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Beyond Selecting a Methodology: Discussing Research Quality, Ethical, and Equity Considerations in Qualitative Engineering Education Research

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Beyond Selecting a Methodology: Discussing Research Quality, Ethical, and Equity Considerations in Qualitative Engineering Education Research

Abstract

The purpose of this paper is to divulge the complexities embedded within our research team's process of designing a qualitative study focused on understanding marginalized students' experiences in engineering. In this paper, we establish a foundation for fruitful qualitative research, grounded in research quality, ethics, and equity. We discuss how the criteria from these foundational considerations can drive decision making for the various components of a research design. In particular, we focus on decision making around purpose, theory, sampling, and instrumentation. In doing so, we shed light on how each element might be intentionally constructed to a) generate insights on how to disrupt the oppressive environment of engineering education, b) protect vulnerable populations, and c) center participants' voices. In writing this paper, our goal is to provide a transparent account of decisions that can go into designing a qualitative study and implementing a research grant proposal, keeping in mind how our power and privilege influence every decision in the research process.

Keywords: methods, research quality, ethics, equity, marginalization

1. Introduction

The research process involves many decisions. It is important for engineering education researchers to make these decisions intentionally, developing and justifying each component of their research design. It is also essential for researchers to align the inner components of a project (e.g., purpose, theory, sampling, and instrumentation) to ensure they are compatible and appropriate to investigate the phenomenon of interest. As Slaton and Pawley (2018) note, all of the features of a research design must be actively chosen and each of these choices has huge epistemic and political consequences. Unfortunately, the process of aligning these components is complex and enigmatic, as researchers often fail to adequately document the details of their decision making process for others to learn from. They are seldom incentivized to do so.

Accordingly, the purpose of this paper is to divulge the complexities embedded within our research team's process of designing a qualitative study focused on understanding marginalized students' experiences in engineering. To address this purpose, we present and implement a process for methodological decision making. We made this choice because we believe alignment can be systematically achieved through grounding decision making in research quality, ethical considerations, and equity considerations. We consider these three factors important together

because studying vulnerable populations requires questioning and disrupting established research norms that strengthen the dominant narrative. Anchoring our decisions on research quality, ethics, and equity ensures that we are disrupting dominant practices by intentionally interrogating the influence our power and privilege plays as researchers and moving towards rigorous research that intentionally centers participants' voices.

1.1. Paper Structure

We provide specific examples from our project context to illustrate how to systematically establish the components of a research design. We organize this paper by major sections that make up a study: purpose, theory, sampling, and instrumentation. We chose to focus on these specific sections because we believe that these are the sections where decisions have the most implications on findings. Our goal is to provide an understanding of what "good" looks like for each of these sections, grounded in the assumption that researchers conducting this work have resources to carry out this systematic alignment.

We begin by presenting our positionality and how this work is situated in the context of a larger project. Next, we establish the criteria for quality, ethics, and equity that we considered. Then, we step through the purpose, theory, sampling, and instrumentation sections in light of the criteria established. Finally, we present the decision we came to in light of those criteria and our next steps. In making this process transparent, we hope to help new engineering education researchers understand the complex considerations that come with executing a research project.

2. Positionality & Context

The research team is composed of the Principal Investigator (PI) who submitted the original grant proposal to the National Science Foundation (NSF) and received the CAREER grant in which this work is situated; and four graduate students who joined this project after the initial proposal submission and before data collection began. The members of the research team do not all share the same worldview, which influenced how the proposal informed later stages of the project.

For context, a grant involves funding a party to do something, with "reasonable hopes that the task can be accomplished" [8]. This expectation differs from a contract, which is a legally binding document that requires the parties to deliver on their promises to provide a good or service, in exchange for compensation [8]. A PI receives a grant by submitting a successful grant proposal, which details their phenomenon of interest and how they plan to study it.

