Research Orientations of Undergraduate Students in Education (ROUSE)

How do prospective teachers view learning to conduct research as a part of learning to teach?

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Over a decade has passed since national reports and position papers (e.g. Boyer Commission, 1998; National Science Foundation, 2000; Schowen, 1998) recommended emphasis and development of undergraduate research (UR) programs. Common among the reports was the need to develop research knowledge and skill, particularly in science, technology, engineering, and mathematics (STEM). It was believed that UR would develop students' understandings of their chosen professions, encourage students to pursue continued graduate training, and ultimately create more scientists. Since that time, there has been both increased participation in UR and development of diverse models to support UR in colleges and universities (Potter, Abrams, Townson, & Williams, 2009). Concurrently, there has been a growth in research on UR and the outcomes of experiences for students. Based on the last roughly 15 years of research, we have growing understandings of UR as part of an undergraduate education. Yet, there remain unanswered questions.

While many universities devote time, energy, and resources to UR programs, participation is typically voluntary for students. Since students elect whether or not to participate in undergraduate research, it is important to understand what factors affect their decisions. Seymour, Hunter, Laurensen, & Deantoni (2004) and Adedokun & Burgess (2011) point out that few studies consider students' motivations to pursue or engage in undergraduate research. This limitation ultimately creates a two-fold problem. First, we do not have strong explanations of why students choose to participate in UR experiences. Second, since prior research findings focus on students who self-selected to participate, this only partly explains what impacts a choice to pursue, or not pursue, UR experiences. Given that the majority of studies on UR experiences focus on natural science disciplines (details will be offered below) (Lopatto, 2003, 2004; Seymour et al., 2004), it is as of yet unclear how factors affecting elective participation are discipline-specific.

This study considers an example within the discipline of teacher education at one private liberal arts university. Within this university, approximately ten percent of all students participate in the university UR program, and additional students, not included in this figure, complete UR experiences through degree programs. In comparison, less than one percent of students pursuing teacher education at the university participate in the university UR program and there is no UR experience in the degree program, despite the fact that teacher education scholars argue that engaging in classroom-based, practitioner research is a hallmark of professional educators (Cochran-Smith & Lytle, 2001). Learning the knowledge, skills, and dispositions of classroom-based practitioner inquiry can readily be

accomplished in UR experiences. Since UR is an elective experience and representation of education students in UR is relatively low, one factor to consider in trying to explain teacher education students' low participation in UR is what affects students' orientations toward UR and research in general. While this represents a particular problem, there is potential that knowledge about teacher education students' orientations might inform other practical fields.

Background

Whether traced to beginnings at Occidental College in the 1950s or national recommendations beginning in the late 1990s, UR remains a relatively new dimension of university curricula. As a result, scholars have only begun to document, describe, and inquire into the effectiveness, challenges, and limitations of UR. Yet, the sparse literature on UR does offer important insights. The following discussion will consider two reviews of research on UR experiences. Then it will help to focus in on research that is relevant to this study, including UR in practical and applied fields as well as research on motivation to participate in UR.

Undergraduate Research Viewed Broadly

Seymour et al (2004) offer one of the earliest reviews of research literature on UR research and find that most studies of UR involve retrospective data, focusing on how the UR experience impacted the student. Subsequently, Sadler and McKinney (Sadler & McKinney, 2010), focusing on STEM fields, also find that studies primarily include outcome data from students' experiences. Sadler and McKinney find that studies of UR experiences have investigated impacts on students' career aspirations, confidence, understanding of the nature of science, intellectual development, content knowledge, and skill development. Both reviews find that the body of research reveals positive effects of UR on students' confidence, intellectual development, content knowledge, and skills (Sadler & McKinney, 2010; Seymour et al., 2004). However, when looking at development of understandings of the nature of science, UR programs show modest impacts on student researchers (Sadler & McKinney, 2010). Finally, the evidence on how UR impacts students' career aspirations remains somewhat mixed. Lopatto (Lopatto, 2003, 2004) finds weak correlations to career aspirations, while many other studies report strong correlations between UR experiences and career aspirations (Sadler & McKinney, 2010). Thus, while there seem to be positive benefits to UR, some dimensions and goals of UR programs may have less impact than we might assume.

Turning our attention to findings from specific studies can offer additional insights relevant to this study. Since this study is interested in orientations toward research and motivations to pursue UR, past research, while retrospective, can contextualize the potential outcomes of UR experiences. Lopatto (2004) reports on a comprehensive study of UR that included faculty and students across forty-one institutions and various disciplines. The study surveyed faculty and student perceptions of the UR experience, and describes benefits participants described from participating in UR programs. Benefits included increased interest in scientific careers, increased persistence in undergraduate education and graduate education, and gains in research skills. Lopatto notes that the greatest benefits focus on developing students' understandings of research processes, methods, and approaches.

