Introducing Them to Research: How Do Students New to Research and Participating in a Summer Research Program Perceive Research?

Tonisha M. Smith and Henry T. Frierson

Researchers from African-American, Hispanic/Latino, and Native American groups are lacking in academia, particularly in science fields. Some attribute the low number of underrepresented minority faculty to a weak or non-existent academic pipeline leading to the doctoral degree. In 2002, 25,936 U.S. citizens earned doctoral degrees (Hoffer, Dugoni, Sanderson, Sederstrom, Welch, Guzman-Barron, & Brown, 2003). In considering minority doctoral production among US citizens, there were 4,730 members of ethnic/racial minority groups awarded the doctorate of which 1,644 were earned by African Americans, 1,364 by Asians, 1,233 by Hispanics, 146 by American Indians, 75 by Hawaiians and other Pacific Islanders, and the remaining 268 were classified as non-Hispanic other. (Hoffer et al, 2003). While recent data have suggested that over 16% of doctorates awarded to US citizens in 2002 were earned by ethnic/racial minority groups, it should be noted that the majority of these degrees were awarded in the area of education, in which blacks are most heavily concentrated (Hoffer et al, 2003). More precisely, in 2002, African Americans earned 680 doctorates in the broad field of education, 333 in social sciences and psychology, 174 in the humanities, 206 in the life sciences, 101 in the physical sciences, and 86 in engineering (Hoffer et al, 2003). This point is not meant to disparage African-American PhD recipients in non-science fields, but rather to draw attention to the need to increase the numbers across all disciplines.

More highly publicized fields like medicine, law, and business that are often presented as more lucrative and glamorous tend to do better at attracting individuals from underrepresented minority groups. As Maddox and Smith-Maddox (1990) argued, "Many minority undergraduates and recent graduates lack the exposure needed to prepare for and select future research and teaching opportunities in technical fields" (p. 480). While many college students have a general idea of what careers in medicine and law entail, most seem not to fully comprehend the nature of the research career unless they have participated in an enrichment program or internship that exposed them to research and the various career options, particularly in academe.

This study was designed to better understand how students who lack research experience transition into research settings and how they view research after participating in a summer research program. The purpose was to gain a fuller understanding of the impact the program might have had, if any, on such students. Our major research question is this: How does participation in a research program

Tonisha M. Smith is a Doctoral Candidate and Henry T. Frierson is a Professor, both in the School of Education at the University of North Carolina at Chapel Hill.

impact students' understanding of research and their attitude concerning research careers?

Previous literature on summer research programs offers further insight into the usefulness of undergraduate research programs and other intervention opportunities that nurture and guide students early on in their academic career. In an earlier study that focused on a summer research program, Prentice-Dunn and Roberts (1985) examined a 6-week summer internship in psychological research designed to prepare minority undergraduates for graduate study. The internship was based on a research apprenticeship model and sought to provide thorough training in research methodology. Another key aspect of the program was that students worked with several researchers and topics to gain extensive exposure to research. According to Prentice-Dunn and Roberts, "Although specialization is a necessary feature of graduate research endeavors, we believe that undergraduate research experiences should broaden the student's learning of research principles while instilling in the student an excitement and respect for the scientific process" (p. 143). The program's rationale was that students should focus on activities like exploring survey methods, training in telephone interviewing as well as experiential exercises such as participating in a research project and learning how to conduct their own studies. According to Prentice-Dunn and Roberts, this internship had a number of advantages: (1) students' writing skills improved according to faculty; (2) students having participated in such a research program are perceived as more attractive to graduate schools than those lacking research experience; (3) and, once in graduate school, students with prior research experience were potentially ahead of other students in their ability to conduct their own studies and forge working relationships with faculty on projects.

Barisa and Holland (1993) studied a program for undergraduate students called Graduate Achievement Program (GAP) that was designed to increase the number of female and minority math and science advanced degree holders. GAP reflects a consortium of undergraduate colleges and universities in Memphis, Tennessee and Fisk University in Nashville, Tennessee, and participants range from freshmen to senior standing. The program is a 12-week Summer Institute that includes taking a computer class, participating in research laboratory activities, attending seminars, an award banquet, and a 'family-style gathering' designed to promote interaction with parents, program staff, and participants. Additionally, each student and his/her mentor complete a progress report that details the research project and assesses the overall experience. According to Barisa and Holland (1993), preparing and exposing students to research opportunities at the undergraduate level is a necessity since this is where future scientists and professors are trained and selected for graduate study. It appears that not only is it important to train students early, the type of training is also important (Carter, 1988; Independent Colleges Office, 1991; Truchan, 1988). According to Barisa and Holland, "Students understand and retain more and are more excited about science when they actively participate in the classroom and the library as they grapple with scientific concepts through discussion, writing, various forms of interactive learning, and mini-research laboratory projects in which the outcome is uncertain and in which they

themselves contribute to the experimental design" (p. 7).