The NSF Faculty Early Career Development Program (CAREER) is a specific program that awards five-year grants to early career faculty who carry out the project as the sole PI. Though

the project is proposed by one person, it is usually implemented by a team of researchers, which means that the project is likely to adapt as influence from multiple points of view is introduced. An additional implication of NSF CAREER Projects on research is that there is a time lag between development and implementation. Ideally, the PI would develop and justify the components of the research design in the proposal itself. However, page restrictions can often leave a research design not yet fully developed and researchers often only revisit the proposal research plan after the project actually gets funded.

This paper is part of an NSF CAREER grant investigating how marginalized students navigate engineering and the subsequent characteristics of the engineering learning environment. For this project, the grant was submitted more than a year before we started working on this paper. The timing of this proposal was such that the Covid-19 pandemic provided the opportunity to reflect on the decisions made in the original proposal before beginning data collection. The research team facilitated this reflection process through a comprehensive literature review during the first year of this project. The literature review helped synthesize existing relevant conceptual frameworks and led to the development of propositions and a conceptual model.

3. An Approach to Research Quality, Ethics, and Equity

We anchor our project on research quality, ethics, and equity, pulling together existing criteria to establish a foundation upon which to base our decisions.We deemed this an appropriate foundation upon which to produce excellent qualitative research that serves a social justice purpose because anchoring our decisions on these three considerations ensures that we intentionally interrogate the influence our power and privilege plays as researchers. This interrogation is important to disrupt normative research practices that center the dominant voices and oppress and exploit marginalized people.

3.1. Research Quality

Ensuring quality in a study is important for many reasons. These reasons include, but are not limited to, elevating participants' voices, mitigating bias in data collection, analysis and interpretation, establishing credibility, building claims of transferability, and managing power dynamics. Tracy (2010) proposes eight universal criteria for assessing quality in qualitative research: 1) worthy topic, 2) rich rigor, 3) sincerity, 4) credibility, 5) resonance, 6) significant contribution, 7) ethical, and 8) meaningful coherence. A worthy topic is one that is relevant, timely, significant, and/or interesting. *Rich rigor* involves using sufficient theoretical constructs, time in the field, sample(s), and/or context(s). Tracy views self reflexivity as a part of sincerity, which also includes transparency about methods and challenges. *Credibility* involves thick description, triangulation, multivocality, and/or member reflections. *Resonance* involves moving readers through aesthetic representation, naturalistic generalizations, and transferable findings.

Significant contribution can be through conceptually/theoretically, practically, morally, methodologically, and/or heuristically. Ethical means that the research considers procedural ethics, situational and culturally specific ethics, relational ethics, and/or exiting ethics. Meaningful coherence includes meaningfully interconnecting literature, research questions/foci, findings, and interpretations with each other and achieving what the study purports to be about [20].

In our project, we view sincerity and meaningful coherence as guiding criteria for the entire project. Sincerity includes laying out the process we undertook to develop an intentional research plan as well as self reflexivity, which involves recognizing how our positionality as researchers influences the entire research process. Meaningful coherence is important because there is little use in conducting research if the research lacks alignment from the literature through the researching questions, findings, and interpretations. Along with sincerity and meaningful coherence, we believe that Tracy's other six criteria are relevant to specific parts of the research design. These criteria will serve as guiding principles for purpose, theory, sampling, and instrumentation components of our project. In these four main components, we present how we made decisions in light of these criteria, as well as ethical and equitable considerations.

3.2. Forefronting Ethics

We acknowledge that Tracy's criteria are not value neutral and have ethical implications [10]. As stated by Gordon et al. [10, p. 693] "all aspects of [a] study from the initial conceptualization to the dissemination of findings must be guided by decision-making grounded in explicit ethical positioning." They argue that Tracy mistreats ethics as an equally weighted criteria with other criteria, when it should instead be applied to the whole process. Forefronting ethics is especially important for social justice and equity, as ethical considerations can consider power dynamics and fairly compensating participants, for example. That being said, we sought to ground our decision-making in ethical considerations by making the decision making process transparent and having these decisions center participants.

