Mindful Methodology: A transparent dialogue on Adapting Interpretative Phenomenological Analysis for Engineering Education Research

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This research methodology paper investigates the pragmatic adaptation of Interpretative Phenomenological Analysis (IPA) in two studies that contribute to engineering education research (EER). IPA is a qualitative methodology used to examine subjective lived experiences of individuals. IPA also acknowledges the role of the researcher in interpreting participants' descriptions and co-construction of findings. IPA's philosophical foundation focuses on participants' idiosyncratic experiences, interpretation of lived experiences, and ways of describing experiences. In this paper, we capture an open dialogue that describes adaptations made to IPA and critically question these adaptations. As IPA gains popularity in EER, it is important to consider how we adapt methodology to fit engineering education *and* how we gain new insight by utilizing different methodologies. By critically engaging the topic of methodology in EER, this paper intends to sharpen our community's command of IPA and deepen our collective insight into engineering education.

Introduction

Understanding the lived experiences of engineering students serves to enlighten engineering faculty on how students interpret or make sense of educational experiences and interventions in engineering. Assessment data based on student interpretations are used by educators to improve academic experiences so that we may better prepare the next generation of engineers. In brief, research that seeks to generate understanding of experiences through assignment of subjective and intersubjective meaning to phenomena by individuals experiencing the phenomena is called interpretive research[1]. The work of Walther and colleagues[2] provides a guiding framework for ensuring quality in interpretive work. In the creation of the framework and subsequent community training, researchers have begun to adapt interpretive methodologies more broadly[3-5].

One interpretive methodology that has rapidly gained traction in engineering education is Interpretative Phenomenological Analysis (IPA)[6-8]. IPA is a methodology for understanding how individuals experience or perceive a phenomenon and create meaning out of that experience. Specifically,

> IPA is concerned with human lived experience, and posits that experience can be understood via an examination of the meaning people impress upon it. These meanings, in turn, may illuminate the embodied, cognitive-affective, and existential domains of psychology[9, pg.34].

Experiences studied with IPA can be tangible first-order experiences (e.g., the process of applying for jobs) or second-order attitudinal experiences (e.g., the emotions experienced when negotiating for a job). IPA has been utilized in engineering education to understand how engineering students' perceptions of their futures influence actions undertaken during problem solving[7], the experiences of black women in engineering industry[8], and how engineering

students negotiate the transition from a senior-level student to entering the workplace[6, 10]. For each of the areas studied, unique patterns emerged based on the individual participants' perceptions and experiences that have gone previously unnoticed in other studies of engineers. The strengths of IPA in engineering education stem from the ability to develop new knowledge from the unique voices of participants. Protecting the power of each individual's voice while still generating themes that are transferrable from one situation to the next supports immersive studies that uncover new perceived truths and the subsequent actions of students. Smith, Flowers, & Larkin[9] have produced the leading text on IPA that clearly outlines the philosophical underpinnings and procedures related to participant selection, analysis, and presentation of results.

Given the power of IPA as a methodology and the detailed methodological outline in Smith and colleagues[9], it is not surprising to see growth in the use of IPA in EER. As the use of this methodology becomes more widespread within engineering education research, investigators will adapt how they practice IPA in the interest of contextual concerns related to their research questions. Yet, as researchers consider how they might adapt IPA in their investigations, a dialectic must be present to assure that the methodology appropriately aligns with the philosophical focus of the research questions. In other words, the question of how a methodology might be adapted to a particular investigation might be tempered with the question of how an investigation can be enhanced by utilizing the strength of the originally outlined methodology.

This paper outlines and critiques two adaptations that have been made for the use of IPA in engineering education. Presented in the following sections of this work are a brief overview of IPA as defined by Smith and colleagues[9] followed by a presentation of two EER studies and their adapted use of IPA. In presenting these adaptations, specific reasons why these adaptations were made are provided, outline how these shifted the underlying philosophical stances, and describe the methods guiding the analytic process. Additionally, each study will be critiqued by methodological experts (Ross and Huff) who were not directly affiliated with the two main studies. The work concludes with a discussion of the implications of adapting IPA methodologies and guidance for those needing to adapt this methodology to their own needs. By mindfully presenting our conversation around IPA in this way, we hope to make transparent the decisions and tradeoffs that are required when utilizing a new methodology in an existing community of practice with its own cultural considerations and research foci.