Barisa and Holland (1993) further assert that active participation and hands-on work is even more crucial to women and minority students who may lack confidence and exposure to laboratory equipment. This idea was also affirmed in Blue's (2000) qualitative study based on a summer research program called Opening Doors. Blue found that the Opening Doors students participated in the program as a way to prove themselves as scholars and because they questioned their ability to perform well in graduate school; these students viewed graduate school as something unattainable either financially or academically. Although these students had outstanding grades as undergraduates, they felt insecure about their abilities and intellect, which Blue's study attributed to minimal or no exposure to conducting research. Blue stated, "Without a model of what graduate school could be like, students described here, may see it as something that only 'other people' do, or in the case of students of color, as an accomplishment that only white students have the ability and finances to achieve" (p. 15). Thus, while summer research programs enhance skills through hands-on learning, such programs have the added advantage of promoting confidence in students of color that a research career is attainable.

In a case study by Wiedenbeck and Scholtz (1995), the researchers focused on a computer-science summer research program that was later used as a model for developing an academic year course on research. Their program's goal was similar to that of other research programs: to attract undergraduates to careers in research, in this case, computer science research. Based on this goal and their belief that many undergraduates lack a clear understanding of what research involves, they sought early on to define research to their participants so that they would have some idea of the job of a researcher. Other program goals included emphasizing hands-on research, giving students exposure to a wide range of activities that researchers engage in during the course of a project, fostering the view of research as interactive and collegial, and exposing students to ethical issues concerning scientific research (Wiedenbeck and Scholtz, 1995).

Based on their study, Wiedenbeck and Scholtz (1995) concluded that research experiences are valuable to undergraduate students when they are structured in a manner that allows them to see their project to completion and helps them build their skills while not expecting them to make "quantum leaps" in research during the short duration of a summer program. Wiedenbeck and Scholtz further found that collaboration with peers through group work helped students feel more at ease with research. Guidance by the research preceptor in formulating questions and reading the literature was also helpful to the participants. "Researchers usually think of knowledge of the literature and research methods of their field as a prerequisite for engagement in research. However in active learning about research, the order is reversed" (Wiedenbeck and Scholtz, p. 48). Active participation and hands on work are vital to summer efforts even if students have limited background in their field of interest because it allows students to get a realistic view of conducting research and a research career (Wiedenbeck and Scholtz, 1995). Similar to findings in other studies, these researchers suggest that immersion in research activities

does not only lead to increased awareness and understanding of research but to enhanced motivation and excitement as well.

In a more recent study, Frierson and Zulli (2002) explore the importance of intervention programs providing exposure to actual research. In their study of an academic year intervention program designed to expose minority science students to research, Frierson and Zulli examined the barriers that prevented these students from participating in research prior to their involvement in the particular program at their home institution. Regarding the issue of barriers, three important factors were raised: (1) Approximately 85% of students indicated that they would not have participated in any form of research had it not been for the research program at their home university; (2) Students felt intimidated about approaching professors about research opportunities; (3) Because students felt intimidated, they began to develop negative feelings about research in general. These findings indicate that access to programs at home institutions and encouragement are key factors in getting underrepresented minority undergraduate students involved in actual research. As a result of their participation in the program, students expressed that they were more confident about seeking out professors and research opportunities

As the literature suggests, early exposure to research and effective mentoring both play key roles in the academic development and aspirations of underrepresented students who participate in science, mathematics, engineering, and technological (SMET) fields as undergraduates and graduates (McHenry 1997). McHenry (1997) discusses the impact of the National Science Foundation's (NSF) program, Research Careers for Minority Scholars (RCMS) that was designed to encourage undergraduate students from underrepresented groups to matriculate into graduate programs. The RCMS program affirmed that underrepresented students can achieve in certain conditions are met: "financial barriers are reduced; early linkage between classroom knowledge and research experiences occurs; adequate program advising takes place; and students are linked with faculty advocates, preferably faculty mentors." (McHenry, p. 116)

For the purposes of our study and in light of the literature, the researchers looked closely at whether or not early exposure to extensive research had an impact on undergraduate junior and senior participants who reported that their participation in a summer research program was their first participation in formal research. The specific intent of this study was to examine those participants' overall perceptions of research after participating in the program.