We will rely on the foundational principles for ethical social science research laid out by Kitchener and Kitchener [11]: beneficence, nonmaleficence, respect for persons, justice, and fidelity. *Beneficence* is doing good, *nonmaleficence* is doing no harm, *autonomy* involves respect for persons, *justice* involves being fair, and *fidelity* involves keeping promises. Using this ethical framework, we build on the ethical criteria in Tracy's work to ensure that our decisions are driven not just by quality, but also by systematic ethical considerations.

3.3. Equity Considerations

Lastly, in addition to ethical considerations, we consider equity considerations to be equally important. A research study can be more impactful if the team considers how to implement it equitably, taking into consideration power dynamics, access, and impact on the communities involved, to name a few equity considerations. We compiled our equity criteria from three different sources in three different disciplines to capture different perspectives on equity. The first source comes from the global health perspective on equity. The CCGHR's equity principles for global health research are authentic partnering, inclusion, shared benefits, commitment to the future, responsiveness to the causes of inequities, and humility [16].

We also incorporated equity principles from child education research, which are that the researchers should examine their own backgrounds and biases, make a commitment to dig deeper into the data, recognize that the research process itself has an impact on communities, have a role in ensuring research benefits communities, engage communities as partners in research and give them credit, and guard against the implied and explicit assumption that white is the normative, standard, or default position [4]. This article provides questions to ask yourself for each stage of the research process, which are useful for practically implementing these principles.

4. Methodological Decision Making

In this section, we discuss each of our four main research components of purpose, theory, sampling, and instrumentation through considerations of research quality criteria, ethics, and equity. After disclosing why we began doing this work to begin with, we present the research quality, ethical considerations, and equity considerations we considered relevant for our project purpose, theory, sampling, and instrumentation respectively. These considerations drove the decision making process to help us finalize the major components of our research design.

Before we begin to consider decisions around quality, ethics, and equity, we consider it important to first consider our personal reasons for conducting research, our values, inclinations, and biases. This process of self reflexivity can take place before, during, and after the research process and is considered a part of Tracy's quality criteria of sincerity and one of Andrew's ethical guiding principles [20], [4]. Self reflexivity is a good starting point for our research team to acknowledge our biases and experiences that we bring into the research.

For our team, self reflexivity involved having conversations about how our identities and prior experiences informed our decision to participate in this research and the lens through which we view this type of work. Additionally, in our goal to achieve self reflexivity throughout the research process, we chose to write this paper to facilitate our transparency and authenticity in this research project.

4.1. Project Purpose

After engaging in self reflexivity, our research team was ready to undertake decision making guided by research quality, ethical, and equity considerations. First, we focused on refining our purpose statement. A purpose statement establishes the intent for a study, detailing what one wants to study and what one hopes to accomplish [7]. Establishing a project purpose creates bounds on the content of the project, honing in on a phenomenon and population of interest. It can be an elusive task to solidify the purpose of a project, as the purpose is often developed in conjunction with other components of the research design.

We believe Tracy's research quality criteria of a worthy topic and significant contribution are relevant to developing a project's purpose. Because a project's purpose establishes the context for a project and drives the subsequent decisions, Tracy states that the topic or phenomenon that the purpose centers around should be relevant, timely, significant, and interesting to produce excellent qualitative research [20]. While Tracy lays out the facet "interesting," we believe that a more appropriate construct is usefulness, as it is not ethically justified to study a population, especially one that is marginalized, simply because it is interesting. That being said, the experience of marginalized undergraduate engineering students is timely due to the current political climate in the U.S. and the increasing calls for broadening participation in engineering.

Exploring the ways students from these populations navigate engineering is significant and useful because it allows for us to explore systemic solutions within the university infrastructure to support marginalized students and possibly make their experiences less marginalizing. The way we set up a topic or purpose is important because it has implications on whether or not the resulting research produces a significant contribution. We view this project as a means to produce conceptually and theoretically significant research, so we feel that our project purpose must center around studying a population in a way that is novel and useful to the research community.