Overview of IPA

IPA is concerned with examining the subjective experience; the participants' experience of "something" [9]. IPA seeks to find deeper meaning and connections in the data that participants may not make on their own. Additionally, the interpretative approach to phenomenology relies on the use of advanced theoretical knowledge. This approach also posits that the subjectivity of the researcher cannot be removed from analysis[11]. The methodology described here is based on the work of Smith, Flowers, & Larkin[9]. Their established methodology overcomes expressed criticisms through the explicit discussion of the philosophical underpinnings that guide all steps of the methodology and is strongly rooted in the

philosophical traditions of phenomenology, hermeneutics, and idiography. This IPA approach has been accepted in nursing and health science[9] and education[12] before its more recent adoption in engineering education[6]. For a discussion of the philosophical underpinnings of IPA and a comparison to other similar methods (e.g., descriptive phenomenology, phenomenography) see Smith, Flowers & Larkin[9].

Analytic Process

Because IPA investigations require a notable sensitivity to the context surrounding each participant's lived experience, studies are typically conducted with a homogeneous population to ensure that the robust findings are applicable to other settings. The emphasis in choosing participants should be on having a large enough group to be able to determine the themes of the particular experience while also having few enough participants for the researcher to commit to studying each case on its own terms. While there is no prescribed number to achieve balance, IPA studies typically investigate less than ten individual cases.

Data analysis leverages a cautious cycle of interpretation, where each participant's case is treated individually before generating psychological themes for the group of participants. The analytic process begins with the detailed examination of each case (individual analysis), followed by an examination of similarities and differences across cases. The goal of individual analysis is to produce highly detailed accounts of participants' experiences of the phenomena under investigation. Individual analysis is done by reading, re-reading, and re-listening to cases to increase familiarity with the perspective and position of the participant. Upon establishing familiarity with participants, the researcher generates descriptive (e.g., marking for comments of interest), linguistic (e.g., examining patterns in language), and interpretative (e.g., applying researcher interpretation to participant responses) annotations within the interview transcripts. These three passes of coding are iterative and provide a rich perspective of what was said, how it was said, and what it means to the individual. After the three passes, the researcher then annotates emergent themes to describe psychological patterns within the portions of the transcript. Final overarching themes are generated after studying emergent themes for each case based on similar definitions.

Once each case is analyzed, comparisons across individuals are made to create a meaning of the shared experience of participants. These results include both the shared themes across participants and the distinctive voices and variations on those themes, thus preserving the idiosyncratic nature of the data[9]. All levels of analysis and data presentation are conducted with the goal of keeping the participants' voices as the focus of the analysis. While the above description reads as a prescriptive list of steps, IPA requires flexibility to repeat steps within the process by the researcher to reach deep psychological themes[6].

IPA takes a stance of questioning that seeks balance between understanding the views of the participant in their own words and the use of theoretical perspectives to shed light on the phenomenon[9]. Understanding participants' views is referred to as hermeneutics of empathy, while examining the participant through the lens of theory is termed hermeneutics of

critique[13]. Paying careful attention to both what emerges from the participants' voices as well as how it converges with theory is a delicate balance in this methodology.

The expected outcomes of IPA data analysis are a dense set of psychological themes that describe how participants experience a particular phenomenon. These psychological themes are intended to aid in deconstructing the expected complexity of such lived experiences. For example, prior work related to engineering identity[10], two themes ("An expanded sense of an engineering-self" and "Questioning the engineering-self") highlighted how female engineering graduates felt a simultaneous increased confidence in their engineering identities and an amplified sense of insecurity. Although these themes may seem to contradict each other, IPA provides a specific means of conceptualizing how individuals can embody complex features of such internal experiences.

Positionality in IPA

When conducting research, the researcher or research team is faced with challenges associated with the inherent bias of a human or set of individuals collecting, handling, and analyzing data[14]. Qualitative research acknowledges the role of the researcher as a filter: data are collected, organized, and interpreted, and an attempt to reduce bias is unnecessary[15]. Qualitative researchers must confront the subjective nature of the researcher in connection with the process of research. Given that IPA acknowledges that this bias cannot be removed from any stage of the study, bias is a topic that cannot be ignored or delayed as it has an impact on validity throughout the research process. Therefore, reflecting upon and documenting the position of each researcher and how he or she approaches the data is an integral part of the interpretive paradigm[16] and of IPA[9].

