Development of an Interview Protocol to Understand Engineering as a Career Choice for Appalachian Youth

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Abstract

As part of a grant funded by the National Science Foundation, we are conducting a three-phase, sequential mixed method project to research the factors influencing the choices Appalachian youth make about pursuing or not pursuing engineering degrees and careers. To identify the factors specific to Appalachia, we are using interviews that will inform the development of a survey. This approach will yield both in-depth and generalizable results. Outcomes from both the qualitative and quantitative datasets will ultimately be used to develop an empirical theory, based on Social Cognitive Career Theory and Future Possible Selves, to explain the gap in engineering as a career choice, and then to develop potential interventions to increase engineering career choice in the region. We believe that the outcomes from this study will be useful to engineering educators, researchers and those doing outreach to high school communities.

Because little is known about engineering career choice among Appalachian students, interviews are central to providing the context-specific information needed for robust survey development. Therefore, we are using a quasi-longitudinal approach and we are interviewing Appalachian high schools students for a current perspective, Appalachian college students for a recent reflection, and working engineering professionals in Appalachia for a longer-term reflection. This paper focuses on the development and pilot testing of semi-structured interview protocols for each participant type.

Preliminary findings from pilot testing support the protocol's ability to provide meaningful information across multiple frameworks. Initial findings from a priori coding of the framework constructs suggest that influences specific to Appalachian students exist within the interview data. Additionally, the usefulness of the quasi-longitudinal approach was realized. Specifically, interviews with college students and professionals yielded insights that informed the high school interview protocol and question probes.

Introduction

The Appalachian region, home to approximately 25 million people, sees little inward migration as a whole and corporations located in the region consistently struggle to hire qualified local workforce, including engineers. Moreover, Appalachian youth tend not to pursue higher education including engineering. Understanding career choices of Appalachian youth can lead to interventions that not only close a gap for a skilled workforce in Appalachia but also help diversify the engineering pipeline. Appalachian students merit study because they have a unique combination of rural population and small schools, higher than average rates of poverty, lower than average educational attainment, a high percentage of blue-collar employment, and less ethnic diversity than non-Appalachian regions. Existing literature regarding engineering career choices is not set in Appalachia, and Appalachian career choice literature does not address engineering. Therefore, a critical research gap exists around Appalachian students and engineering career choices. Closing this gap requires the development of research tools appropriate to this unique population and engineering career choices. This paper focuses on the

development of interview protocols for a quasi-longitudinal study of the career choices of Appalachian youth. The protocols leverage multiple theories related to career choice in an effort to capture influencing factors of engineering as a career choice by Appalachian Students. After briefly describing the overall project, we describe some unique features of the region to offer context. We then describe the protocol development process including outcomes from pilot testing.

The Overall Project

The study described here, e.g., developing interview protocols, is part of a larger project funded by the National Science Foundation. The overall project is a three-phased mixed methods project designed to understand the barriers that inhibit students from pursuing engineering careers in the Appalachian region of the United States and, ultimately, to develop a theoretical framework that explains the factors that limit Appalachian students' pursuit of engineering careers. The framework would serve as a foundation for research-based interventions designed to broaden participation among this demographic.

In the first phase of the research project, we are exploring salient influencers of students' career choice process. To do this, we are exploring career paths from the perspective of high school students, college students, and engineering working professionals. The three different perspectives afford a quasi-longitudinal[1, 2] look at planned (high school), current (college), and reflective (working engineers) career paths and the factors that shape those paths.

The overarching purpose of the project is to develop a theory that explains choices to pursue or not to pursue engineering careers among Appalachian youth. Doing so means starting with what is already known about this process in this population. Prior research suggests that motivation-related frameworks such as expectancy value[3], self-efficacy[4], social cognitive career theory[5], and future possible selves[6] may have explanatory power in this context. In fact, research using these theories includes studies on career choices in Appalachia in general and studies on engineering as a career choice in populations outside Appalachia[7-10]. However, many of the existing studies rely on quantitative surveys so the relative importance of factors are based only on the factors pre-determined to be relevant, i.e., participants can only answer questions about the factors they are asked about. Because no single framework currently appears sufficient to adequately explain the unique set of challenges Appalachian students face related to engineering as a career choice, we are embarking on a broader qualitative study of potential factors that draws on known factors but also explores potential interactions as well as areas not well accounted for in existing theories.