An ethical project sets out to do good and do no harm to everyone involved throughout the project. This consideration means that our project purpose needs to seek out beneficence and nonmaleficence in order to be considered ethical by the criteria we considered [11]. That being said, in the context of this project, our purpose should simultaneously seek to support marginalized students and prevent perpetuating harm done to them, both of which require aiming for systemic change because the current system often harms marginalized students.

The equity criteria we believe are relevant to a project purpose in general and our project on marginalized students from the criteria we considered are responsiveness to the causes of inequities, shared benefits/having a role in ensuring that research benefits the community, and

commitment to the future [16], [4]. In our project, we can be responsive to the causes of inequities by establishing a purpose that addresses the actors within an oppressive system, acknowledging that marginalization of students is a process that is actively carried out by people in an unjust system. Shared benefits are relevant to a project purpose because the purpose establishes who the project is for and thus who will benefit from its outcomes. As a result, our project purpose must address not only who we think will benefit from the project, but also how the researchers, participants, and outside stakeholders will benefit. Finally, we believe it is important that a project's purpose is created with a commitment to the future, acknowledging the previous work completed in the relevant domain and how the current work will fit into the ongoing dialogue to do good and do no harm [11]. This criteria informs us that it's important that the purpose of our project highlight why our project is necessary to undertake and how it will provide the foundation to benefit people in the future.

Decision

The purpose originally proposed by the PI to NSF was to "examine how marginalized students navigate engineering and interrogate why and to what end." As the project developed, the original purpose statement took on new forms: "investigate the navigational strategies of marginalized students in engineering and advance the responsiveness of university support structures." and "we aim to understand how marginalized students acquire and use resources to navigate these spaces."

In light of the research quality, ethical, and equity criteria we considered, we augmented the existing project purposes to include the reasons for undertaking this project as well as stating to do good and do no harm, identifying who benefits, and highlighting how this project commits to the future. Our augmented project purpose is to understand marginalized engineering students' navigational strategies to support students, prevent further harm, and develop responsive support structures, addressing actors who perpetuate an unjust system. Our project will benefit the engineering ecosystem by illuminating the navigational strategies of marginalized students in order to ultimately transform the engineering environment into one that values and uplifts all of its participants.

4.2. Theoretical Foundation

Theory in social science research establishes a lens through which to explain observations. The National Research Council posits that "the choice of what to observe and how to observe it is driven by an organizing conception - explicit or tacit - of the problem or topic" [1, p. 61]. Just as scientific research is guided by a model or theory, social scientists use a theoretical framework to "guide inquiry" because many variables in engineering education "cannot be tightly controlled" [5, p. 92]. Strong theory uncovers "underlying processes so as to understand systematic reasons

for a particular occurrence or nonoccurrence" [19, p. 378]. Borrego (2007) also acknowledges that anchoring a study to a theoretical framework can be frustrating because it creates an additional step to executing a research project. Despite the frustration, theoretical frameworks are regularly employed in social science research because "theory drives the research question, the use of methods, and the interpretation of results" [1, p. 62].

We believe that Tracy's research quality criteria that are most relevant to establishing a theoretical framework for our project are rich rigor, resonance, and significant contribution [20]. Rich rigor involves using sufficient theoretical constructs to address relevant factors and answer the research questions. In our project, we sought out a strong alignment between the theoretical framework we chose and the phenomenon of marginalization. As a result, we identified existing theories with constructs that conceptualize how an engineering environment marginalizes students

Resonance is also relevant to this decision because using a theoretical framework that resonates with the population further enables generating insights that makes sense to them. This criteria means that we must be cognizant of the extent to which the frameworks we consider accurately and fairly conceptualize marginalized engineering students. Finally, significant contribution becomes relevant if and when the existing theories are not sufficient enough to address the project purpose and adequately serve the population sample. If and when this gap occurs, development of a theory will provide significant theoretical/conceptual contribution to the field for the current project and projects in the future.