Positionality is an individual's unique world perspective. It varies based on the social conditions in which it is produced. Each individual speaks from their standpoint and shares their partial, situated knowledge. The collection of standpoints and acknowledgement of the researcher(s) and participants in constructing knowledge is an important aspect of meaning making in interpretive work[17]. The confluence of multiple standpoints generates perspectives that might otherwise be missed. Gadamer called this convergence the "fusion of horizons."[18]

> "Understanding" is the fusion of our past and present horizon. Indeed, the present cannot be formed without the past. Past and present cannot exist without each other and "understanding" is always the fusion of these horizons supposedly existing by themselves[18].

Through this "understanding," past experiences of the researcher are fused with the experiences of the participants; this convergence creates a new understanding of the experiences under investigation.

Being explicit in acknowledging positionality when conducting research provides transparency in the research process. Subjectivity influences the interpretation of findings, and being transparent about such influences is key to developing comprehensive and rigorous

research outcomes. Interpretative research depends on inter-subjective creation of meaning and understanding[19]. When conducting interpretative research, no understanding exists without interpretation. As such, being reflective is not a means of obtaining objectivity but instead a process of self-examination utilized to describe the researcher's own contribution to the understanding[15,19]. This reflective approach allows the reader to trace how the original understanding of the topic evolved over the course of the research. The process of understanding and documenting one's positionality throughout the course of conducting IPA research makes explicit the frameworks and experiences that guide interpretation, and when examining the ways in which IPA is adapted to EER, new approaches to considering positionality must be concurrently considered.

Positionality of Authors

To understand the positionality or interpretive stance of the researchers, we outline salient experiences and uses of IPA. All of the authors of this study have proposed and utilized IPA as a methodology in nationally funded research studies, dissertations, or both. As such, all of the authors have found and defended the value of IPA for understanding a topic of interest in engineering education. In writing this work the authors hope to promote the use of IPA, while providing a transparent dialogue related to the critique of methodological changes. Given the goal of promoting this methodology, the authors may not evaluate the methodological changes to the same level as someone who is critical or skeptical of the methodology. While the authors attempt to set this aside and provide a critique grounded in the traditions of IPA, the positionality of the research team cannot be fully removed[9].

In addition to the group positionality statement, we unpack portions of the positionality of each author. This paper is organized as a critical dialogue among five authors. Adam Kirn, Allison Godwin, and Cheryl Cass are connected to the two investigations that are discussed in this paper. They describe the adaptations made to IPA and discuss the rationale for making these adaptations. Monique Ross and James Huff have been invited as co-authors to this paper to transparently provide critical questioning to the adaptations made in the studies. More specifically, Adam Kirn is a lead investigator in each of the studies mentioned in this work. Additionally, he has worked with one of the critique authors, James Huff, to promote IPA regionally and in the communication of IPA for engineering education researchers. He has minimally worked with the other critique author, Monique Ross, in developing her methodological stance in IPA. Additionally, Adam Kirn has worked to co-develop the remaining two authors' understanding and use of IPA. Allison Godwin has directly mentored Monique Ross in the use of IPA and both have been aided by James Huff in developing their understanding. Finally, James Huff has worked alongside one of the authors of Smith and colleagues[9] to develop his skills and understanding of IPA.

Adaptations of IPA for Engineering Education Research

Study 1: Multiple Sources of Data to Understand Ph.D. Student Experiences

In the first project in which the authors have utilized IPA, we investigated the experiences of engineering Ph.D. students during the course of their doctoral programs (NSF EHR-1535453, and EHR-1535254). Engineering doctoral degree-granting institutions and departments have been slow to make programmatic decisions informed by evidence derived from rigorous EER. The lack of research-driven innovation has potential to marginalize students who do not thrive in more traditionally established engineering graduate communities, and has created a 50% attrition rate in engineering graduate education[20]. As the demand for creative engineering solutions increases, there is a pressing need to promote doctoral training environments that foster a desire to achieve metrics of success in academics and research, persist to graduation, and ultimately seek a permanent position as an engineer. To address this issue, we have sought to understand the influence of past and present student experiences on their engineering identity formation and motivational goal setting processes.