The important inference to make from these findings is that UR enables students to learn how knowledge is generated through research processes. Similarly, Palmer and Marra (2004) find that UR experiences also support epistemological development. Epistemological development refers to developing understandings of how knowledge is generated within a discipline. This finding clarifies that not only do UR experiences help develop understandings of how knowledge is generated, but also help develop disciplinary understandings of knowledge generation. An important implication of these findings is that it may be important to consider discipline specific approaches within UR.

The UR literature does not yet sufficiently address discipline specific approaches. Prior research on UR focuses heavily on UR experiences in STEM disciplines (Seymour et al., 2004). Lopatto's (2003, 2004) survey provides not only information about the benefits, drawbacks, and perceptions of faculty and students involved in UR, it also highlights that there are many underrepresented disciplines. Roughly 96 percent of Lopatto's (2004) sample was composed of students majoring in a natural science. Thus, a limitation from prior research is the dominance of undergraduates whose UR is in STEM disciplines. A problem this raises is that while not identical, many STEM disciplines have common understanding of what it means to engage in inquiry; answering empirical questions through manipulation of variables, observations and data collection with respect to these variables, and analysis and interpretation of that data. However, the disciplines underrepresented in the literature may engage in inquiry, but following approaches that do not reflect this paradigm, and thus to novices may not align with their understandings of what research is.

For example, within teacher education there is a body of literature on undergraduate inquiry into practice (e.g. Ball, 1995; Chant, Heafner, & Bennett, 2004; Cochran-Smith, Barnatt, Friedman, & Pine, 2009; Lytle & Cochran-Smith, 1992; Zeichner & Schulte, 2001), yet these studies are not included in the UR reviews. Similarly, outcomes of research in some underrepresented disciplines involve nontraditional products such as narratives, ethnographies, historical accounts and may not be included in these reviews. For example in the field of history, one paper reported on a project in which UR produced a volume of student-written narratives (Stephens, Jones, & Mark V. Barrow, 2011).

The lack of discipline specific understandings of UR experiences is important for several reasons. Palmer and Marra (2004) describe epistemological differences between students pursuing STEM degrees and students pursuing applied and practical degrees (such as fields of nursing,

accounting, human services, etc.). Students pursuing applied and practical degrees focused on knowledge as facts alone. Additionally, these same students struggled to understand how knowledge is intellectually constructed through disciplinary practices. They felt that being knowledgeable in a discipline involves knowing the facts associated with that discipline. And conversely, according to Palmer and Marra's research, these same students did not understand how individuals within the discipline helped construct those facts through systematic practices or that such practices are part of professional activity.

Synthesizing across findings (e.g. Lopatto, 2003; Palmer & Marra, 2004) we know that UR promotes epistemological development and students report that mentoring during undergraduate research experiences helps make knowledge and knowledge construction in a discipline visible. Yet, students in applied and practical fields did not see knowledge construction as part of their disciplinary professional learning or future activity. Logically, we know this is naïve. Thus, undergraduate research may have important benefits for students in applied and practical fields, particularly if it can change their understanding of knowledge in those fields.

Scholars have made recommendations to improve on the UR experience. Sadler and McKinney (2010) recommend design features for UR programs and experiences. One design feature focuses on epistemic engagement; i.e., engaging UR participants in activities that involve demanding knowledge-generating activities. Examples of epistemic engagement include activities like forming research questions and testing theories with empirical evidence. Such epistemic engagement also seems to have potential for higher motivation for students. The second feature Sadler and McKinney recommend for UR is planning explicit learning about the nature of science. While Sadler and McKinney are focused on making experiences effective, this recommendation may respond to an implied barrier to participating in UR. If a student feels he or she does not understand science or the

nature of science, it may lead that student to be less motivated to pursue UR.

In addition to the gaps in research specified above, additional limits to prior research on UR experiences need consideration. In particular, the majority of prior research on UR experiences has focused on the retrospective experiences of students. Therefore, we have limited understanding of factors that contribute to students' initial motivation and attitude toward pursing an UR experience. Adedokun & Burgess (2011) highlight this limitation and argue, following theories of cognitive science (e.g. National Research Council, 2000), that preconceptions are important because they impact how individuals make sense of experiences. Based on their survey, Adedokun & Burgess find that students have preconceptions about scientists and their work, the ease and/or difficulty of doing research, the duties or tasks involved in research, the nature of collaboration in research, and the role of mentors in research.

Pacifici & Thompson (Pacifici & Thompson, 2011) were similarly concerned about students' preconceptions. By considering students' expectations as compared with outcomes, Pacifici & Thompson reveal that there were areas in which students' expectations failed to match their experienced outcomes. Most notably, students' expectations to make connections with faculty and publish their research were significantly different than outcomes students' experienced. In summary, these studies remind us how students' preconceptions and expectations are present in the UR experience. Research needs to consider students as they enter UR and also the factors that contribute to their attitude and motivation toward research.

