

Stories From Central Appalachian Engineers: Cultural Characteristics That Bolstered Their Academic Success

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Introduction

This empirical full paper reflects on the unique undergraduate experiences of engineers who identify as Central Appalachian. On the campuses of major universities, Central Appalachian students are often marginalized because these educational spaces were not created with their needs and experiences in mind. By collecting stories of Central Appalachian engineers' lived undergraduate experiences through interviews, this study will take an asset-based approach to identify the unique cultural capital these students hold and use their stories of success as examples for tomorrow's engineering students from the Central Appalachia region. Drawing from a larger phenomenographic study, this paper focuses on the following research question: How do engineers from Central Appalachia describe characteristics common of their region that helped them succeed in their pursuit of an engineering degree? The larger phenomenography seeks to shift the dialogue from the disparities faced by Central Appalachian engineering students to the identification and engagement of the cultural capital they hold as they pursue their engineering degree and become career-ready.

Introduction and Background Literature

The mountainous region of the United States known as Central Appalachia encompasses the 68 counties in greatest economic distress within the rural regions of Kentucky, Virginia, Tennessee, and West Virginia [1]. Per the Appalachian Regional Commission's most recent report, from 2016 to 2020 Central Appalachia lagged behind the rest of Appalachia in employment, economic wealth and educational attainment [2]. Opportunities to become an engineer without leaving Central Appalachia are almost non-existent. If students desire to study engineering-related fields within the region, they can study engineering technology at one of several community colleges and small four-year schools. Some students within the region choose to begin their studies at a community college but still must transfer outside of Central Appalachia to complete their engineering degree. Because of these educational and economic gaps, the region of Central Appalachia specifically bounds my study. Additionally, Central Appalachian students present a compelling case for study because engineering degree programs at major universities may be a big leap socially, economically or logistically for them. This study's asset-based approach uses stories of success to describe paths forward for tomorrow's engineering students from the Central Appalachia region.

Frameworks

This study draws on the theoretical frameworks of Social Cognitive Career Theory (SCCT) and Community Cultural Wealth (CCW). The interaction between these two frameworks is depicted in Figure 1. SCCT was used to inform the design of the study and create the interview protocol. In the larger phenomenographical study, it helped define the processes through which engineering students of Central Appalachia "form interests, make choices, and achieve varying levels of success in educational and occupational pursuits" [3, pp. 36]. This framework explores barriers encountered during these pursuits and also acknowledges the importance of identifying

contextual conditions that support and enable members of marginalized groups to pursue their goals in the face of deterring conditions [3]. SCCT builds on Bandura's statement that two appraisals, self-efficacy and outcome expectations, influence one's "choice of activities and environments, as well as one's effort expenditure, persistence, thought patterns, and emotional reactions when confronted by obstacles." [4, pp. 83]. In this framework, self-efficacy is defined as "people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances" [5, pp. 391]. For example, "Can I do this?" Outcome expectations are defined as "personal beliefs about probable response outcomes" [4, pp. 83]. For example, "If I do this, what will happen?"

For the thematic analysis we conducted for this study, we propose that the experiences and needs of Central Appalachian people can be modeled using tenets of Community Cultural Wealth (CCW), a framework that was created for minoritized groups, and more specifically, communities of color. This theoretical framework focuses on positioning oneself for success in a domain not created with one in mind [6]. Although Central Appalachian students are not a minoritized population, they are a marginalized group within higher education. As such, these tenets are useful to identify ways undergraduate engineering students from Central Appalachia can come to recognize and leverage their strengths as they approach degree attainment and come to see themselves as career-ready engineers. Stating that these undergraduate students are living and studying in a system that was not predominantly made for them places the root of their difficulties on lack of access to resources and experiences that are more easily accessible to many of their peers. It also demonstrates that they don't lack cultural capital, they simply hold a unique cultural capital that wasn't historically embodied by the dominant culture in the higher education space. The six tenets of CCW served as a priori codes, and thus were used as categories in this thematic analysis to organize findings and guide discussion. The definitions for each tenet came from Yosso's 2005 study [6].

The six tenets of CCW [6, pp. 79] are as follows, with one modification in wording in the definition of Navigational Capital that replaces the phrase "people of color" with "marginalized populations":

- 1) Aspirational capital: Ability to maintain hopes and dreams for the future, even in the face of real and perceived barriers
- 2) Linguistic capital: Intellectual and social skills attained through communication experiences in more than one language and/or style.
- 3) Familial capital: Cultural knowledge nurtured among familia that carry a sense of community history, memory and cultural intuition
- 4) Social capital: networks of people and community resources
- 5) Navigational capital: skills of maneuvering through social institutions not created with marginalized populations in mind
- 6) Resistant capital: knowledge and skills fostered through oppositional behavior that challenges inequality