Research has shown that the development of an engineering identity based on past experiences positively influences choosing a career in engineering[21] and belongingness to engineering[22, 23]. Work examining student motivations towards future goals has shown motivation to positively influence career choice, persistence, and performance in engineering[7, 24]. Despite the positive influence of both of these constructs for undergraduate engineering students, little work has examined how these constructs manifest in and are influenced by Ph.D. experiences in engineering.

In this work, we recruited engineering doctoral students from two institutions to participate in focus groups related to their doctoral experiences. Focus groups were centered on one of four conceptual areas based on the research questions related to motivation and identity development. Specifically, the four areas were engineering identity, future time perspective, identity-based motivation, and graduate student experiences. Due to the demanding schedules of Ph.D. students, we were only able to recruit enough participants for seven focus groups (less than two per construct). While the focus groups provided rich data they did not provide enough voices to capture tensions and appropriate depth within each theme. In attempts to capture this depth and tension, a second round of recruitment sought engineering Ph.D. students for participation in interviews. Forty-one students (about eight per larger thematic area) were successfully recruited to participate in interviews, providing us with the necessary data to understand the full complexities of doctoral students' experiences. While both focus groups and interviews have an established tradition in IPA[9], these data sources are not often combined.

The process of analyzing interviews requires the researcher to understand and unpack their position during the course of analysis and then to leverage their position when making interpretations of the data. Researchers then examine each subsequent case and create super-ordinate themes for the entire dataset. For interview data, the researcher only has to interpret how the participant makes sense of past experiences. In the analysis of focus groups there is an additional expectation that the researcher will interpret the interaction that exists between the participants of the focus group. This interpretation of interaction requires the researcher to not only interpret student responses based on past experiences but also attempts to understand how the student is making sense of their current experience. The noted

challenges of participants who talk too much or too little, or not as deeply as they would if by themselves also manifests in focus group data collection[25]. The data derived from focus groups and interviews allows for different levels of depth of analysis and theme generation.

To overcome these challenges, one researcher of a five member analysis team analyzed the interviews (about eight interviews per researcher) for one conceptual area following traditional IPA approaches[9]. The focus groups were analyzed after the interviews. It was noted by the research team that the focus groups lacked the significant depth of the interview data. As such, a decision was made to analyze the focus group data with an eye toward confirming previously generated themes while examining the data for emerging themes. For example, when asked about their identity development within their graduate programs, interview participants discussed being in a state of transition or having a temporary identity. While focus group participants reflected this conversation of transitional identities, they did not delve into deep discussion about the temporary nature of their identities. While not discussing the nature of their temporary identities, focus group participants did expose that the cultural priorities of graduate school did not match those of undergraduate spaces, creating the need to shift or transition their identities. Even though IPA procedures of analyzing the data (descriptive, linguistic, and interpretative passes) were used, this process of analysis for focus groups more closely reflects the traditions of directed content analysis[26]. Directed content analysis starts with a theory or relevant research findings as guidance for initial codes to interpret meaning from the content of textual data. In trying to confirm the previous results from the interviews with the focus groups, this works moves the philosophical underpinnings of this work away from its interpretivist home to a space slightly closer to positivism.

Critical Perspective. The focus of this particular study on the lived identity experiences of engineering graduate students indeed aligns with an IPA methodology. The adaptation to IPA that is in question is how the research team analyzed data that was collected from both focus groups and interviews. While the decision to collect two forms of data was a sound one in response to realistic study constraints, the purpose of this section is to provide a critical perspective on how this decision affects the overall alignment between the research objectives and the IPA methodology.

As previously discussed in this paper, IPA is a powerful tool for unpacking individual lived experience of some phenomenon[27]. This experiential reality need not only be accessed through conducting interviews, as noted above. Focus groups, diaries, and other techniques have been used to collect IPA data[28,29], but any technique must be carried out with the central question of whether or not the tool elicits the desired social reality, in this case, individual lived experience of graduate student identity. As put by Walther and colleagues[2], data collection occurs with the underlying question, "Do we get to see what we think we see?" (p. 640).