Undergraduate Research and Implications in One Discipline

Given this study's focus on teacher education, it will help to contextualize these findings in response to the relevant research on teacher education. It seems clear that scholars believe UR offers effective learning experiences for students. Similarly, a robust body of literature describes effective learning experiences in teacher education. The literature on teacher education advocates addressing competencies in subject matter knowledge (e.g. Ma, 1999), pedagogical content knowledge (e.g. Grossman, 1990; Shulman, 1987), and technical knowledge (e.g. Jackson, 1990). Research has also shown that teacher education students have pre-existing ideas about what they believe it means to teach and consequently an idea of what they need to learn in order to be effective (Feiman-Nemser & Buchman, 1985; Feiman-Nemser & Buchman, 1987; Jackson, 1990; Lortie, 1975).

Additionally, other researchers argue that while competency factors such as these are influential in teacher preparation, it also is important to consider frameworks that include (1) beliefs, (2) vision, (3) belonging, and (4) identity (Fairbanks et al., 2010). These researchers ultimately argue that self-knowledge and having a sense of agency enables beginning teachers to be more responsive to students in school contexts. This kind of responsiveness has parallels to research processes that involve analysis and interpretation of a set of variables. Fairbanks et al also suggest that good teaching requires critical thinking and adaptability. An interesting connection is that these traits reflect many of the traits described by the research on UR. Thus, it is possible to infer that UR could be beneficial in teacher education.

The potential benefits of UR experiences in teacher education can be understood by looking briefly at both theoretical stances and empirical studies that examine the role of research in the professional life of a teacher. The notion of teachers conducting research has been a topic of discussion in teacher education literature for some time. Some teacher education scholars argue that research is at the heart of teaching. Connelly and Clandinin (1998) describe teacher research as teachers' attempts to systematically study and improve practice based on classroom experiences. Many aspects of teacher research have been documented and argue that teacher research

is a crucial practice that is a hallmark of professionalism in teaching (Cochran-Smith & Lytle, 1998, 1999, 2001).Developing skills for and dispositions toward teacher research could be accomplished through UR as an experience in teacher education.

A challenge, however, is that the practical dimension of teaching can lead students to believe that research is only about a project to solve a practical problem rather than an approach to generating knowledge and understandings of the discipline (Cochran-Smith et al., 2009). Researchers agree that teacher education students fail to fully understand how research is relevant to their future lives as teachers (Capraro, Capraro, & Helfeldt, 2010; Chant et al., 2004; Cochran-Smith et al., 2009). Yet, Capraro et al. (2010) maintain that teacher learning experiences that include structured extensive field experience focused on research can result in beginning teachers who have greater confidence in their knowledge, skills, and dispositions toward teaching. Additionally, researchers conclude that teacher research helps bridge theory and practice for candidates learning to teach (Chant et al., 2004; Cochran-Smith et al., 2009).

It remains a challenge to create research experiences that transform thinking about how research is integral to teaching. In response we should recall how Fairbanks et al. (2010) explain that prospective teachers' beliefs and visions about teaching have a significant impact on teacher development. Therefore, to create meaningful research experiences, research suggests that it is important to have greater understandings of the preservice teachers' attitudes and perspectives on research and undergraduate research.

In summary, we know that faculty mentoring and students' dispositions toward research are important in terms of supporting and facilitating UR. Specifically in this case,

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prospective teachers often struggle to connect teacher research with being an excellent teacher. Studies have shown that research experiences in STEM disciplines as well as in teacher education lead to greater understandings of the epistemic practices of the discipline, greater confidence in their knowledge, skills, and dispositions toward the discipline. From the perspective of teacher education, these dispositions can result in teachers more likely to be responsive to their students' needs. Furthermore, we know that self-knowledge and having a sense of agency impacts students and their visions of becoming teachers. As a result, it seems important to consider teacher education students' perspectives on or orientations toward undergraduate research. These considerations may be transferrable to other practical and applied disciplines, allowing insight into ways to encourage a wider variety of students to participate in UR experiences.

Methods

This study was conducted at a private liberal arts university located in the southeastern United States. The university attracts students from across the country and internationally. The majority of students come from the east coast of the United States. Demographically, the students are predominantly white/Caucasian, middle to upper income, and female. The study occurred within two sections of an introductory education course required for admission to the teacher education program. Students in the course are considering pursuing teacher education. One section was taught in the fall term of 2009 by this author/investigator. A second section was taught in the spring term of 2010 by a different professor. From across the two sections, 31 students agreed to participate in the study. The students were predominately in their second year of study, though there were a small number of first year students.