The ethical criteria we considered relevant when establishing a theoretical framework for a project are considering situational and culturally specific ethics, respect for persons, and justice [20], [11]. Theory used in engineering education is often adapted from other fields, so it is important to consider means of appropriate adaptation into engineering education for an engineering population. This adaptation may include considering how a theory is appropriate for engineering culture or a specific institutional context (e.g., a minority-serving institution).

In our project, we felt that this principle indicates that our theory needed to account for the oppressed and oppressor to acknowledge the effects of people perpetuating a marginalizing system. Respect for persons acknowledges people's freedom of action and freedom of choice. We view this criterion as important to theory because theories are a way of framing people and can be deficit based or asset based. For our project, an ethical theory for our contexts would recognize our students as agentic in an engineering environment and would be asset based, positing that students bring capital into an environment. Justice concerns the equitable distribution of goods and services, as well as not promoting unfair treatment. We view this principle as relevant to theory because theory can drive research questions and methods, which deal with distribution of goods and services to participants during and after the research process.

In our project, ethical theory would lead to justice through seeking transformation of the existing systems to allocate resources more fairly.

The equity criteria we considered most relevant to theory are humility; guarding against the implicit and explicit assumption that white is the normative, standard, or default position; and a commitment to the future [16], [4]. Humility involves questioning how we position ourselves in the research. Humility acknowledges that theory is a lens that magnifies some things and obscures others, and who we are influences what we think to magnify and obscure. To guard against the assumption that white is the standard position, we need to consider whose voices were involved in creating theories we consider for our project, which includes the scholars proposing the theory as well as the data used to justify the theory. Commitment to the future is relevant to theory because theory is a way of advancing a field of inquiry, as it provides explanations to phenomena. In our project, we decided to pursue a theory that commits to the future by seeking out theories that explain systemic phenomena and can apply to people with different types of marginalized identities.

Decision

For the NSF CAREER Project, the initially proposed theoretical framework to guide investigation of the navigational strategies of marginalized students in engineering was person-environment fit (PE fit) and critical race theory (CRT). The PI on this project initially proposed grounding PE fit in CRT to expose patterns of systemic exclusion and marginalization produced by the structure of engineering. While PE fit helped us clarify the purpose of the conceptual work and situate marginalization as an environment dependent phenomenon, we felt a more holistic approach was more appropriate. Accordingly, we performed a critical review, seeking out additional theoretical frameworks to compliment PE fit. We found the following theories framed students in different ways that could be useful: Health Care Access [2],[3], Service Quality [15], and Stress-Coping [9], [14], [18].

The National Research Council states that “different theories may give conflicting predictions about the problem’s solution, or various theories might have to be reconciled to address the problem” [1, p. 62]. The research team experienced the frustrations of identifying a single theoretical framework that could fully capture the purpose of the study, so reviewing the literature provided a systematic approach to bring together multiple frameworks with key mechanisms to precisely capture the phenomenon of marginalization. These key mechanisms informed key constructs in our developed model and corresponding propositions to explain the process of being marginalized in an undergraduate engineering program.

Through developing a model, we address the quality, ethical, and equity considerations discussed in this section. By proposing a model that is uniquely constructed to explain marginalization in

the engineering environment, we can ensure a strong alignment between theory and phenomenon and use a theory that resonates with the population being studied. Additionally proposing a model is an inherent theoretical contribution because we are introducing a new theory into the field of engineering education.

Proposing a model uniquely adapted for our project also addresses the ethical criteria discussed above. Developing a model from the ground up means that we can ensure it is appropriate for engineering culture and marginalized students, especially given that marginalized students in engineering will be studied to confirm the theory. In order to acknowledge students as agentic and bring capital into the environment, we are developing a model that depicts the engineering environment as marginalizing and portrays the student as having agency to enter the environment and navigate through it. The student enters the environment with different forms of capital and consciousness as well. We seek out the final ethical concern of theory seeking transformation by acknowledging that our project, driven by our theory, will provide specific evidence to motivate transformation by disrupting the marginalizing factors of the engineering environment.