In this specific investigation, it is not immediately clear how the focus group data can provide a robust snapshot of individual experience of engineering identity in graduate students. The use of focus group, as described, provides a more intersubjective dialogue that might be more related to external events within the graduate student experience rather than embodied phenomena that are lived by individuals. When the research team noted a lack of depth and

tension in the focus groups, this might be because the setting of the focus group was not conducive to eliciting the personal constructs of identity. Consequently, the critique authors contend that the research team made a cogent decision to probe these constructs in the setting of individual interviews.

That said, the choice to interview forty-one participants for a single IPA study is questionable and a stark departure from the methodology. To stratify these participants based on some thematic categories also threatens the ability to apply IPA. As discussed earlier, IPA demands a particular attention to the idiosyncrasy of each case and works well in studies with very small numbers. Smith and colleagues recommend that studies exceed no more than ten participants[9]. The rationale for this guidance is that the IPA researcher must maintain a delicate and intentional hermeneutic position throughout the process and walk with each participant on his or her own terms. This interpretive exercise is highly likely to become a deductive and comparative practice if too many participants are analyzed, and certainly if these participants are categorized due to some *a priori* analysis. While such decisions may align with expectations of qualitative research in engineering education, they do work against some essential commitments to IPA.

From the perspective of using IPA, the research team made a credible decision to inductively analyze graduate student identity using data from the more appropriate method of interviews. Moreover, while the research team might have analyzed focus group transcripts with techniques inspired by IPA, we agree with the authors that this analysis tends to reflect a particular form of content or thematic analysis rather than IPA. By examining this set of data for confirmation of themes that were found in analysis of the interviews, the researchers trade off their ability to engage the Gadamerian dialogue--where they maximize their attention to fusing their own theoretically informed "horizons" with the lived world of study participants[18]--that we might expect in an IPA study. Rather than presenting this study as an IPA study with multiple data sources, it might be more accurate to claim that the research was characterized by an IPA study of interview data followed by a thematic analysis of focus group transcripts with a deductive interpretive stance[30].

Study 2: Group IPA to Understand the Experience of Working on Diverse Teams

In the second project, we investigated the experience of first-year engineering students working in diverse teams (NSF EEC-1531586 and EEC-1531174). The purpose of this study was to understand how students undergo teaming and how students' incoming attitudes about diversity influence participation and belongingness in engineer teams and engineering as a discipline. Sensitivity to diversity has been shown to help achieve a common group identity that is essential to effective teams[31]. Significant research and tools have been designed to develop and assess team member's effectiveness[32, 33]; however, little research has been conducted on how students develop sensitivity for students from different cultures and backgrounds within teams. This need is especially salient for students early on in their engineering careers who may not have experiences with others different from their own culture and upbringing and are encountering a new environment in a higher education setting. Working in diverse teams can cause negative emotions, possibly due to diverse approaches to

problems and a more frustrating experience for diverse individuals to work together. Forming and educating diverse teams that effectively work together and appreciate each other's differences is an important outcome for an increasingly global engineering workforce.

This project is motivated by two broader goals in the engineering education community and promoted by ABET which are complementary: 1) to graduate students with an ability to function on multidisciplinary teams and 2) to give students the broad education necessary to understand the impact of engineering solutions globally.

In this work, we interviewed students who were placed in teams of four for a semester of an introduction to engineering course. We interviewed each student in a team twice about their background and experiences in their teams. In total, we collected eight interviews per team and collected data from five teams for a total of 28 interviews with attrition. The data collection approach was consistent with how IPA is typically conducted[9]. The interview focused on student's voicing of their lived experiences and their interpretation of the meaning of those experiences. The deviation from traditional IPA methods occurred in the analysis of these data.

We used teams of four researchers to analyze the large amount of data collected. Each coder was assigned to a member of the team and engaged in analyzing transcripts from both interviews to become an expert in their assigned participant's voice, background, and description of their experiences. This approach is different than how IPA is traditionally conducted. Typically, the published research using this methodology has been conducted by a single researcher. IPA as a methodology emphasizes the positionality of the researcher and how his or her hermeneutic and interpretive stance influences the data collection and analysis. In our work as a team, we adapted the IPA approach to be true to the importance of acknowledging each researcher's position while also pragmatically accomplishing data analysis in a reasonable amount of time.