Methods

The Program

We conducted our study using participants from the 2003 cohort of the Summer Pre-Graduate Research Experience (SPGRE) Program, started in 1988 at the University of North Carolina at Chapel Hill (UNC-CH). SPGRE is a 10-week summer research program that targets underrepresented minority students, prior to their junior or senior

year of undergraduate study, who have expressed an interest in pursuing a career in research. SPGRE students travel from across the United States to convene at UNC—Chapel Hill for this summer program. While the largest segment of students are science majors, SPGRE caters to non-science majors through a component known as the Moore Undergraduate Research Apprentice Program (MURAP).

Another important aspect of the program is the effort to match students with faculty research preceptors based on commonly stated research interests. As part of the application process, students express the areas of research they are interested in pursuing. Prior to a student's acceptance, they must communicate with professors who share mutual research interests to determine if they would like to work together. If a match is made, follow-up communications are encouraged to further discuss expectations, concerns, and goals for both parties. This process is designed to ensure that the best possible matches are made between students and faculty preceptors. The participants conduct formal research under the guidance of their faculty research advisor and are expected to produce a final paper and a poster summarizing their research at the end of the program.

In addition to the aforementioned expectations, SPGRE students are expected to participate in various workshops and seminars designed to better acquaint them with graduate studies and research careers. Speakers discuss topics such as graduate school, career options, life in the academy, etc., in hopes of elucidating the doctoral process and post-graduate opportunities. The ultimate goal of the SPGRE program is to introduce participants to formal research activities in an academic environment in hopes that they will want to pursue an advanced, research-based degree and career.

Participants

While many SPGRE students arrive having had some type of research experience, some arrive without any prior research experience. There were 59 students in the 2003 SPGRE cohort of which 14 had no prior research experience or, more precisely, had not been involved in any type of research project under the guidance of an experienced researcher. For the study, we selected the 14 students who had a lack of research exposure. In the group, there were four African-American males, one Latino male, and nine African-American females. The participants were both science and non-science majors. There were 12 science majors and 2 non-science majors. The majors represented were computer science, biology, history, electrical engineering, forensic science, chemistry, cinematology, food and nutrition, and mathematics.

Procedures/Analysis

On the first day of the program, students were asked to identify themselves according to their previous research experience. Those who said that they had no research experience were called aside and asked to participate in a focus group. The 14 self-identified students were separated into two groups of seven students, and two

interviewers conducted each focus group. The four interviewers were all doctoral students. The program participants were asked to respond to a series of questions concerning what qualifies as research, the qualities of a good researcher, the usefulness of research to their undergraduate education, why they had not participated in research previously and what their career goals and plans were after graduation. Both subgroups responded to the same questions and each focus group session was recorded. The sessions were approximately an hour in length. Focus group responses were transcribed immediately following each session.

The students participated in a second focus group session during the last (10th) week of the program to determine whether their initial responses had changed as a result of their participation in a summer research program. Students were asked to respond to the same initial questions. During each focus group session, the two groups were interviewed in separate rooms. However, for the purposes of the study, the two groups' responses were collapsed for the pre-program and post-program results.

Qualitative methods were employed in collecting data and analyzing respondents' impressions of research. Notes taken during the focus group and the transcribed interviews from both sessions were read several times and closely analyzed to see if particular themes emerged relating to students' perceptions of and experiences with research. Respondent feedback was divided into four primary areas: Student understanding of research before participating in SPGRE; Student understanding of research after participating in SPGRE; Student motivation for participating in SPGRE, and Student attitudes toward research careers, pre- and post- program.

Results

Pre-Research Experience Focus Group Outcomes

Initially, the respondents were asked to provide definitions of research and its associated activities. According to the responses, research is looking at new materials, generating new discoveries, coming to your own conclusions and hypothesis about the information that is already out there, and challenging previous thoughts and methods. When asked specifically about activities that qualify as research, students responded that trial and error, number crunching, statistics, reading, interviewing and searching in books were all research activities. One student remarked,

> I think of hands-on activities. Like as far as undergraduate, you don't really get the opportunity to get hands-on kind of research, you learn from like the general education stuff. When I think of research, I think of something that will allow me to apply what I've learned to something and that's what I think is hands-on.