Our development of a model specifically designed to address marginalization also addresses the equity concerns we presented above. We seek to avoid viewing whiteness as the default through generating our own model and informing that model by data from different marginalized groups - not just white people. In addition, our model is committed to the future because it provides a basis to transform the existing oppressive environment of engineering by illuminating how students currently navigate it.

4.3. Sampling

A pivotal decision in the research process is deciding whose data gets collected and used, which is referred to as sampling. Krathwohl describes sampling as a way of "selecting a small number of units from a population to enable researchers to make reliable inferences about the nature of the population to which the units belong" [12, p. 160]. It is impossible to gather the data you need from every single person in the population, so sampling relies on gathering data from a smaller subset of the population. Qualitative studies sample smaller groups with the ultimate goal of describing a particular situation [6].

We believe that Tracy's research quality criteria that are relevant to sampling are rich rigor and credibility. Rich rigor, as defined by Tracy (2010), focuses on the variety and amount of data collected by the researcher. This criteria is focused specifically on whether a study has a sufficient sample to make claims in the study. In addition, Tracy states that sample and context for the study should be carefully considered because it's important for the context and sample to be appropriate for the project [20]. One specific aspect of credibility that we believe directly applies to sampling is multivocality. Multivocality is focused on including multiple perspectives

from the study participants as an effort to gain a deeper understanding of the context and experiences. Another aspect of multivocality is that the researchers acknowledge that there are "...cultural differences between themselves and participants" [20, p.844] which also connects to the positionality of the researcher, the process of self reflexivity, and the importance of amplifying and uplifting the participants with marginalized identities.

In Tracy's criteria, ethical considerations are divided into a few different categories. For sampling, procedural ethics mandated by the Institutional Review Board (IRB) are directly applicable when interacting with human subjects. With this criteria, participants are made aware of potential impacts of the study, how their information will be used, and that they have permission to leave the study at any time [20]. Additionally, the participants' data is protected and anonymized in an effort to not trace it back to them through deductive disclosure [20]. Another ethical consideration is relational ethics, where "...the researchers are mindful of their character, actions, and consequences on others" [20, p 847]. We will establish a relationship of mutual respect with the participants of our study, and revisit the setting and individuals once the study is complete to share findings.

Similarly, equity criteria can also apply to sampling practices in research. The equity criteria we believed relevant to sampling are responsiveness to the causes of inequities; recognizing that the research process itself has an impact on communities; and guarding against the implicit and explicit assumption that white is the normative, standard, or default position [16], [4]. When curating a sampling frame for future participants, we were intentional with what populations we chose to include in the study because we want to be responsive to the causes of inequities. To achieve this criterion, we will provide justification as to how we recruited participants and how we made the decision to include participants from certain populations in the sample.

We also believe it is important for us to recognize that the process of conducting research has an effect on communities. Therefore, we believe we must acknowledge the impact that our research will have on the individuals involved in the study and the populations we chose to sample. Additionally, when selecting a sample of participants for a study, especially a study that focused on marginalized participants, we believe it is important to not position white participants as the norm in the study. By taking the time to acknowledge our own implicit biases and consciously unlearning the societal influences of placing white men as the normative population, we can see marginalized populations as individual entities and not in comparison to one another.

Decision

Given the research quality, ethical, and equity criteria described, the team plans to interview a total of 24 students with the sample consisting of students from marginalized and non-marginalized groups. In our study, we will use purposive sampling to achieve the criteria of

rich rigor. Purposive sampling is defined as "the deliberate seeking out of participants with particular characteristics, according to the needs of the developing analysis and emerging theory" [13, p. 885]. We also plan to solicit recommendations from organizational partners to identify students to interview.