We incorporated a reflection protocol into the analytic process to document each researcher's position. This reflection protocol was then used to guide a larger group discussion among the research team. This process allowed us to reflect on our own perspectives and understand how they might influence the results of our work but also understand the different perspectives brought to the group from our team. We acknowledge that negotiating meaning and themes from each participant and researchers into superordinate themes for the experience of working in teams has been a nontrivial process. Each coding team met for an hour each week to discuss their progress in understanding each student's transcript as well as negotiate how a student's voice could be brought forward and understood in the context of the engineering team experience. The cross-researcher interpretation of superordinate themes moves beyond traditional measures of methodological rigor in IPA[2,9] to one that shifts the underlying philosophical tradition of a hermeneutic approach to analysis.

In the hermeneutic tradition of IPA the researcher leverages their perspective in interpreting the student's perceptions of their lived experience. IPA traditionally has three hermeneutic passes: the participant's interpretation of their lived experience, the researcher's interpretation

of the participant led conversation in an interview or a focus group, and the reader's interpretation of the written analysis. When shifting from work led by a single researcher to work led by a group of researchers the number of passes must change. A hermeneutic pass must be added between the traditional second and third passes of IPA to allow the researchers to make sense of each other's interpretations of the data. In adding this additional pass the focus of IPA shifts away from the participant and towards the voices of the researchers. In prioritizing the voices of researchers we shift IPA from balancing the voice of the participant with the lens of the researcher to one that favors the theoretical lens of the research team. Understanding participants' views is referred to as hermeneutics of empathy, while examining the participant through the lens of theory is termed hermeneutics of critique[13]. Leveraging a greater use of the hermeneutics of critique allows the use of multiple theoretical vantage points throughout the course of analysis. Additionally, the use of group analysis accelerates the time needed to generate superordinate themes for participants.

Critical Perspective. The study described above was consistent with traditional applications of IPA as an appropriate methodological approach. The research team was interested in the lived-experiences of first-year engineering students in diverse teams as well as how they made-meaning of these experiences. The data collection of in-depth interviews was also aligned with IPA practices as the researchers explored student's voices with regards to their lived experiences and their interpretation of the meaning of those experiences. The deviation, however, articulated above was their use of a team for analysis for pragmatic reasons. Traditionally, IPA has been reported as being executed by one researcher. IPA has been described as this delicate walk, with the researcher going alongside the participant as they describe their experiences and how they interpret their experiences. As such, the IPA researcher invokes an intentional mindset to maximize her/his attention to the participants' experiences through the use of reflective practices. While it is not widely reported in engineering education, there have been studies that invoke what is called an "interpretive team." This approach has additional challenges when combining multiple individual's positionalities and interpretation of the participants' voices.

An interpretive team has some basis outside of EER. In the field of nursing[34] stated that, "analysis is typically done by an interpretive team" (p. 177). Crist and Tanner described that team as a set of researchers that are experts in hermeneutic interpretive phenomenology or in the content area of inquiry[35]. They also asserted that people experiencing the phenomenon of interest can make valuable team members. Crist and Tanner made the claim that involvement of a team through debate, brainstorming and discussion, adds depth and insight to interpretations[35]. The interpretive team invokes the epistemological tenets of IPA by acknowledging the researcher is inextricably situated in their world, as such the "[…] interpretive team acknowledges (as much as possible) any assumptions that could both influence the investigator's conduct of interviews and observations as well as the whole team's interpretations"(p. 203). In short, the team must participate in a deliberate attempt to be reflective and honest about the influence their experiences have on the interpretation. This reflective practice is not to bracket but instead to be transparent and clear about their situated world and that of their participants. This act of reflection is necessary whether the analysis is

done by one or many researchers. While this approach is not documented by Smith, Flowers, and Larkin[9] specifically as an option, it has been frequently practiced in other fields.