Conceptual Model

For the larger study, a conceptual model was created that adapts SCCT to interlock with the tenets of CCW. All six of the CCW tenets can be defined as inputs at various points within the model.

matter of interest is not the phenomenon itself, but rather the variation in ways people understand the phenomenon; this is known as a second order perspective [7]. Thus, phenomenography is the “study of how people experience, understand, or conceive of a phenomenon in the world around us” [8, pp. 56]. The phenomenography seeks to allow participants to share ways they used their own self-efficacy to identify and engage their cultural capital. This could help other Appalachian students recognize cultural capital that they haven’t perceived themselves as holding or had not thought of leveraging. Also, it explores the idea that if a student knows they hold a certain capital, simply having that knowledge may shift the amount of capital they hold. For example, if a person comes to realize they have a very strong mountain accent, do they become more reluctant to speak publicly, or do they turn on a “country charm” persona that makes them come across as genuine?

Methods

This study employs semi-structured interviews to explore characteristics common of Appalachian people that participants felt helped them succeed in their undergraduate engineering program, or that they tried to hide during college.

Participant Selection:

Status as “a person of Central Appalachian roots” bounded the regional component of my selection criteria. Although Central Appalachia itself is defined by the ARC, participants had autonomy to decide if their roots are in the region. Participants must also hold a bachelor’s degree from an ABET-accredited engineering program at an R1 or R2 university.

For my study, we initially used targeted sampling to identify study participants by searching through three main resources:

- 1) Area chambers of commerce
- 2) University Alumni Centers
- 3) Social Media Groups

Individuals within these groups were asked to pass along the first author’s contact information to potential participants who met the selection criteria (from Central Appalachian and practicing engineers). Additionally, we used snowball sampling by asking participants to pass along the researcher’s contact information to additional potential participants from their networks of Central Appalachian engineers. Because snowball sampling often relies on members of a group to recommend other members of the same group, it is inherently non-random [10]. To ensure as much variation in the participant sample as possible, we selected participants with a range of demographic parameters (age, gender and county of origin). Additionally, Appalachian engineers at various points in their career were selected, lending a quasi-longitudinal aspect to the study.

Data Collection:

Larsson and Holmstrom [8] have expressed that data from 20 interviewees is usually sufficient to discover a breadth of ways to understand a phenomenon. In this study, 13 participants were interviewed, and while this number is lower than 20, based on initial demographic and career level data collected, they represent a breadth of experiences. Also, participants’ roots were spread across the whole Central Appalachia region, and in all states including Tennessee, Kentucky, Virginia, and West Virginia. This paper focuses on data collected through two interview questions selected out of the 28 interview questions based on their relevance to the research question and strong, direct connection to asset-based framing:

“Were there characteristics common of Appalachian people (that you saw in yourself) that helped you succeed in engineering?”

“Were there characteristics common of Appalachian people that you tried to hide or separate yourself from? If so, when and why?”

Data Analysis:

Prior to coding, transcripts were cleaned and read twice by the first author. During the cleaning and reading phase, no coding or speculative connection-making was done to maintain procedural validation and “mitigate threats to an authentic view of the social reality” [9, Fig. 2]. For this paper, the six tenets of CCW served as a priori codes assigned to phrases from all participants’ responses to both questions. Two peers who are experienced with CCW were co-coders for this work. By ensuring consistency across coders’ perceptions of statements made by participants, communicative validation was bolstered.

Results

Aspirational capital:

This code was one of the most frequently occurring codes in the data. Participants repeatedly mentioned that among Appalachian people, strong work ethic and willingness to persevere when they needed to achieve a task was common. Participants also noted that much of this persistence was rooted in necessity. Tight finances and limited resources fueled creativity and innovation. One participant, Harry, mentioned his uncle building an underground house. The uncle had no formal education, but he decided that was what he was going to do. Harry said that he sees this innovation in himself--as did several participants. Regarding strong work ethic, Luke noted that he “took that into college.” Another, Ray, noted that he and people from the region “don’t like to get beat; don’t like to fail in life.” Regarding Central Appalachian people, Rachel noted that, “they had to work hard for everything they’ve gotten, right? So I do see that in myself quite a bit.” Dustin said that working alongside Central Appalachian people as a young person taught him self-sufficiency. Don noted also that strong work ethic and promise keeping persisted among Central Appalachian people, even in the face of challenges. Beyond work ethic and perseverance, Rachel discussed aspirational capital from a different angle: dialect. She noted that although some people from the region try to hide their accent, she has taken the opposite approach:

“Me, That’s something that I never wanted to do. Because that’s part of me. And there’s this perception that this accent makes you less intelligent or something. So I kind of wanted to prove the opposite of that. It’s like, I know I’m really smart. I know I’m really good at my job. I do it with this accent, because this is part of me. And people from this area are smart, you know. The accent just is the cherry on top.”

