

WIP Nurturing Novice Researchers: An Exploration of Undergraduate Student Experiences in a Creativity Inquiry Research Class

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Introduction

The undergraduate experience is greatly enhanced by participating in research experience early and often [1]. Undergraduate research in the disciplines has been shown to be effective in recruiting students for graduate school [2]. Undergraduate students report the usefulness of these experiences in teaching “real world” skills and, with proper intellectual stimulation, often produce publishable research. Additional studies have examined how experts recommend teaching qualitative research in a classroom [3]. The focus was legitimizing qualitative inquiry and then selecting a method to teach instead of attempting to teach them all. This paper will look at similar questions but from the undergraduate students' perspective as they engage in educational qualitative research. Using an autoethnographic lens, this paper will explore how students' perceptions, attitudes, and skills evolve as they progress from the early stages of qualitative research engagement to the more advanced phases. This paper will provide valuable insights into the educational practices and strategies that effectively support the development of novice educational researchers among undergraduate students.

Positionality and Methods

This study takes place at a public research university located in the Southeast United States. The university has over 22,000 undergraduate students and 5,000 graduate students. As a R1 university, students are encouraged to partake in research opportunities throughout their education through the Creative Inquiry (CI) Program. CI is a program in which faculty members and graduate student lead and mentor undergraduate students through research and collaboration. This CI has 9 people, including professors, graduate students, and undergraduate students with varying backgrounds in fields such as engineering, psychology, biology, mathematics, and education. For a lot of people in this group, this CI is their first real experience with taking part in research, specifically qualitative research. Over the fall 2023 semester, the team has been coding written student reflections using a priori coding [4] and we meet in a hybrid format. The team has processed over 100 pages of student reflection data on a curriculum intervention in engineering and improved their intercoder reliability continually over the past semester. The group began to think about how they have grown as qualitative researchers and reflected on the following questions to answer what has helped them grow as qualitative researchers.

1. What was it like to work on your first educational research project? Reflect on your classroom and out-of-class experiences.
2. What challenges and growth opportunities were the most/least helpful as you learned about the complexities of qualitative research methodologies?
3. How did your perceptions, attitudes, and skills evolve as you progressed from the early stages of qualitative research?
4. What educational practices and strategies supported your development?

After CI members answered these questions, we shared our responses with each other. Then the team used open coding and thematic analysis to determine commonalities and differences amongst their experiences.

Results

Through the course of the fall semester, the CI team developed valuable critical thinking, organization, collaboration, and communication skills. Similar to the process of analyzing reflections from engineering students, the CI team also took the time to reflect on their own progress with qualitative coding using MAXQDA (Qualitative Data Analysis Software) [5]. This CI team is composed of student researchers from various science-based disciplines who could resonate with the topic and connect with the participants. Being able to connect with the participants allowed the team to gain valuable insight pertaining to the perspectives and experiences of the research participants. The team's first-time experiences with qualitative research are reflected in this paper, highlighted by the following:

Resonation with Topic

Being able to resonate with the research and understand patterns was crucial to the research process. As indicated by researcher Isha, *“As a student in STEM myself, I found myself relating to a lot of the challenges, and therefore, being able to categorize and make connections through patterns has been an experience that I personally have been impacted by.”* Resonating with the topic increased the likelihood that the study would yield more meaningful insight. The integrity of the research is stronger because of the connection between the researchers, participants, and the research itself. *“As a former general engineering student, I had taken similar surveys and pondered the same situations as the students we are studying.”* This statement by researcher Eli demonstrates how having experience from participating in similar research surveys in the past helped him to categorize the data as a researcher. Eli also emphasized that he had experienced situations and experiences with students like the ones conducted within the research. These shared experiences formed a connection between the researchers and the students, strengthening the results of the research.