In light of this goal, this paper focuses on the development of appropriate interview protocols (high school, college and working professionals) that are 1) grounded in existing research, 2) open enough to identify new relevant factors, and 3) appropriate for our sample population. The resulting protocols were developed by answering the research questions: 1) What types of questions are necessary for the chosen frameworks? 2) Do the interviews provide data that can inform a future survey? 3) Do the different protocols provide information that support analysis of high school students career choice decisions? and 4) Does the protocol length accommodate interviewing high school students during the school day?

Context for the Appalachian Region

To understand why existing protocols for other underrepresented groups may not be relevant, it is necessary to understand the context of the Appalachian region. The Appalachian region, as defined by the Appalachian Regional Commission (ARC) is 200,000 square miles and contains counties from New York to Mississippi. Characteristics of the region include its geography and culture[11, 12]. The region contains a unique set of characteristics relevant to societal and economic factors. For example, the average number of college degrees in Appalachia is roughly half of the national average, yet in Virginia, the percentage of students enrolling in a 2-yr community college is at a higher rate than the state average [13]. With respect to jobs, there are less technical white collar jobs in Appalachia[14] and Appalachia contains primarily traditional blue-collar jobs such as mining and manufacturing, which are decreasing. According to the most recent report from the Appalachian Regional Commission, "two-thirds of Appalachian counties have unemployment rates that are higher than the national average" while incomes across the region average 25% below the national average in 2009[15]. Another characteristic of Appalachia is its ethnic diversity. The majority of Appalachia shares ethnicity characteristics of many affluent Americans as they are Caucasian, largely Anglo-Saxon ethnicity, Protestant, and roots tracing back several generations[16].

The ARC has divided the region into sub regions, as shown in Figure 1. These regions include Northern, Southern, Central, North Central, and South Central Appalachia. Through history, the boundaries of what is considered Appalachia have changed as shown in Figure 2. Figure 2 shows that the boundary of Appalachia has changed several times with the boundaries expanding in 1964 and again in 1967[17]. The addition of areas was primarily due to distraught economic conditions of the added areas such that they resembled the economic conditions of the existing Appalachian region. Central Appalachia is the region that has always been considered part of Appalachia. Central Appalachia contains the largest gaps compared to the rest of the United States with respect to social factors such as educational attainment, income, and poverty. Because Central Appalachians do not fit the stereotype of economically disadvantaged (e.g. non-white, foreign-born, single parent families), average white Americans, or any other group except their own[16], existing research on engineering as a career choice may not have captured the essence of how or why Appalachian students make their decisions to attend college or to pursue an engineering degree[11, 16, 18, 19].

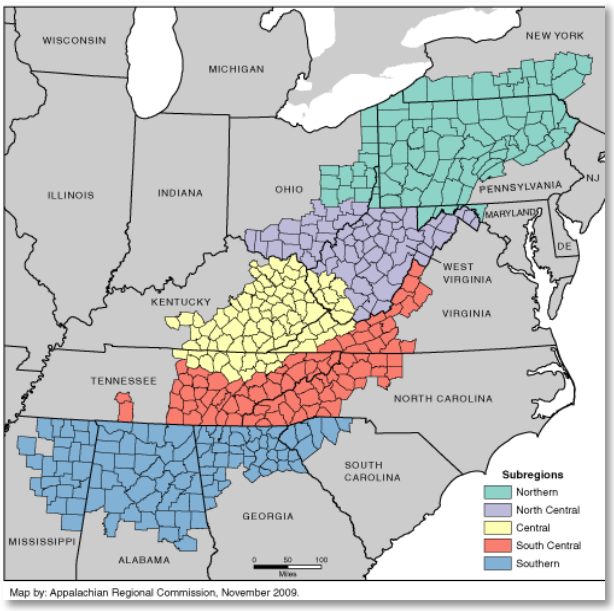

Figure 1 Map of Appalachia regions (from Appalachian Regional Commission)