Data for the study included a variety of sources; this article focuses on findings from a

survey administered to all consenting students. The survey designed for this study (see Appendix A), consists of Likert scale items that ask about dispositions and attitudes toward research. As its basis, the instrument took prior validated instruments including Lopatto's (2003) survey and forms of the instrument, Views of the Nature of Science (Lederman, Gess-Newsome, & Latz, 1994; Schwartz, Lederman, & Crawford, 2004). Existing instruments included useful questions of interest for this study. This study sought to connect those questions with additional issues rooted in prior research. Of interest were perspectives on the role of research in teaching, understandings of the nature of research, interest and motivation for research, and research efficacy. Prior to administration the survey was reviewed and revised based on feedback from experts. Survey responses were compiled and frequencies of responses by question totaled to analyze the group as a whole.

The study has important limitations. First, the small sample size limits the ability to generalize from these findings. A larger sample is needed to see if the patterns hold for a greater number of students. Increasing sample size would likely rely on a multi-institutional study. Such a study would have added benefit of increasing understandings of the role of different program structures in encouraging students to pursue UR experiences. A related limitation is that students in the sample were of mostly in their second year of university study. This could impact their attitudes and dispositions and produce biased results. The aforementioned multi-institutional study could potentially address this limitation. From another perspective, another limitation is that data were collected in a single disciplinary field. Further studies could be designed that explore attitudes and dispositions toward UR across multiple disciplines to explore whether findings reported here are discipline specific. The present study infers from prior research disciplinary differences may affect students. Yet the data to support that claim is not currently available. Thus, there remain important unanswered questions about

students' attitudes and dispositions about UR experiences.

Results

The following results focus on survey responses from two groups of students who were considering becoming teachers. Given limited variation between the responses of the two groups, the responses were treated as one group. Item analyses of individual questions were conducted to examine frequencies of positive and negative responses on each question for all respondents. The findings are described in four categories: students' impressions of research, students' perceptions of the usefulness of research in the education profession, students' attitudes about learning to conduct research, and students' interest and motivation to conduct research as an undergraduate.

Impressions of Research

In general, based on the survey, students have a positive, though uncomplicated impression of research (see Figure 1, Appendix B). Students unanimously reported finding research personally valuable (#9). Moreover, almost all students agreed that research is an inquiry-oriented activity, which begins with questions and focuses on problems (#2 and #3). However, students express a belief that research follows similar methods regardless of the topic (#10). Thus, students present a view of the general notion of research as being about asking questions of problems in the world, but their ideas about how those questions get answered begins to reveal more about students' impressions of research.

Students' ideas about research seem more traditional when we look at other questions. For example, only one-third of students expressed the idea that people who conduct research are creative (#7). Furthermore, two-thirds of students believe that research involves manipulating and controlling variables (#1). Additionally, students were equally divided in terms of their opinion of research as confirmatory activity (#5).These observations can lead to the

interpretation that students privilege a somewhat positivist view of research as being logical, controlled, and focused on experimentation. Concurrently, these students may believe that research involves confirmation of pre-existing ideas. Thus, we can interpret that students' impressions of research are somewhat traditional and remain naïve or inaccurate.

It is interesting that nearly all students (28 of 31) expressed the belief that research was useful and applicable in social sciences (#8). This is important since teaching is a practical field that has commonalities with social sciences. However, social science research is often described as more subjective, and potentially relies on creativity, which students seemed to find less applicable in research. Moreover, conducting experiments (a perspective privileged by students) in fields like social sciences, and especially teaching, is challenging, for several reasons. Variables in social settings, school being a social setting, are quite complex, difficult to control, and in some cases encompass complex ethical considerations. In addition, within a social setting all participants have unique experiences, backgrounds, and even abilities, which creates complex variables to both identify and evaluate.

The students express value in research and see it as relevant to social sciences. Yet students also seem to conceptualize research as confirmatory and experimental activity. Thus students may hold a view of research that does not align with the norms of research (as being confirmatory) or relevant and useful as an approach to research in their chosen field (as being experimental).

Perceptions of Usefulness of Research in the Education Profession

The preceding findings raise questions about whether students' impressions of research are connected with perceptions of the usefulness of research as a future teacher. However, usefulness of research can be examined from two broad perspectives. One perspective is to consider whether students find research generally and personally useful. An alternate perspective focuses on whether students find research useful in preparing to participate in the education profession. Figure 2 (Appendix B) summarizes students' responses to questions about usefulness of research broadly and within education as a profession.

The figure demonstrates that two-thirds of students report that they do not regularly use research in order to make day-to-day decisions (#1). These responses may be misleading. One limit is that "use research" can have multiple interpretations. We might interpret that students do not find research-based knowledge relevant to daily, practical activity. This is important since there is a significant amount of practical activity in teaching. Conversely, it may be that responses reflect an idea that "use research" refers to engaging in research in terms of experimental study. Such an interpretation would explain negative responses since few people engage in experimental investigations on a daily basis. Yet it is interesting that in contrast students report believing that they *would* engage in research in their future professions (#2). Thus students seem to find research relevant at some level, but not something they personally use in daily decision-making.