Critical Thinking

As mentioned by researcher Isha, *“I learned to think critically and truly understand the obstacles students face here and how we can best cater to those challenges and make a difference.”* Critical thinking and understanding and catering to academic challenges for students in STEM was an outcome of the research conducted. Reflexivity allows researchers to reflect upon their own perspectives and assumptions. We can grow professionally by building critical thinking skills, which we can develop by participating in reflection within our research. These skills are important in qualitative research as they build the applicability of our findings through established patterns and trends. The trends found within our research are incredibly significant in helping inform our understanding of the present and future of STEM education. An example of how critical thinking within this research project has been applied can be seen within cognitive understanding and figuring out how like-minded students think. As shared in the quotation by researcher Nathan, *“Getting to know people with similar interests and getting into discussions on*

how to categorize survey responses has helped me see the details of how other people think.”

Qualitative research involves capturing the experiences and perspectives of participants and analyzing them. Critical thinking is facilitated by coding survey responses and analyzing them on a deeper level. From data analysis, coding, reflection, and application, this remark indicates how critical thinking helps to enhance the experience of participating in STEM education research.

Strength in Organization

In order to improve the process of attributing codes in an efficient manner, the CI team worked to improve their organizational skills. These skills proved to be very beneficial, allowing the team to effectively sort through the responses. Student researchers Kassy and Angelina both commented on the benefits of using tools like the codebook to organize data in an easily accessible way. Student researcher, Eli noted how the collaborative effort to define and expand upon improved definitions has significantly enhanced his ability to organize data. *“My ability to properly organize the data based on the improved definitions that were defined and expanded upon as a group.”* Observably, these collaborative efforts have resulted in a more effective work process in redefining and enhancing the codebook. Organizational tools acquired, like the codebook, have further improved the CI team’s ability to increase productivity and researcher agreeability.

Necessity of Collaboration in Group Qualitative Coding

This group of student researchers held diverse identities, came from various backgrounds, and were pursuing distinct academic trajectories. It is clear that each researcher has not found themselves on the same exact page, as our unique experiences continue to shape our interpretations and applicability of each code. Contrary to the famous statement “Great minds think alike,” our experience in qualitative coding suggests a new perspective. Student researcher Kassy, highlights that *“In our classes, we were paired with classmates, and collaborated in an attempt to come to a consensus of codes. Collaboration was essential, as it was evident that we all think differently when it comes to coding, even with the guidance of the codebook.”* In our case, *great minds think differently*, but are collaboratively engaged and are receptive listeners amidst the various perspectives. As researchers, we were committed to fostering an open space, where each member has an opportunity to contribute their thoughts and opinions.

While acknowledging the necessity for concurrence at the end of the day, it is crucial to recognize that collaboration has been the exclusive route in which our intercoding similarity score was enhanced. Furthermore, challenges extend beyond coming to an agreement on coding; understanding the foundational convolutions of qualitative research methodologies has been additionally demanding. Student researcher Ben states, *“In class collaboration and activities were what I found to be the most helpful in learning the complexities of qualitative research methodologies.”* From starting out being paired with others in the classroom and transitioning into group coding, collaboration has amplified our efficiency in our understanding and our ability to qualitatively code. Overall, our team's collaborative efforts in qualitative data have been instrumental in being able to overcome challenges, resulting in more efficiency and similarity in our coding.

Navigating Communication Using Modern Day Technology

Within this research class, flexibility of mode of communication played a pivotal role in the students' overall success. This course placed a strong emphasis on communication, especially considering the various needs of instructors and students. It was especially important to ensure every student could attend and participate in class. This research course employed a dual teaching approach, conducted through in person and Zoom instruction. While this strategy provided the flexibility needed for some students and instructors to attend class, the integration of technology introduced challenges. Occasionally, technology was uncooperative, interrupting communication and making it harder to use time efficiently. Student researcher Angelina highlights that *“While the out-of-class environment has provided me with flexibility means, it has also presented challenges regarding real-time coding and communication with other members within the CI.”* As the semester progressed, student researchers demonstrated great adaptability to the hybrid means of communication. While it was initially a distraction, the students were able to adapt to the system and use it to their advantage. Students harnessed the capabilities of Zoom by using breakout rooms and screenshare features to enhance their discussions. Among the various modes of communication, many students found in person coding to be more helpful. Student researcher Ben who has attended the course through Zoom and in person emphasizes *“In person meetings were especially helpful because it is easier to communicate and talk things through in a real-world environment.”*