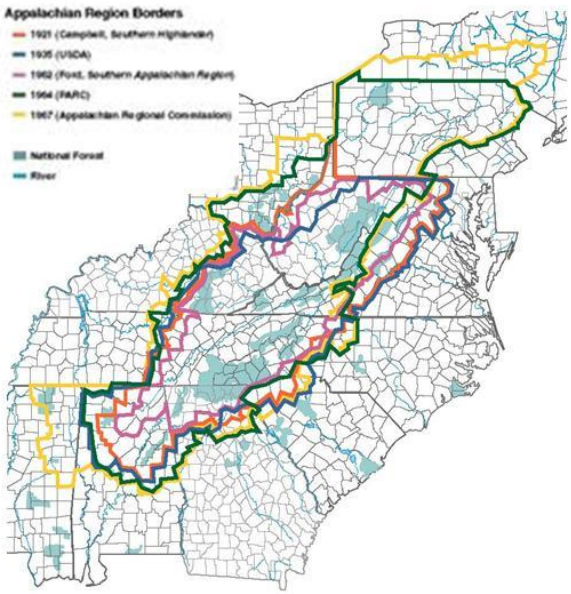

Figure 2 Appalachia boarder changes (from Whisnant)

Frameworks

Although a variety of frameworks could be appropriate places to start for this research, we initially focused on two in the development of our interview protocol. The two we selected are broad and include constructs that overlap with other theories such that our interview protocol would not be self-limiting and would build from existing literature. We chose social cognitive career theory (SCCT)[5] and future possible selves (FPS)[6] on which to base the initial protocol questions.

SCCT was chosen because of a rich history of research in 1) Appalachia, 2) Engineering as a career choice, and 3) underrepresented groups. Moreover, extensive use of SCCT in career choice research, in a variety of contexts, exists. SCCT has constructs that consider both distal and proximal factors in addition to social and personal influences. Research using SCCT considers specific constructs of the model, such as interests, supports and barriers, outcome expectations, and choice goals. In addition, research using SCCT has encompassed a variety of settings, persons, and goals. Relevant research on middle or high school students from rural or Appalachian areas includes Ali and Saunders, Ali& McWhirter, Bennett, and Chenoweth[7, 11, 20-22]. The variety of work by Ali considers the type of path post-secondary education students may take (e.g. college, trade school, and workforce) as well as key influencers of the students. In addition, work by Ali and her colleagues include conducting pathways analysis to support the path directions and linkages of the SCCT framework. Additional pathways analysis includes research with first generation college students and other underrepresented groups such as gender and ethnicity[8, 23, 24]. Results of Flores[23] show that traditional versus non-traditional contextual variables influenced the strength of the linkage between interests, career self-efficacies, and career choices for Mexican Americans. Research specific to supports and barriers includes work

concerning coping efficacy versus barriers relative to the process variables for obtaining outcome expectations[25] and a comparison of Bandura's model to SCCT for contextual support and barriers in engineering majors[26]. Qualitative research using SCCT includes research on engineering paths for early career professionals and underrepresented college engineering students [27-29]. SCCT use for researching historically underrepresented groups includes both quantitative and qualitative research[23, 28].

This rich history of research provides a solid platform on which to build our study specific to Appalachian youth and choices to pursue engineering careers. However, while SCCT does appear to offer insights into career choice among Appalachian students, the framework itself provides only a generalized explanation of the interactions among personal, background, learning, and contextual factors. In addition, the quantitative research analyzing the strength of the pathways connecting the constructs indicates that the combination of task level/context driven inquiries influences the results[8, 23, 24]. Given the unique combination of factors present in Appalachia, effective outreach efforts for this population require a more nuanced understanding of the individual factors themselves, along with interactions that may be elided in a more generalized model. Moreover, the culture of Appalachia overall may play a significant role in shaping the possible goals and visions individuals have about their future.

