understand the process. As reported by Adedokun and Burgess (2011), many students interested in research endorse a variety of preconceptions about research, which can bias the students' attitudes towards or against research. This tendency suggests that a student's overall level of confidence should also be assessed and controlled for to account for the influence of general confidence on research self-efficacy.

To improve on the current study, we also recommend that multiple assessments be performed to capture the growth that occurs between the first year of study and graduation. Conducting pre- and post-tests at the beginning of a research experience and across matriculation would provide greater

insight into changes in research self-efficacy overtime as would a post-graduation follow-up. Craney et al. (2011) report a variety of gains for undergraduate students involved in a 10-week summer research program, despite lacking a control group, using self-reported measures, and involving such a brief period. As suggested by an assessment of reflection entries during a summer program conducted by Adedokun and Burgess (2011), a more extensive qualitative analysis could elucidate the intricacies of the quantitative results. Individual interviews, field observations, focus groups, or detailed weekly reflections are all useful tools for gathering insight into the responses participants give in close-ended questions (Adedokun & Burgess, 2011; Craney et al., 2011; Lopatto, 2010) and could also lead to a better understanding of the development of research self-efficacy.

Recommendations for Teacher Scholars

Based on the results of the current study with undergraduate students responding to a survey provided through a research pool experience, we recommend that all instructors explicitly identify the aspects of their courses and assignments that align with “research skills”. For example, instructors who incorporate synthesis of information across multiple sources, compare/contrast assignments, differentiating between valid/trustworthy sources and those that are not, or collect data of any type for conclusion are already engaging in teaching research skills. Students may simply need to hear that the skills they are practicing are also considered research skills applied to their discipline-specific experience. The results of this study also suggest that simply participating in a research study is a great way to illustrate the research itself while promoting an interest in research and perhaps building some confidence in their ability to do so. Clearly, courses that require research elements such as conducting a literature review or an actual study with data collection and analysis are examples by which instructors could emphasize and encourage students to acquire myriad research skills.

Conclusion

The results of this three-year study at a PUI-HSI institution indicated that undergraduate students report fairly high levels of research self-efficacy and moderate levels of interest in research overall. Students who reported a single research experience rated themselves as 50% confident on average when conducting research. In contrast, students who reported multiple research experiences rated themselves as 75% confident on average when conducting research. Similarly, interest in research also increased from neutral to a moderate level of interest with more reported research experiences. The results are especially exciting as they derive from a sample that was majority minority and first generation or low-income undergraduate students. Frequently presented with a variety of obstacles and preconceptions about research itself, many undergraduate students from this demographic do not consider conducting research initially (Hathaway, Nagda, & Gregerman, 2002). Through strong mentoring, structured research methods classes, and positive experiences, whether individual or group, the study demonstrates that undergraduate students will increase interest in conducting research and beliefs in their ability to do so with repeated experiences.

Acknowledgments

We would like to thank David Gonzalez for his initial efforts in organizing and cleaning the bulk of the dataset.

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