Overcoming Imposter Syndrome

The CI team faced many challenges while completing their qualitative research project, one obstacle being imposter syndrome. Imposter syndrome is a behavioral phenomenon characterized by self-doubt in one's skills or inability to recognize their own achievements [6]. Upon examining student reflections, it is clear that the students experienced imposter syndrome when coding their reflections. For instance, Natalie noted that *“I was worried and self-conscious about my codes at first but having a supportive and non-judgmental group definitely helped out a lot with that.”* Similarly, Kassy emphasized how having a safe, open-minded environment allowed her to conquer her own imposter syndrome, *“Having supportive and open-minded instructors and classmates allowed me to feel okay sharing some of my codes, as well as some of my reasonings for my codes without judgment.”* These reflections show the team felt that experiencing and overcoming imposter syndrome was important to their research journey and led to significant growth as qualitative researchers.

Growth in Becoming a Researcher

For many members of the group, this project was their first experience in undergraduate research. Engaging in research is a transformative and an enriching academic experience and equips students with skills applicable to both their academic and personal lives. Student Isha remarks *“Although research in itself may sound daunting initially, participating in this research project has not only facilitated my professional growth but my personal as well.”* Despite the initial learning curve associated with qualitative research, students have recognized that this research course has been a beneficial experience. Student Angelina highlights that *“Overall, this educational research project has been a valuable learning experience that has broadened my*

understanding of engineering and qualitative research.” Research demands diverse skill sets contingent upon the subject and the research type. Students from this research project have acquired foundational skills with broad applicability to their future research projects.

Students highlight competencies such as collaborating for consistency, being able to understand the foundational complexities of research and apply it to their own work and utilizing professional colloquialisms through the process of crafting a research paper. Isha states that *“Through analyzing these intricacies, I found myself developing analytical skills that I did not have prior knowledge of before the research. Deciphering and understanding complex ideas and communicating them effectively has been a challenge, but it has aided in my cognitive development like no other.”* Overall, the multifaceted acquisition of skills has allowed students to become highly skilled researchers and prepared students to become well-rounded professionals. *“Through this CI project, I have gained essential skills, including consistency, insight, and confidence, that I can apply to future qualitative research projects.”* (Angelina). As demonstrated, the skill sets acquired from this research project will continue to play a role in their undergraduate research journey.

Conclusion and Future Work

Based on the responses of the undergraduate research students, it was clear that first-time researchers experienced some anxiety and imposter syndrome. Being novice researchers, the group experienced many difficulties, such as categorizing data without strict guidelines. Qualitative research, that has a researcher’s interpretations, was a daunting task to be presented with. Since qualitative data can contain a wide variety of participant responses, it was essential for students to use the same set of rules and approach problems from the same perspective, in order to maximize the accuracy of data analysis. The biggest challenge faced by the researchers in this study was learning how to collaborate effectively. To tackle this problem, the researchers worked together to develop a codebook that explicitly stated the definitions of their terms, as well as giving examples of what should or should not be included when coding responses. This organization helped make the process of classifying data more collaborative. Because the researchers developed the codebook as a group, they all gained clearer definitions of the terms, which has led to more accurate coding.

Collaboration also helped alleviate some of the symptoms of imposter syndrome. When put in groups to work together, researchers were not only able to help fill in the gaps of each other’s understanding, but also helped each other realize that they were not alone in their struggles. Essentially, based upon our research, it can be concluded that collaboration and organization are critical to the success of undergraduate researchers. In the future, we will seek to understand how students process the synthesis of the data they have been collecting. It is essential to understand if the benefits of collaboration and organization will translate to that portion of the research. We will also hope to assess how the students handled the process of creating the research paper and the positives and negatives of that experience.

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