To provide insights into the link between local culture and future goals, we combined SCCT with Future Possible Selves (FPS). FPS was chosen because it considers how students are able to view themselves in the future as a precursor to actual career choices, i.e., to become engineers students must be able to envision themselves as engineers. Past studies in the Appalachian region indicate that a lack of available role models and lack of experience with higher education may be barriers students face in choosing engineering as a career[11]. Literature identifies that economic challenges often force Appalachian students to migrate from the region for employment reducing the availability of role models with engineering experience[7]. In addition to a shortage of role models with engineering experience, migration patterns of educated individuals has created a perception within Appalachia that education strips individuals of their roots and heritage[7]. At the same time, the various subregions of Appalachia typically have very strong local cultures that can provide powerful visions of the future, often linked strongly to both past traditions and family ties. To understand how cultural realities and perceptions influence students' ability to view their futures in an engineering career, the FPS framework was used in the development of the interview protocol. The FPS framework, first proposed by Marcus and Nurius in 1986, provides a means to represent "individuals' ideas of what they might become, what they would like to become, and what they are afraid of becoming, and thus provides a conceptual link between cognition and motivation" [6, p.954]. The framework has been used to study various populations including inner city youth, rural women, and other groups without a full range of positive role models[30-34]. Within Appalachia, the percentage of people without a college degree and with low waged blue-collar jobs is higher than the national average. Thus, determining the effect of these scenarios in light of a desired or feared future self is relevant.

FPS thus offers a framework for understanding how students in Central Appalachia envision their future, but typically, studies that employ FPS do not account for the source of those future beliefs or the ways in which those beliefs shape future decisions. Moreover, neither SCCT nor FPS alone fully accounts for the ways in which students who experience similar cultural and

learning environments make different choices regarding future careers. By utilizing both frameworks, we expect to gain in-depth information about how individuals view their future careers and how environmental and personal factors shape their vision.

Method

To capture individual's experiences with engineering as a career choice in Appalachia, a qualitative approach utilizing semi-structured interviews was chosen as the initial data collection method. An advantage of qualitative research is its ability to provide rich insight into a situation and capture salient aspects of the situation from the perspective of the participants [35, 36]. To capture a full range of information from the participants, allowing them to tell their "story" of how their perceptions, influences and experiences defined their career path, but to minimize variation among interviewers and remain cognizant of time restrictions, a combined interview approach was used[37]. Our semi-structured interview protocols combine the informal conversation flow of an unstructured interview with the structure of a standardized open-ended interview; this method was chosen to align with the oral culture typically associated with Appalachian individuals[38, 39].

The development of the interview protocols for this study was an iterative process. Beginning with the end product in mind, the interview protocols had five goals. The goals were: 1) capture what Appalachians, at different points of academic and career stages, articulate as important; 2) have data to analyze relative to a variety of motivational and socio-cognitive frameworks; 3) be structured in a manner that the questions are similar for the three different phases of choosing careers and living career choices; 4) contain sufficient structure for multiple interviewers to gain similar data, yet not prohibit an informal conversation flow; and 5) limit the necessary time to 45 – 60 minutes to allow all interviews to be conducted in a reasonable time period and, for high school students, to fit into class period times for high school interviews.

The steps to develop the protocols are shown in Figure 3. These steps are: 1) review existing literature on career choice for Appalachian students and for engineering students, 2) develop a set of initial questions, 3) engage in expert review of questions of clarity and content, 4) pilot the protocol, 5) review responses 6) make modifications, 7) conduct several pilot interviews using multiple interviewers, and 8) review data for content and comparison between interviewers. Examples of the process during each step are provided below to illustrate the development of the final interview protocols.