While clearly believing that they would engage in research in their future professions, students were nearly evenly divided on whether teachers should rely on research to inform pedagogical decisions (#10). As a group, the students were evenly divided when asked whether research should inform the creation of policy as well as administrative actions in schools (#9). The survey statement juxtaposed making decisions based on research findings with relying on personal experiences. Thus, it can be interpreted that students value personal experiences as being of equal value as research-based explanations. This pattern also continued for students' views about teacher decision-making. While students reported that research was important for teachers and anticipated using research as a teacher, they were again evenly divided over whether teachers should rely more on knowledge from research or based on personal experiences in making pedagogical decisions (#10).

The findings reported in Figure 2 highlight an issue central to this study. When asked about their interest in conducting undergraduate research, students' responses were positively skewed and quite strongly so. No students were strongly opposed to conducting research as an undergraduate, and one-third strongly agreed with being interested in conducting such research (#3). However, when thinking about the practicality of undergraduate research in the teacher preparation program, the findings are less clear (#4). While most students (three-fifths) felt it was possible to conduct research while a teacher education student, the responses were more distributed. One-tenth of students strongly agreed and three-tenths agreed that it was difficult to conduct research and be an education student. Yet, these same students almost unanimously agreed that research is useful and manageable for teachers (#5 & #6). Thus, students express interest in conducting research as undergraduates and see research as relevant to teaching but are not completely convinced that it is possible to complete research as teacher education students.

Attitudes about Learning to Conduct Research as it Relates to Learning to Teach

Students' attitudes about learning to conduct research and how learning to conduct research relates to learning to teach are summarized in Figure 3, Appendix B. These results suggest that students' attitudes are less uniform across the group as in other categories and furthermore continue to reveal uncertainty about the relationships between teaching and research.

Most students felt it was generally important for people to learn to conduct research (#2). But, students were more evenly divided on whether learning to conduct research is important in learning to teach (#1). While students are interested in learning to conduct research, they report mixed views on what is challenging to learn. Students expressed confidence in their ability to review literature and identify questions (#6 & #8). However, students reported being less confident in their ability to understand theory

and identify problems for research (#7 & #9). Thus, while students expressed limited confidence in their ability to conduct research, they recognized that they would need more assistance in application of theory to interpret research findings. This is important since the students are early in their undergraduate education and as a result know relatively little about theories of teaching and learning.

Attitudes about Opportunities to Conduct Research

Finally, the last section of the survey attempted to gauge students' attitudes about their opportunities to conduct research. Students' responses are summarized in Figure 4, Appendix B.

Most students felt that it would be possible for them to conduct meaningful research as an undergraduate student (#1). This positive attitude continues as most students felt they had ideas about problems to investigate (#5). Furthermore, students perceived that it would be possible to engage in research within the context of practicum experience in teacher education (#4). Thus, students feel that undergraduate research is possible, even in the competing context of field-placement practicum assignments that are part of their teacher education program.

Conclusions & Implications

The findings reported here offer preliminary descriptions of students considering careers as teachers. The findings reveal that these students have emerging, though incomplete ideas about research, undergraduate research, and research and undergraduate research in relation to learning to teach. This is consistent with prior research within the framework of learning to teach (Cochran-Smith et al., 2009; Wilson, Floden, & Ferrini-Mundy, 2002; Zeichner & Schulte, 2001). Findings reported here suggest this may be a result of naïve or inaccurate impressions of research. It is also important to note that these same students have preconceived ideas about the usefulness of research findings in decision-making in the education profession. In this study, students who are considering entering the teacher

education program were equally committed to relying on personal experiences and research findings to make decisions about teaching and learning. This suggests that students have simplistic ideas about research and the implications research has for decision-making in the education profession.

An important implication involves considering how this information is useful in supporting UR in teacher education and potentially other disciplines. Prospective students in this teacher education program expressed a belief that engaging in research was beneficial and possible as an undergraduate teacher education student. Yet, consistent with prior research (Cochran-Smith et al., 2009), the challenge seems to be in helping students perceive the usefulness of engaging in research – either as a student or as a future professional. As scholars have explained, beliefs, visions, belonging, and identity impact teacher development, as well as their views of inquiry-oriented activity in the education profession (Fairbanks et al., 2010). Thus, we may need to consider ways to affect these beliefs, visions, belonging, and identity in teacher education courses. For example, helping teacher education students see the usefulness of research in teaching may impact their beliefs about inquiry in practice. Alternatively, it might be possible to help teacher education students understand the epistemic practices of the education profession. This is important so that students can understand the ways that research and practice interrelate. The students surveyed seem to have confounding perspectives on the possibility of engaging in inquiry while completing practical experiences as education students. These perspectives—students' views of research and their sense of possibility to engage in research—offer a starting point to explaining the lack of participation in UR and also offer inroads to finding approaches to change this trend.