Lastly, one participant, Don, noted that he thought that when it comes to education, being from Central Appalachia is not a barrier at all. He stated,

“But one thing I wanted to get out there, that going through [a local community college] and going to [large land grant university], my experience was that students from Southwest Virginia were just as prepared for college life at [a large land grant university] than people from

anywhere else that was there. I mean being from the rural region was not a disadvantage when it came to that level. If you took advantage of the opportunities and to get the education to get there."

Linguistic capital

Regarding Linguistic Capital, participants noted that the dialect and concise simple nature of Appalachian spoken word had several benefits. One participant, Garrett felt that his down-to-earth demeanor and speech made his communication with peers more practical and gave clarity to conversations. When Gerald talked about a former boss who had a strong dialect, he said, "listening to people like him helped me realize that you don't have to talk a certain way or use certain words to have an understanding of a topic." Lastly, bridging Linguistic Capital and Social Capital, Gerald shared the following:

"I would say there's just a different, not language, but just the way that we talk is different. And that's something that I've noticed is pretty common among engineers in Appalachia. That's kind of how we relate to each other, and I've used that."

Familial capital:

One participant, Dustin, mentioned his parents "making him get a job" before college. He noted that this positively influenced his work ethic in college. Another participant, Garrett, who had a strong friend base of Central Appalachian peers at college, mentioned the strong "moral center" of his "little group for success." Ben mentioned the area "has a big sense of family. And it's huge." He noted that, "the whole region has this whole...or used to have this whole...mindset of, 'If something happens to one person, we'll take care of them.'" He also noted, "that kind of is ingrained in me whenever I'm in school, and I see someone struggling. I have no qualms about going over and say, 'Hey, I saw you're struggling with this. Do you need some help?'" Applying this sense of community to his own life as Ben graduated college and entered the work world, he said, "That kind of sense of community is something that as I go out into the world, my community just keeps getting bigger, because that's just how I how I grew up."

Social capital:

During college, Cody expressed that being around other people from Central Appalachia made it "easier to form a connection" because of the similar background. It also gave him a group he was comfortable "studying" and "just hanging out" with. Another participant, Don, mentioned that being from Central Appalachia helped him better serve his customers who are also predominantly from Appalachia. He cited the friendliness and sociability of Central Appalachian people, noting the people within the region "understood" one another. Bridging social and familial capital, Ben's comment about having no qualms about going over and say, "Hey, I saw you're struggling with this. Do you need some help?" shows his desire to be a resource within his Central Appalachian community, rooted in his upbringing. Another participant, Noah, mentioned the Governor Scholar program, a unique program that connected him with other Central Appalachian students at the large land grant university he attended. Entering college with 100 to 150 friends from his home region gave him a tremendous amount of confidence during his transition.

Conversely, Harry noted that when he lived and worked outside the area, he defended Appalachia. He said that people outside the area “have a different attitude toward the people in Appalachia.” And Dustin said that he knew people from Central Appalachia who fit in “just as fine as anyone else” with peers from other areas in college.

Navigational capital:

The social capital that Cody mentioned regarding peers from Central Appalachia being “easier to form a connection” with also translates into navigational capital because he and his peers formed a cohort to navigate their experience as engineering students. Dustin shared that his experiences working alongside Central Appalachian people when he was in high school taught him “self-sufficiency” that he carried into college. Ben and Noah both mentioned working with peers. Ben discussed the willingness to help others as a trait common among Central Appalachian people that helped him build and maintain friendships in college, while Noah mentioned coming into college with his Governor’s School cohort, which provided him peers from “back home” to navigate a major university with. Lastly, Noah also mentioned the feeling of relief that was common among him and his peers when they were maintaining 3.5 GPAs and were from Eastern Kentucky. This demonstrates a goal of engaged navigational capital.

Conversely, participants routinely referred to hard work and perseverance as substitutions for navigational capital. David said, “The hard work, I mean, that’s the kind of ‘dinner bucket’ mentality of just pack your lunch, get your boots and your hard hat and go to work and get it done. That was it, man! It was pretty simple.”

Another substitution for navigational capital was “sharpening” or losing the dialect. Rather than leaning into it, some participants decided to attempt to eliminate it to gain credibility. Additionally, Noah mentioned dressing nicer than peers to “compensate” for the risk of being perceived as “hillbilly”—another attempt to follow the “mainstream norm” rather than leaning into unique navigational capital.

An interesting paradox to the idea of unique navigational capital held by Central Appalachian participants altogether was described by one participant, Luke, who said that when he was told by his university that he was a “minority” on campus, he was completely surprised. When he was given access to additional resources as part of AMSTEM (an Appalachian minority stem program), he said he was “amazed.” When discussing a college application response, he noted:

“In a way, I almost leaned into it more because when I had to write that letter about Diversity, it was like, Oh, man, we go out back and we live on deer meat and fish we catch and all that. It’s just like, because I’m trying to be diverse. But I’m like, I don’t do that. We go to the grocery store. But it’s almost like they want you to be something sometimes, and that’s kind of like what we talked about earlier about the oh, “woe is me.” I never felt woe is me really.”