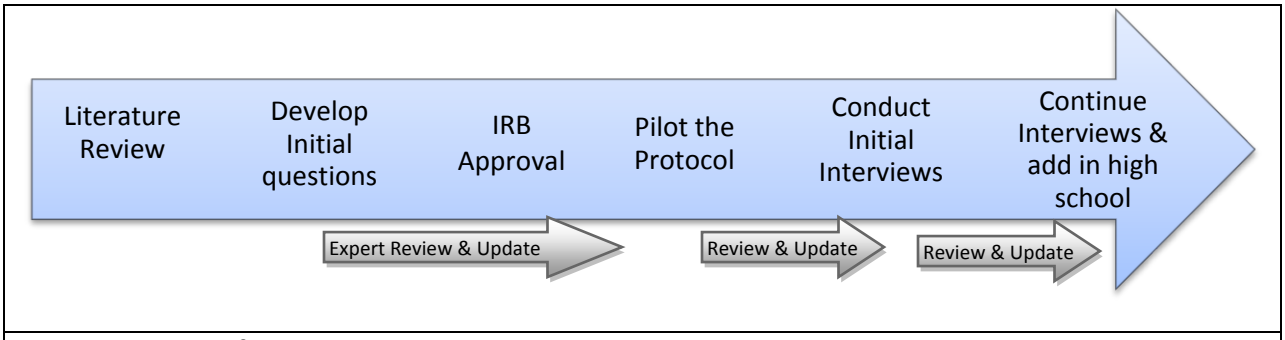

Figure 3. Steps of Interview Protocol Development

Protocol Literature Review and Developing Initial Questions

The initial step was to review existing literature of two key frameworks, SCCT[5] and FPS[6]. Within the literature, SCCT typically uses a quantitative approach and FPS often uses a well-defined or more structured interview protocol. Therefore, open-ended questions were developed to capture the constructs of each framework. The questions were set into the three protocols; one for high school, one for college, and one for working professionals. Probes were included with each question that were designed to capture information that literature suggests is pertinent to Appalachia and to help respondents give detailed examples. For example, with the high school protocol, the participant is asked about unique aspects of growing up in the Appalachian area and their interests. Next the participants are asked about high school including learning experiences and role models (in and out of school). The protocol then transitions to the participant's future plans including plans for academics and expectations for a job, why it is what they want, and who, if anyone, is helping them to achieve their goals. In addition, participants are asked about career goals they are not pursuing and why.

Prior to sending the protocols out for the initial expert review, the team mapped the questions. The mapping used the high school protocol as the baseline. The questions were mapped to SCCT and FPS constructs to verify at least one question anticipated a response for each of the SCCT and FPS constructs. The college and working professional questions were then compared to the high school protocol. For example, the question, "What type of activities interest you?" can provide information on interests as well as culturally specific learning experiences (SCCT constructs) and risky behaviors/ material lifestyles (FPS constructs). This question was re-worded to add a reflective component, "in high school", for the college and working professional interviews.

Initial Expert Review and Protocol Updates

The initial questions were reviewed by teachers, engineering graduate students, professors, engineers working in Appalachia, and the grant team. Recommendations included wording changes and the order of the questions to help the conversation flow. An example of a wording change in the high school protocol was to add adjectives to refine the context or timing of a question, "What do you want your **future** job or career to provide you?" Adding the word future helps high school students to think beyond their current situation and provide concrete details of their outcome expectations such as lifestyle, location, and family attributes. Other recommendations included modification of the question order to begin with the current situation for each protocol. Thus, we started the protocol with a "Tell me about (*high school, college,* or *your job)*" question where the interview would choose the appropriate term depending on the participant being a high school student, college student or working professional. The intent was to have an ice breaker question to get a conversation flow stared. For the high school protocol, questions about future expectations were moved to the end of the protocol and a question specific to a desired career not being pursued, a road not taken, was placed after that. Asking if there are career choices not being pursued allows for barriers or self-confidence that may not have surfaced. Similar types of questions relative to flow we made across all three protocols.

Pilot Interviews

Upon completion of the initial protocol and after receiving Virginia Tech Institutional Review Board approval, pilot interviews were conducted. Interviews were conducted in Virginia and Tennessee with a total of 1 high school, 8 college, and 4 working professionals. Only one high school interview was conducted because of the timing of the pilot interviews (over the summer) and additional human subjects' research requirements for conducting interviews with minors. The grant team for timing, flow, and content reviewed pilot interview data. Adjustments were made to the protocols to support flow of the conversation and to leverage noteworthy data gleaned during the pilot interviews. The interviews were also analyzed for data relevant to SCCT, FPS, and information unique or situated in context to Appalachia.

Data from the pilot interviews suggested a more conversational flow would occur if some of the questions were combined and if the probes were reorganized. For example, the revised protocol prompts students to describe their future career aspirations and those they may not be able to pursue. If the participant references multiple items (e.g. money and location), they were asked to provide the relative importance of each. The pilot data also suggested that asking about engineering too soon in the interview might imply engineering as the "right" answer and influence subsequent responses. To reduce this bias in answering questions about interests, career plans, and future expectations, engineering as a career choice was not asked early in the protocol. Additionally, because reasons for not choosing engineering are of interest, a prompt for this specific situation was added in case the participant had not commented on engineering and to reinforce the idea that not choosing engineering is also important to talk about. In addition, there was little detail on participants' confidence levels and confidence is critical to both SCCT and FPS. Therefore, probes concerning confidence, e.g., confidence to get into college, to get a degree, and to get the type of job they want were added.