While the findings reported here focus on prospective teacher education students, there are some outcomes and insights relevant to the broader UR community. First, the findings

Works Cited

add to the research base on UR and suggest that it may be important to investigate disciplines beyond STEM fields when attempting to understand all students' UR experiences. While there are parallels between this example case and prior research findings in terms of students' understandings of the nature of research, there are also features that distinguish students in practical and applied fields like human services, business, communications, counseling, nursing, etc. Most notably, students may not appreciate that an UR experience does more than provide research experiences and knowledge and skills to conduct research. As argued by both Palmer & Marra (2004) and Sadler & McKinney (2010), UR experiences develop epistemological understandings of a discipline. Yet, students' responses on the survey suggest this kind of benefit was not perceived as important; one can speculate that students in applied and practical fields would hold similar positions.

Finally, the limited understandings we have of students' prior conceptions of research and UR (Adedokun & Burgess, 2011; Seymour et al., 2004) make it difficult to think strategically about increasing involvement in these elective programs. While this problem is less pronounced in STEM disciplines, there is good reason to believe that greater understandings of perceptions and orientations toward research would be useful knowledge. Understanding how to increase the numbers of students who engage in UR requires us to learn about both those who chose to do UR, and those who do not. This study only offers a glimpse into this issue and there are natural limits to the generalizability of these findings. However, the findings discussed above do give reason to consider further investigations into students' orientations toward research. Such investigations should look broadly across disciplines, seek to consider differences between disciplines, and potentially offer insights into approaches toward mentoring in order to encourage participation in undergraduate research.

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Appendix A

| Respond to the following statements according to how you feel about the statement. A = Strongly Disagree – I never believe this is correct. B= Disagree – I don't think this is correct. C= Agree – I think this matches my beliefs. D= Strongly Agree – I believe this is always true.	A Strongly Disagree	B Disagree	C Agree	D Strongly Agree
1. From my perspective, research involves controlling and manipulating variables.	SD	D	A	SA
2. I think that research begins by asking substantial questions.	SD	D	A	SA
3. I think research begins by identifying what are important problems to solve.	SD	D	A	SA
4. Research should consider events that happen in the world.	SD	D	A	SA
5. Most of the time, I think people conduct research in order to confirm their ideas.	SD	D	A	SA
6. Most of the time, I think research begins with a problem or issue.	SD	D	A	SA
7. I believe that people who conduct research are also creative.	SD	D	A	SA
8. I think that research can be used to understand disciplines like history, culture, the arts, and education.	SD	D	A	SA
9. For me personally, research is valuable.	SD	D	A	SA
10. Research, regardless of the topic, uses similar methods (e.g. an experiment) to find and interpret information.	SD	D	A	SA
11. I frequently use research in making day-to-day decisions.	SD	D	A	SA
12. I expect that in my future profession I will often need to engage in research.	SD	D	A	SA
13. I am interested in being able to conduct research as an undergraduate student.	SD	D	A	SA
14. My peers tell me that it is difficult for Education majors to conduct research since they have extensive practicum requirements.	SD	D	A	SA
15. I believe that research is useful to teachers because it helps them meet the needs of children	SD	D	A	SA
16. I believe that it is possible for teachers to conduct research while they are teaching.	SD	D	A	SA
17. Research is useful to other researchers.	SD	D	A	SA

|				
18. Policy decisions based on research are better than policy decisions based on personal experience or recommendations from practice.	SD	D	A	SA
19. School administrators should rely on research less than their own experience or the knowledge of other professionals to make decisions.	SD	D	A	SA
20. K-12 Teachers should rely on research to inform the majority of their pedagogical decisions.	SD	D	A	SA
21. Teaching is practical work that focuses on children learning. Therefore, learning to conduct research is not as important in learning to teach.	SD	D	A	SA
22. The majority of people should learn about how to conduct research.	SD	D	A	SA
23. Based on my past experiences, I have found that learning research skills is challenging.	SD	D	A	SA
24. I would like to learn research procedures.	SD	D	A	SA
25. For me, the most challenging aspect about research is conducting analysis.	SD	D	A	SA
26. For me, the most challenging task in research is conducting a literature review.	SD	D	A	SA
27. For me, the most challenging aspect of research involves understanding which theories are important.	SD	D	A	SA
28. For me, the most challenging task in conducting research is developing a research question.	SD	D	A	SA
29. For me, the most challenging task in conducting research is identifying a research problem.	SD	D	A	SA
30. I believe that it is possible for me to conduct meaningful research as an undergraduate.	SD	D	A	SA
31. I believe I have adequate knowledge to design, implement, and analyze research.	SD	D	A	SA
32. I believe I have adequate skills to design, implement, and analyze research.	SD	D	A	SA
33. I believe that it is impossible to engage in a practicum experience and also conduct research.	SD	D	A	SA
34. I believe that I have important and practical questions that are researchable.	SD	D	A	SA