Such responses suggest a fairly basic understanding of both quantitative and qualitative aspects of research. And, as Wiedenbeck and Scholtz (1995) pointed out, the responses also indicate the importance of experiential learning in clarifying research to

undergraduate students.

Explaining Their Lack of Research Experience

As indicated, the participants in this study had no prior research experiences, so we felt it important to understand why they had not participated in research prior to their involvement in the SPGRE program and if there were particular barriers that precluded their involvement in research. When asked why they had not participated in research at their home institutions, the students indicated that class schedules or other opportunities interfered with their ability to participate in research activities and some cited problems concerning access to research opportunities at their home institutions:

"There are time issues or you have a job or you're just doing other things at the time."

"I didn't want it [research] to interfere with my classes."

"Well, I don't know if this is the case at other schools, but at mine, especially if you are an academic science major where you have to do some sort of research, but you just don't qualify for anything; for you to be able to get any other research opportunities, do any kind of research, you have to be in with the professors . . . And it's kind of hard to get in with certain teachers if they don't know you. You have to be known by them; otherwise you are not even considered. So, even though it's listed as a class (Intro to Research with Dr. Whomever) and you know what they teach, you can't just go and register for the class, you have to be in with teachers because you are going to be spending a lot of time with them. And it's kind of hard to get in with certain teachers if they don't know you then, it's kind of not worth your time to bother. And it's the same thing with the new biomedical research center—the reason that most undergraduates don't go over to that building is because we're not really welcome there, we don't know anybody over there. No classes are offered over there until you are upperclassmen, and by then you are on your way out and it doesn't benefit you."

While the first two respondents spoke of scheduling conflicts and balancing their time, the third student's longer response speaks to a more serious concern involving the perception of research as a club in which only a select few can participate. Blue (2000) raised this point that underrepresented students see research and other academic opportunities as unattainable due to inferiority complex and/or lack of exposure to people of color in such positions. This also echoes the findings of Frierson and Zulli (2002) when they reported that a large number of underrepresented minority students indicated that they did not know who to approach to gain research experiences. The respondent also remarked that research opportunities are offered too late, when students are upperclassmen and unable to reap the benefits of early exposure to research.

Another respondent suggests that professors have greater control over her ability to conduct research than she; thus, she concludes that it may not be worth the effort to pursue research. Frierson and Zulli (2002) also mentioned that intimidation in forming relationships with professors can lead to negative attitudes concerning research.

What Attracted Them to the Summer Research Program?

Another area of interest was why students from underrepresented groups elect to participate in summer research programs. The respondents cited various reasons for their decision to participate in the SPGRE program such as referrals from past participants, meeting a requirement, a desire to explore career possibilities and to make connections that might work to their advantage when applying to graduate school. Some of their statements are provided below:

> *"Word of mouth. I have a friend that participated in it and she said that it was a good experience. Plus, I'm in the LSAMP, and the lady over that program said it was a good experience to travel and get the chance to do research in another state or somewhere different than your home institution and it looks better on your CV or when you apply for grants and things."*

> *"I think that it is also a good way to come and find yourself and see what you want to do because after completing the program, you might find out that research isn't for you. Or, that your major might not even be for you. So I think that it's a good experience."*

> *"And, you know, just the fact that such a program is at UNC, because I might want to come here for graduate school. Getting familiar with the campus."*

> *"This is the first program like this I knew about. One of my professors told me about it."*

> *"It was a requirement for my scholarship; we have to participate in summer research, the summer of our sophomore year to the summer of our junior year, and this was the one chosen."*

One student was clear that he had only participated to satisfy a requirement of some kind. Interestingly, another student stated that SPGRE was the first research program that she was aware of. Some of the respondents seemed more aware of the potential benefits than others, citing the impact of the program in affirming career goals and influencing graduate school attendance and selection.

Thoughts Concerning a Career in Research

Several respondents indicated that they had considered a career in research. However, some were much more certain of their career goals than others. When asked if they had ever thought about a career in research, most students responded affirmatively. However, it may be important to note that some of their responses reflect confusion as to the types of opportunities available for science students interested in research careers:

"There is no other choice for me. In my field, you will do research, there is no other option."