We aim to interview multiple students from our defined demographic groups to gain various perspectives on the experiences of marginalization in engineering environments and collect a sufficient amount of data to support the ideas described in the proposed model of marginalization. The practice of multivocality will be demonstrated in the sampling strategies of this study through interviewing multiple students holding multiple marginalized identities to gain various points-of-views. The research team will also address multivocality by addressing our positionalities in the study and how that may impact our analysis of the data.

We acknowledge that marginalized students are not a homogenous group, but by focusing on students from different groups, both marginalized and non-marginalized, we can collect data on experiences that can be attributed to the environment of engineering. We also hope to better understand how the students from marginalized groups navigate the engineering environment. Though not included in the original proposal, we are considering including university employees in the sample because they provide a different perspective on the student experience and the demands of the engineering environment. We will use purposive sampling to gather data on university employees as well because organizational partners can recommend university employees and students at the same time.

4.4. Instrumentation

It is important to strategically decide how to collect data from participants, which is often referred to as instrumentation. Qualitative social science can involve a variety of instrumentation options for data collection.

Similar to sampling, we believe that the relevant research quality criteria for instrumentation are rich rigor and credibility. Tracy (2010) mentions that studies with rich rigor not only have a significant sample to make strong claims, but they also collect a sufficient amount of data from the sample and take care to analyze the data. This suggestion can be implemented as taking detailed notes, conducting a number of interviews/observations/focus groups of an appropriate length, and additional details for the protocols. For data analysis, rigor is demonstrated by providing descriptions of how the raw data is utilized for the study, and being explicit with how the data is sorted and organized in the analysis process. Additionally, credibility is an important criteria with instrumentation. One aspect of credibility is triangulation which is characterized by multiple aspects of the study, such as sources of data, theoretical frameworks, or even researchers arriving at the same conclusion when working with the same data [20].

In regard to ethical considerations, we believe relational, situational, and cultural ethics are particularly important with instrumentation [20]. Relational ethics, as described in the sampling section, are necessary for the researchers to recognize how their own identities and beliefs influence their work. The instrumentation of a study following Tracy's criteria will also consider situational ethics. Situational ethics involves continuous evaluation of the methods and data to determine whether the research is causing more harm to the participants or environment than good. Gordon and Patterson (2013) mention that researchers "... are responsible to the communities where research is conducted" (p. 693). This responsibility involves being intentional about how data is collected, what data is collected, how much time is taken from the participants, and many other aspects related to working with participants, especially those from marginalized communities. Furthermore, compensating participants for their time and efforts in the study can also be a critical piece to the ethical considerations. Gordon et al. (2013) emphasize that the time researchers take from participants is valuable, and the participants deserve to be compensated for their time and efforts. Compensating participants and reporting findings back to the participants, are actionable items we can employ to ensure that we are maintaining relational ethics.

Equity criteria for instrumentation can also play a role in how the participants of the study are impacted by the work. We must have a role in ensuring research benefits communities by considering the time that we are taking from participants when we contribute to our study, as well as how much the participants share about their personal, lived experiences [4]. The instrumentation for a study also determines how much of a role the researcher and the participants play and how power is distributed in the research process, which is related to authentic partnering and engaging communities as partners [16], [4].

Decision

Given the criteria described in the previous sections, we will use semi-structured interviews with questions based on literature focused on marginalized populations and student support structures. Interviews will enable us to "examine how a student explains, rationalizes, and articulates their decision-making and expectations" and "solicit navigational strategies that have not manifested in response to previous situations" (from the original proposal). Researchers generally use interviews to "ask students how they would respond to predetermined situations" (from the original proposal). The interviews will provide sufficient data to make claims about the experiences of marginalized students (and university employees) while allowing the participants to explain their experiences in their own words. Semi-structured interviews provide space for participants to "tell their stories their own way, without … introducing a prior conceptualization in the discussion" and they "[allow] the language of the phenomenon to emerge from the naturalistic language of the participants" [12, p. 28]. Allowing students to participate in the

research process authentically promotes rich rigor, credibility, and ethical considerations, namely relational and situational ethics.