After changes were incorporated into each protocol, the three protocols (high school, college, and professional) were compared to each other. The review was to verify no questions were unintentionally deleted from a protocol, additions to a protocol were considered for each protocol, and that the sentence structure was correct for the participant timing. For example, confidence in getting a college degree was future tense for high school students, but past tense for working professionals.

Initial Interviews

A second round of interviews were conducted with the modified protocols and different participants. During this time, an additional 15 college students and 5 working professionals were interviewed. The timing of these interviews was the fall of the 2012 – 2013 school year. The process to interview high school students was in work, but not complete. The team chose to interview additional college students and professionals to improve those protocols and to see what additional information could be learned to benefit the high school protocol.

The key area necessitating improvement during this phase was the amount of time spent "in the present" versus reflecting on high school for the participants. Upon review, we found that the college protocol focused on college experience, college selection, and major selection in the

beginning minutes of the interview. The resulting data showed that participants began to focus on college experiences and decisions as opposed to those experiences growing up that influenced their career choice. The protocol was modified to begin with prompting the participant to describe their current situation, as an icebreaker, and then move to questions prompting discussion of influences and experiences that developed their career path. The original flow of the working professional was also changed to improve focus on decision making during high school and reduce focus on current decision-making. The initial interviews of working engineers contained significant data based on their current situation and less on the factors that caused them to be where they are today. Similar to the college protocol, this protocol begins with an icebreaker question asking the participant about the work they currently do. They are then asked for the career path that led them to their current job as a segway into their past. The next question asks them about where they grew up, followed by what high school was like for them.

The level of detail and examples received was also improved from the original interviews. For example, future-related questions in all three protocols were clarified to gain answers that are more concrete. For example, questions asked about the participant's next steps versus asking about their plans. In addition, instead of asking the participant to describe themselves in the future, modifications included asking the participant to imagine themselves 10 year out and describing what their life will be like. If not previously discussed, participants were probed to discuss future selves they wish to avoid or things that scare them about the future. For professionals, this portion of the interview is a reflection on their earlier experiences. To clarify a participant's background further, additions to the probes included asking for specifics of the type of job and education of influential adults. For example, if a grandfather was mentioned not only was how he influenced the participant asked, but his job and educational background were also asked. This additional background information is relevant to understanding role models and learning experiences in a region with higher than average blue-collar jobs and lower than average formal education.

The analysis of the college and professional pilot interviews provided insight for contextual references to listen for in the high school interviews. Preceding the final update of the high school protocol, the team incorporated details from the college and professionals interviews in the form of probes. These probes were intended to capture features salient to Appalachian students. For example, probing a student about relatives, if they lived in the area, and how close the family was geographically and socially.

Results

Using the iterative process described in the methods section, we developed protocols that met our initial goals and research questions. As will be demonstrated in the discussion of our data, our protocols: 1) capture what Appalachians, at different points of academic and career stages, articulated as important; 2) allow for data to analyze relative to a variety of motivational and socio-cognitive frameworks; 3) are structured in a manner that the questions are similar for the different phases of choosing careers and living career choices; 4) contain sufficient structure for multiple interviewers to gain similar data; and 5) limit the necessary time to 45 – 60 minutes to allow interviews to be conducted in a reasonable time period and, for high school students, to fit into class period times for high school interviews.

The iterations of protocol revisions created three protocols that achieved the goal of capturing facets of culture, experiences, and role models that shape the career choice of individuals in Central Appalachia. As shown in the examples below, the protocol focused on individual's experiences growing up, identified influences of others, and demonstrated how experiences shape the desired future self. Our pilot data supports the inclusion of SCCT and FPS as appropriate frameworks and suggests that we are elucidating appropriate factors relevant to these frameworks through our protocols.