Impressions of Research
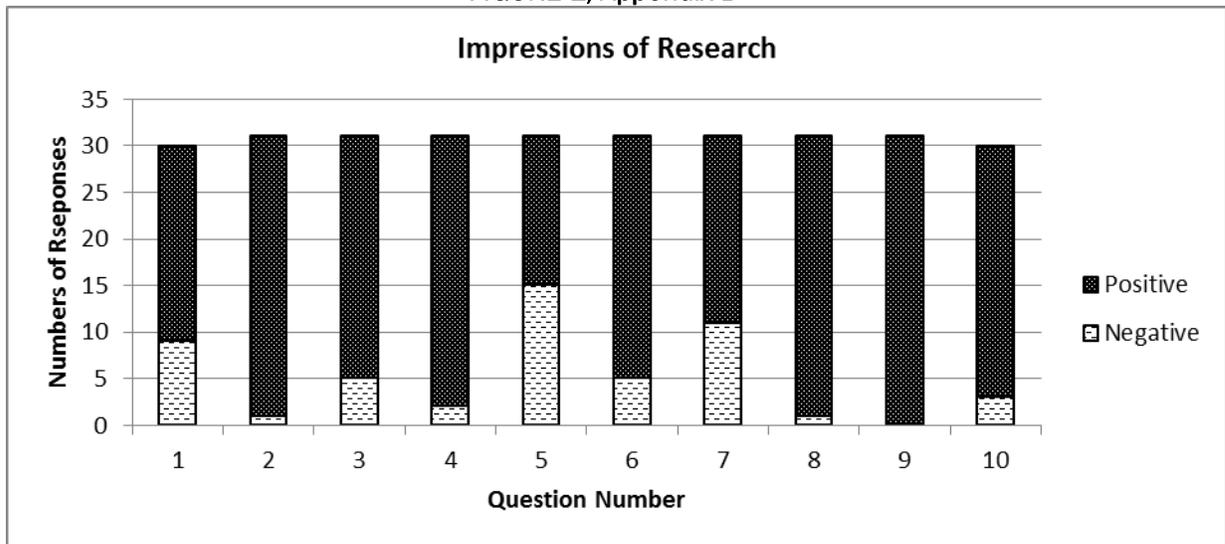
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5. Most of the time, I think people conduct research in order to confirm their ideas.
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7. I believe that people who conduct research are also creative.
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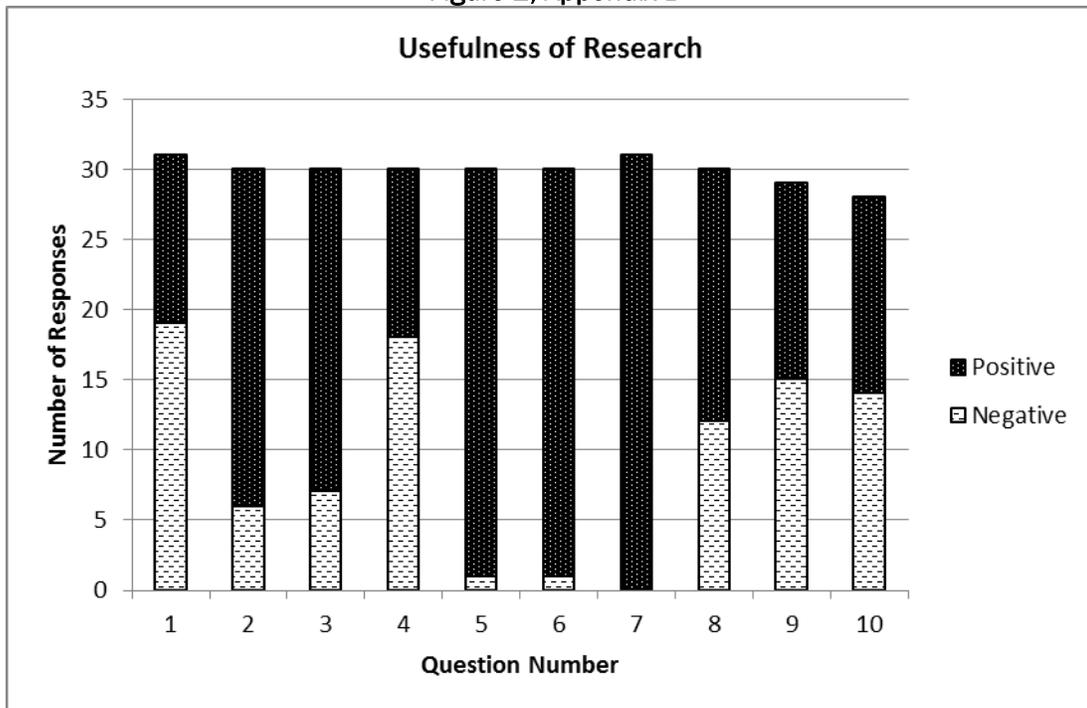
1. I frequently use research in making day-to-day decisions.
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3. I am interested in being able to conduct research as an undergraduate student.
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5. I believe that research is useful to teachers because it helps them meet the needs of children
6. I believe that it is possible for teachers to conduct research while they are teaching.
7. Research is useful to other researchers.
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10. K-12 Teachers should rely on research to inform the majority of their pedagogical decisions.