"As a science major, you can go one of two routes, research with a PhD or you can be an academic and teach and still do research with your PhD, so you can't get out of it. And I think that kind of sucks because not everybody who goes into science or scientific study, whether its biology or chemistry, is really all that interested in research. I think that there should be more that we should be able to do with it than just end up in somebody's lab or running your own lab doing the same 'ole, same 'ole."

"I still don't know what I want to do in Computer science as a career, so research allows me the opportunity to explore areas in which I might be interested in."

Post-Research Experience Focus Group Outcomes

There was not much variation in terms of definitions of research after participation in the program. Students mentioned that research involved quantitative analysis of data, being familiar with a topic first, for example, doing a literature review, and anything that helps you answer your question. However, while their definitions of research did not change much, students did indicate that they had acquired new research skills and experiences that they saw as valuable.

"I didn't know that interviews were research; I thought research had to be experiments. I didn't know that surveys and interviews counted as research."

"I got more than I thought I would. I learned how to write and will continue research in the fall."

"I learned to write a research paper and recognize technicalities."

"Because of the technology that UNC—CH has, I got the lab experience that might not have been available."

As the comments suggest, students did acquire valuable knowledge from their

participation and were able to identify tangible skills that can be used at their home institution for future research.

Thoughts Concerning a Career in Research

The post-focus group session results indicate that most participants still have an interest in research. Even for those participants who expressed an aversion to research by the end of the program, such feelings seemed to stem from working on a project that they didn't enjoy or find interesting or working with people who they were not comfortable with, both of which are important issues to address as indicated in the following responses.

"The project I worked on was a website; I didn't enjoy it and I want to enjoy what I'm doing."

"The research done this summer has nothing to do with what I want to do. I want to work more with the business side. Research isn't for me."

"I don't want to be in a lab; there are stand-offish personalities."

Participants in this summer research program also indicated that they gained knowledge that has helped them determine what they would like to do after completing their undergraduate education. One student remarked, *"It was a good experience because of narrowing choices about graduate school and I can now focus in on a career; my ideas were broad but now they've been made more specific."* Clarifying career choices and opportunities was considered of value to the students.

Ultimately, the purpose of programs such as SPGRE is to encourage underrepresented students to pursue graduate studies. Table 1 provides an overview of how the program was associated with career choices based on the participants career choices before and after the program.

Table 1 provides an illustratation that that at the end of the 10-week program, the majority of students remained interested in the PhD degree. However, by the program's conclusion, there was a decrease from eight students to six who expressed interest in pursuing the PhD. The number of students interested in pursuing the MD/PhD remained the same. The number of "undecided" students increased as did the number who intended to get a master's degree.

Discussion

Based on the research question and subsequent results, the central finding is that the SPGRE program did not have the intended effect for those 2003 participants who had little or no prior research experience, and the intended effect was to increase the number of students interested in obtaining a PhD degree. The purpose of the study was to

determine the impact of a research program on students with no prior research experience and if we look strictly at numbers, then the program was not successful. However, if we look closely at the comments from the participants, it becomes more evident that program had a positive impact on most of those students. Perhaps the most significant impact the program had was helping those particular students determine their career goals based on an enhanced understanding of research and the research career. Furthermore, this reinforces the notion that there are many boundaries, lack of exposure, lack of confidence and intimidation, that make research a more challenging endeavor for many students from underrepresented groups. Another significant barrier that perhaps was not addressed in the literature concerns, students working on projects and/or with people they find less than interesting. While SPGRE worked hard to ensure suitable matches, those who expressed an aversion to research after the program typically cited the aforementioned reasons. For programs such as this, perhaps it might be useful to place more emphasis on better matching of students, preceptors, and projects.

As observed in this study, overall, pre- and post-program interest in the PhD remained relatively steady among those who had intentions to pursue doctoral education, although there was a small decrease in numbers. Initially eight students expressed plans to pursue the PhD, but only six had this same goal by the end of the program, so there was a slight decline. Unfortunately, due to a problem with sound quality during the second focus group, it was not clear whether the two students who changed their minds about pursuing the PhD moved to another career selection or became undecided. This is an error that will be addressed in any follow up studies on this topic.