One place in particular is the connection of what SCCT refers to as learning experiences and what FPS considers a feared future self. Within the SCCT model, learning experiences relate to interacting with the environment and include verbal encouragement and vicarious learning[5]. Oyserman[40] describes feared future selves as providing individuals with motivation to avoid a particular end state. In both cases, examples of what students want to do are given by explicitly stating what they do not want to do in the future. High school, college, and working professionals have examples of not wanting a factory/blue collar job. This is an example of pursuing college not necessarily for the interest in what the career choice is so much as what it is not. Ultimately, our results show that knowing what you do not want to be matters. Similarities in feared future selves and learning experiences emerged among several students who have either worked summer jobs in factories or cleaning or who have relatives encouraging them to avoid what they do for a living (mining, factory type jobs, blue collar jobs). When asked for reasons to continue with his education, even though his parents did not and education is not emphasized in his family, Bob replied,

> "Well, that was the thing. Actually, they were kind of the reason why I went to college. I saw what they were doing, the jobs they were working. And uh, how it was killing them. The long hours. Very little pay. And I didn't... When I was 12 I started helping my mom clean a bank. And I realized I didn't want to be scrubbing toilets for the rest of my life so I was like, you know, I gotta get an education. I don't want to have jobs like this the rest of my life to get through."
>
> *Bob, college student*

Changes to the protocols improved the specifics of learning experiences and interpersonal relationships. In addition, unique data was gleaned from asking about jobs and educational background of adult influences. On several occasions students reference family member who they consider to have some engineering background because of a job title (military and industry) or a skill possessed, but that person may not have any form of a college degree. Kelly's dad dropped out of college and joined the service. He was enlisted in the military and worked around planes. When asked if she had any experience with engineering, she indicated "just with my dad when he was in the *(branch of Service)*, that was about it." When probed for what an engineer does she replied,

> "Basically create the electronics and the vehicles, and most of the technology we deal with everyday, and that we just don't realize it."
>
> *Kelly, high school student*

Additional results include improvement of the focus of college and professional participants toward their high school career decision making thought processes. The order of questions did influence participants' focus. After reordering the questions based on the initial interview findings, the interviewees focused more on their responses on reflections of high school and decisions for going into college. As a measure to demonstrate this, a page count of the first four working professional interviews was conducted and 15% of the interviews were centered on the participants' life during high school. Initial interviews after changing the order of the questions contain 33% centered on the participants' life during high school.

Given our final criteria of time limitations, we found that the high school interviews can be conducted between 45 – 60 minutes. It seems that 50 minutes for a high school interview is the minimum amount of time necessary for a thorough interview. Fortunately, several schools are on block schedules meaning there may be 90 minutes between classes. For the interviews in the longer time slots, we can continue to probe and seek additional examples which helps us understand when saturation is achieved and how long is long-enough for an interview.

Conclusions

Development of interview protocols is an iterative process. Taking the steps to ensure the questions are open ended and neutral is important. It is no less important to pilot the protocols and refine the question wording, order of questions, and probes to best suit the participant base. Using existing literature as a baseline for the interview questions is valuable, but from there several iterations involving members of the participant community and preliminary analysis of the interview data is necessary. The iterations of protocol and interview data is what ensures the final protocol is capable of retrieving the type of data needed for analysis.

The combined protocols are working. Interviews were conducted by multiple researchers and resulted in data useful for analysis using multiple frameworks. Five goals of the interview protocols were established and the current protocols are meeting the goals. The goals were established to help ensure the interviews provide data that can inform a survey, support analysis of high school students career choice decisions, and are a length to accommodate interviewing high school students during the school day. Preliminary analysis of the data indicates the necessary information to support the NSF grant was collected.

The refined order of the questions in the protocols allowed the participants to tell their "story" of career choice. The refined probes allowed for contextual answers from the college and working professionals. The data from the college and the engineering professionals was used to improve the order and prompts of the high school protocol. The prompts within the questions allowed for multiple interviewers to obtain data rich with information for a variety of frameworks, while allowing a natural narrative to unfold. Because the researchers have a different depth of knowledge on several frameworks, a synergistic affect was possible. The probes were sufficient to capture data pertinent to multiple frameworks. The structure of the protocol was sufficient for different interviewers to obtain similar data and the team was able to massage question wording to allow consolidation of questions so that the total interview length was appropriate. An additional benefit of the added probes was the interviewer's ability to approach a question from

multiple perspectives, allowing the participant to provide meaning back to the interviewers in more than one way.

In addition to providing qualitative themes on career choices, this information will be useful when developing survey questions related to who and what influences students across the Appalachian region. Additional interviews using the final protocols are being conducted in support of the NSF grant on barriers influencing engineering as a career choice for Appalachian students.

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