Learning about Research
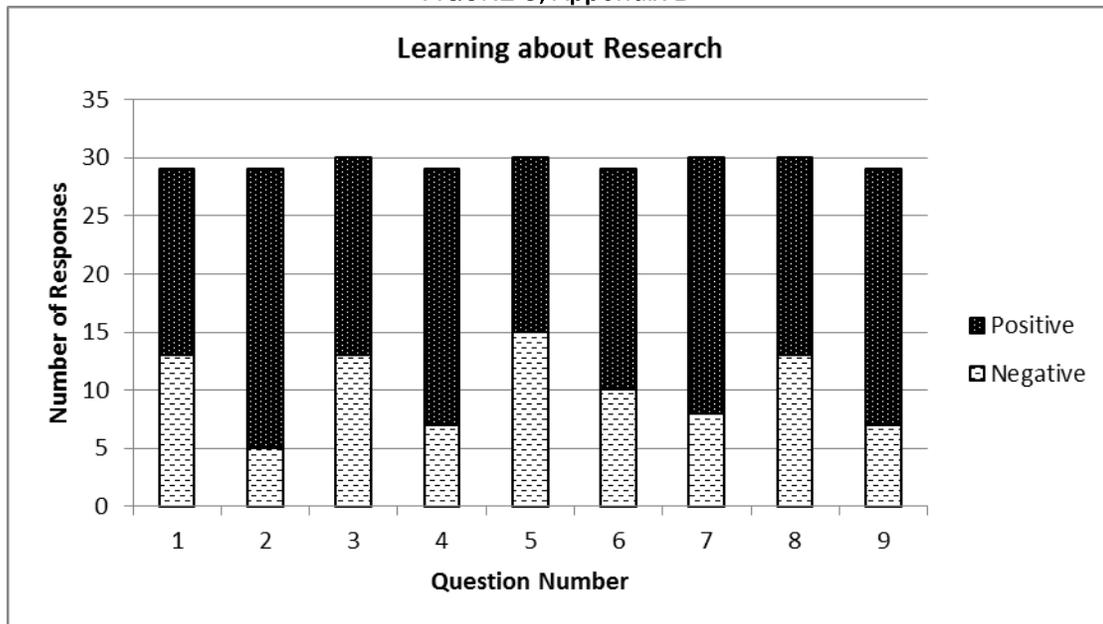
1. Teaching is practical work that focuses on children learning. Therefore, learning to conduct research is not as important in learning to teach.
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9. For me, the most challenging task in conducting research is identifying a research problem.

Attitudes about opportunity to conduct research
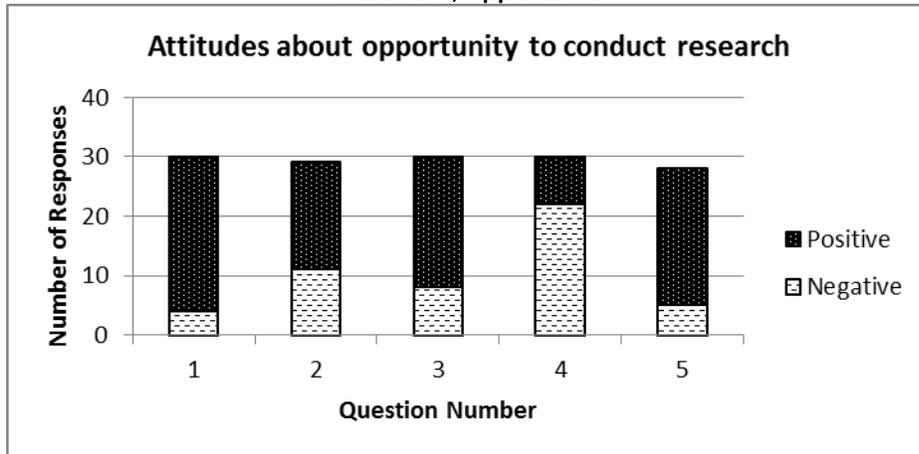
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