We aim to interview at least 24 students, as well as university employees, and have multiple researchers working with the data. This plan will address the need for rich rigor through having a significant sample and sufficient amount of data. After conducting pilot interviews, we plan to evaluate the extent to which these interviews gathered sufficient data. We may also supplement these interviews with focus groups, physical documentation, and/or observations, thereby providing a means of multiple data sources to triangulate and achieve credibility.

For our study, the interviews will be conducted by trained interviewers who reflect on their positionality and biases before, during, and after conducting interviews. For our intended study, the research team selected and adapted interview questions rooted in research on marginalization to be inclusive and mindful of students' and university employees' varied experiences within the engineering environment.

5. Conclusion and Next Steps

In this paper, we presented and implemented a process for methodological decision making. We outlined the components of research quality, ethics, and equity that we believed relevant to the different components of our research design - i.e., purpose, theory, sampling, and instrumentation. We present one way to augment the aspects of a research proposal, and this process is heavily influenced by the prior experiences and identities of our research team.

It is important for researchers to think more carefully about these topics and be transparent in their approaches so that we can learn from one another's decisions and the consequences of those decisions once implemented. The method we employed in this paper can be thought of as a model for others in the future to think through how to inform elements of a research design by devoting attention to explicit literature informed criteria. A summary of the criteria and sections we believed corresponded to those criteria for our project are found in Appendix A.

Through establishing and reflecting on research quality, ethical, and equitable criteria for qualitative research, we made decisions about our project purpose, theoretical foundation, sampling, and instrumentation. For the project purpose, we examined and incorporated criteria into the purpose statement related to beneficence and nonmaleficence, as well as highlighted who benefits from the project and how the project commits to the future. For our theoretical framework, we presented how our literature review led us to develop a model to appropriately address the research quality, ethical, and equitable criteria we sought to meet including making a significant contribution, resonance with the participants, justice, and guarding against the assumption that white is normative. With sampling, we established that we will interview at least

24 students from marginalized and non marginalized backgrounds and establish an IRB protocol accessible to participants to address criteria including multivocality, rich rigor in sample size and context, and procedural ethics. Finally, for instrumentation, we established our use of semi-structured interviews to address relational and situational ethics, with interviews conducted by trained interviewees who engage in self reflexivity practices.

In our ongoing project, we will implement the decisions we laid out in this paper to begin our pilot data collection and analysis. The research quality, ethical, and equity considerations presented in this paper will continue to serve as guiding posts as we move from the pilot study to data collection for the first case in the project and beyond.

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Appendix A - Foundational Criteria and Corresponding Sections

Criteria Type	Criteria/Standard	Sections Discussed
Research Quality [20]	Worthy Topic	purpose
	Rich Rigor	theory, sampling, instrumentation
	Sincerity	all
	Credibility	sampling, instrumentation
	Resonance	theory
	Significant contribution	purpose, theory
	Meaningful coherence	all
	Ethical	[see “Ethics” section]
Ethics [11], [20]	Beneficence	purpose
	Nonmaleficence	purpose
	Respect for Persons	theory
	Justice	theory
	Fidelity	*Not yet addressed*
	Relational Ethics	sampling, instrumentation
	Procedural Ethics	sampling, instrumentation
	Situational Ethics	theory, instrumentation
Equity [16], [4]	Authentic Partnering	instrumentation
	Inclusion	*Not yet addressed*
	Shared Benefits	purpose
	Commitment to the future	purpose, theory
	Responsiveness to Inequities	purpose, sampling
	Humility	theory
	Reflexivity*	all
	Commitment to dig deeper into the data	*Not yet addressed*
	Recognize impacts*	sampling
	Benefit community*	purpose, instrumentation
	Engaging people as partners*	instrumentation
	Decentering whiteness*	theory, sampling
*paraphrased for table		

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