Additionally, it may be important to note that the majority of these SPGRE respondents had intentions to further their education beyond the undergraduate degree (both prior to and after the program). These students still indicated that they had been enriched as a result of participating in the program, particularly in the area of making educational/career choices. As one student remarked, *"I think it is a good way to come and find yourself and see what you want to do."*

Next, the results suggest that SPGRE provides research opportunities that may not be available at participants' home institutions and that some students are unaware of research opportunities that may be available to them. One student mentioned that SPGRE was one of the first programs of its kind that she had heard of. If this is so, then SPGRE has an added benefit of catching students who may have otherwise fallen through the cracks. Even if students have academic year research programs at their home institution, programs such as SPGRE can perhaps serve as a valuable supplement that keeps students immersed in research during the summer. Although there was a decline in the overall number of students who initially stated an interest in pursuing the PhD, the program seemed to make a difference in the students' lives by helping them to make clearer career choices and equipping them with useful skills, such as improved writing and research capabilities.

The function of SPGRE and similar programs is to increase the numbers of underrepresented minority groups pursuing research degrees and careers. As the literature suggests, many minority undergraduates lack the exposure needed to select

research and teaching opportunities in technical fields (Maddox & Smith-Maddox, 1990). Furthermore, through early exposure, students are afforded the many benefits that come with active, hands-on learning. Learning about research while conducting research can lead to more meaningful learning and increased excitement for scientific discovery (Wiedenbeck & Scholtz, 1995).

Future research might include studying this segment of the SPGRE population on an ongoing basis. And, it might also be useful to include students with prior research experience to determine if and how the program might affect their feelings about graduate education and research careers. For comparative purposes, it might also be useful for those who come to the program with a strong background and interest in research continue to have that interest after the program to better assess how the program can be enhanced. It might also be useful to study the rates at which participants continue on to graduate school, both those with or without research experience, to better assess how undergraduate research programs can best serve such students and encourage graduate degree attainment. Finally, more attention could be paid to individual participants to better observe their movement from one career selection to the other by following the focus groups with individual interviews to obtain more specific details concerning each respondent.

Overall, undergraduate research programs such as SPGRE are successful in contributing to the PhD pipeline in the science, mathematics, and engineering fields. However, based on the low numbers of underrepresented minority groups in graduate school and tenure-track faculty positions, more action is needed to address this widespread and continuous problem. As suggested, early exposure to research is important in instilling awareness, confidence, and the skills sets necessary for graduate school. Summer research and other research programs offer students a chance to explore the prospective career of researcher and academician and make valuable connections with other students and faculty members. Further studies are needed to examine means to increase awareness about research related careers and to increase the number of scientists from underrepresented groups.

References

Barisa, M. T., & Holland, C. (1993). *The graduate achievement program: A description of the first year of a summer enrichment program in math and science for minority undergraduate students.* Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans, LA. (ED 372933)

Blue, D. (2000). *When 'they are also us': Building community and negotiating culture among students of color in higher education.* Paper presented at the Annual meeting of the American Educational Research Association, New Orleans, LA (ED 443318)

Frierson, H.T., & Zulli, R.A. (2002). Examining the perceptions of minority undergraduate students participating in a university-based research program. In Allen, W. Spencer, M.B. and O'Connor, C. (Eds.) *African American Education, Vol. 2* (pp. 119-132). Elsevier Science Ltd.

Hoffer, T.B., Dugoni, B., Sanderson, A., Sederstrom. S., Welch. V., Guzman-Barron, I., & Brown. S. (2003). *Doctorate Recipients from United States Universities: Summary Report 2002*. Chicago: National Opinion Research Center.

Maddox, A.B., & Smith-Maddox, R.P. (1990). Developing graduate school awareness for engineering and science: A model. *The Journal of Negro Education, 59*(3), 479-490.

Prentice-Dunn, S., & Roberts, M.C. (1985). A summer internship in psychological research: Preparation of minority undergraduates for graduate study. *Teaching of Psychology, 12*(3), 142-145.

Wiedenbeck, S., & Scholtz, J. (1995). Introducing undergraduates to research: A case study from the field of human-computer interaction. *Computers Education, 24*(1), 37-49.

TABLE 1

Post-Baccalaureate Goals of the Focus GroupParticipants Before and After Their Summer
Research Experience

PRE-SPGRE GOALS	POST-SPGRE GOALS
PHD = 8	PHD = 6
MD/PHD = 2	MD/PHD = 2
MASTERS = 1	MASTERS = 2
MD = 1	MD = 1
LAW SCHOOL= 0	LAW SCHOOL. = 1
WORK = 1	WORK = 0
UNDECIDED = 1	UNDECIDED = 2