Given this context of an interpretive team, we would like to revisit the research presented above. The research team executed their analysis in alignment with an interpretive team approach to conducting IPA. We would argue that their deviation from IPA was not the introduction of an interpretive team, since there appears to be a precedent in nursing, but instead it was their shift away from the participants voice to that of the lens of the research team. In returning to the foundations of IPA, there is a delicate navigation between interpreting the experiences of a participant and honoring their stories and voices. Attention to the idiosyncratic nature of the in-depth interviews, however, can aid in ensuring the participants do not get lost in team interpretation. Balancing the demands of pragmatism with the intimate detail associated with an IPA, is a challenge that IPA researchers must consider when designing a research study. Based on the information given in this paper on this study, while the team walked the boundary of IPA, they did so with great effort to try to maintain the idiosyncratic nature of IPA.

Discussion and Recommendations for Practice

The adaptations made here highlight two main areas of consideration that emerge when adapting IPA to the differing needs of EER studies. First is the positionality of the participants and the researchers of a study. By including multiple forms of data collection (i.e., interviews and focus groups) in Study 1, we created different contexts for participants of each data collection type that shifted how they reflected on latent constructs (e.g., identity). Students in focus groups demonstrated less depth in responses and a negotiation of the group experience that was not reflected by their peers who participated in interviews. The limited depth indicates that focus groups may be better for measuring first-order experiences in engineering (e.g., applying for a job) than second-order experiences (e.g., the emotions experienced when negotiating job offers). Additionally, when mixing data types, each set of data necessitated a different analytical approach. With the interview data we utilized an IPA approach, while the focus groups utilized a content analysis approach. The utilization of the two approaches potentially limits the ways in which the positionality of the researchers can be merged or fused with the voices of the participants. For researchers seeking to adopt IPA it is suggested to prioritize one type of data collection based on the type of experience the researchers wish to understand. Limiting the data types helps to limit the number of different experiences researchers must interpret and allows for a focus on the richness that comes from fusing the voices of the participants with those of the researcher. If multiple data types are necessary, using IPA with other interpretive approaches can harmonize the different analyses through a common methodological approach.

Second, the use of team based analysis indicated the need to shift the hermeneutic cycles that underlie IPA. By shifting IPA from an experience led by a single researcher to one conducted by a team, the group was required to not only negotiate the voices of themselves and their participants but also the unique voice of each researcher. The addition of this interpretive cycle shifts the use of IPA away from one that merges the voice of the participant and the

researcher to one that prioritizes the voices of the research teams in negotiation. While the research team would like to suggest having a lead researcher for every IPA study this is not realistic given the time constraints and numbers often required for EER studies. As such, the authors recommend that research teams seeking to adapt IPA to their work set aside significant amounts of time to discuss the different positionalities that exist within the team. Prompting conversation of positionalities through self-reflection in writing prior to the group discussion of positionalities serves to foster a dialogue of individuals biases that may be difficult to elucidate through dialogue alone. Additionally, the research team suggests focusing the positionality discussion around the experiences of interest and utilizing key questions from the study to prompt the research team. Through this explicit consideration of each individual researcher's position the conversations needed to reach a shared interpretive stance are more readily negotiated.

Finally, the authors recommend a published dialogue and critique of the methodological adaptations made for EER. While this process serves to cement the decisions and process that have gone into the existing studies, it also provides future researchers with a guide to the different ways methodologies can be utilized in EER. By providing a transparent guide to researchers to the different adaptations of a methodological framework that are successful, we may be able to increase both the use of and quality in implementation of new methodologies.

Limitations and Future Work
The work presented is a first pass of critiquing methodological adaptations of IPA in EER. As such, the authors will continue to work to highlight changes in the methodology and how this has shifted implementation of IPA. Areas that warrant further critique include but are not limited to population size and homogeneity versus the expectations of a research community with traditions outside of interpretive paradigms and the needs to recruit students. Additionally, future work will seek to provide a framework or guide for conducting and documenting critiques of methodological adaptation that can be used by future researchers.

Summary

This work presents adaptations of IPA to EER. In our adaptations we have also provided critical perspectives of how the decisions made to match the needs of our research questions and studies have shifted the philosophical underpinnings of IPA away from their defined traditions. The methodological shifts presented show that project driven decisions are often non-trivial and require significant consideration of the ways in which the strengths of IPA can still be utilized to understand engineering student lived experiences. By openly presenting the critical perspectives of this work, we hope to make explicit the decisions and tradeoffs made in these works, and guide future adaptations of IPA in EER.

Acknowledgements

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