Resistant capital:

Linking aspirational capital with resistant capital, when Rachel said that she has chosen to keep her dialect (“the cherry on top”) to demonstrate that smart people may have an accent, she uses her own talent to challenge long-held beliefs by others around her that people with a dialect are “less smart.”

On a systemic level, but not tied to undergraduate experiences, Harry, mentioned that his company and several other local coal companies are pumping money into a mining engineering technology program to recruit young students to get an education within the region. Another student, Noah repeatedly discussed the value that the Governor Scholar program in Kentucky was to him when he was an engineering student.

Discussion

Perceptions of being an outsider but not being left out:

In this study, some participants, such as Noah who intentionally dressed nicer to separate himself from being perceived as Appalachian, told stories of times they were criticized or misrepresented by others outside of the region. However, no one indicated that they saw themselves as marginalized. They simply focused on the lessons learned from the challenges they had faced, and challenges they saw those around them overcome. Their resilience and determination landed them in an engineering classroom and helped them earn their degrees. This is an interesting observation because although this determination is in many cases aspirational capital and the collective creation of ways to succeed as Central Appalachian engineering students is in many cases navigational capital, these participants didn't express it that way. In fact, one participant, Luke, indicated that when he got to [a large land grant university] and was placed in a program he referred to as AMSTEM (Appalachian Minority STEM), he was amazed that he was being characterized as marginalized. He said,

“So I'm getting looped in with the minorities. And I'm thinking I'm a middle class white male. what I'm saying is, that was something that just kind of amazed me. I didn't feel like that. I was different or yeah, I guess at the time that didn't seem like a deterrent for me. I never felt like that was something that I need to be classified as.”

Expectation of having to work hard and persevere through challenges:

Persistence and hard work can be perceived as aspirational or navigational capital when they are engaged to attain an individual's goal(s). However, simply working hard and buckling down persistently is not aspirational capital based on how participants described their experiences. Aspirational capital refers to working hard and buckling down because one can see a brighter future and a path to reach that success. While some participants talked about their lived experiences overcoming challenges in the Central Appalachian region and the positive impacts those victories had on their ability to see a successful future for themselves, others simply saw persistence and hard work as an expectation; “just pack your lunch, get your boots and your hard hat and go to work and get it done.” The participant that shared that phrase did end up becoming a very successful engineer, and knew from the outset that he could do it, but he didn't frame his experience as overcoming obstacles.

Choosing to hide or embrace unique characteristics:

There was a roughly even split in participants who chose to hide their dialect and those who chose to lean into it. Hiding the dialect does not align with any forms of cultural capital. In fact, it conflicts with the essence of CCW, which focuses inherently on recognizing skills that people with unique lived experiences can bring to the table and acknowledges that characteristics widely held by a dominant culture should not become what other cultures aspire to emulate. As such,

dialect could hold assets that would be lost if people from the Central Appalachian region attempt to “drop” the accent. The participants that recognized the various ways that maintaining the regional dialect can help them bolster connections with others and display themselves as an example of intelligence and accent together demonstrate both linguistic capital and social capital.

Embracing a sense of community:

Lastly, the idea that Central Appalachian people are welcoming and have a desire to help others emerged in several responses. These participants bolstered their own social capital by building stronger relationships with peers from inside and outside the region at college. For example, one participant, Ben, indicated his intrinsic desire to help others ended up helping himself throughout college because he gained access to friendships and broadened life experiences that he otherwise wouldn't have had. Attributing these experiences to his roots, Ben made the following statement:

“But yeah, that kind of sense of community is something that as I go out into the world, my community just keeps getting bigger, because that's just how I how I grew up.”

Conclusion

The breadth of participants' responses to the two selected interview questions showed a variety of ways that participants engaged cultural capital—sometimes knowingly, and sometimes unknowingly – to describe characteristics common of their region that helped them succeed in engineering. The responses also showed times that participants conformed to other groups' norms, such as dropping an accent, or trying to dress nicer than peers to be taken as credible. They also noted characteristics such as perseverance which can be engaged in the form of aspirational capital but also can simply be engaged in the form of persistence without a true vision of success. These findings can serve as a base for future studies in a variety of ways. For example, an interesting sequel to this study could probe ways participants used their intrinsic diligence, perseverance, and hard work to achieve goals. Essentially, how did simply “hard work” become “aspirational capital” for these engineers at the time they were students? Analysis of the interview responses is the first step in the larger phenomenographic study, and future work will entail a complete phenomenographic analysis of participants' responses to all interview questions.

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