

How Can They Know What They Don't Know? The Beliefs and Experiences of Rural School Counselors about STEM Career Advising

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Many factors contribute to the educational challenges students face in rural areas, including a lack of funding compared to urban and suburban schools and a lack of role models pursuing postsecondary education. School counselors in all settings are trained to provide education to students about the postsecondary options in demand. College and career counseling with students and families in rural areas requires unique understanding of the rural characteristics that shape community life and family dynamics. National attention on rural education has highlighted a particular need for advising into STEM career fields. Using a phenomenological approach, the researchers examine the beliefs and experiences of eight school counselors working in rural schools regarding their lived experiences of advising students in their rural areas about careers in STEM. Three themes about STEM-focused career development emerged from the interviews with the school counselors, a lack of opportunities and resources, challenging local influences, and ideas for much needed place-based innovations. Implications are discussed for several key players with the ability to improve and increase STEM advising for rural students. Examples include the following: for practicing school counselors, intentional career counseling efforts that include rural families; for counselor educators, the addition of rural field placements and assignments focused on rural student career needs; and for rural communities, combining the school counselor's efforts with local business and industry to highlight and increase STEM career awareness for students and their families.

Keywords: rural education, rural students, school counseling, college and career advising, rural STEM

Rural students in the United States face large academic gaps in graduating from high school (Dupéré et al., 2019; Johnson, Strange, & Madden, 2010) and in going on to attend college (Byun, Irvin, & Meece, 2015; Koricich, Chen, & Hughes, 2018). The recent Every Student Succeeds Act included a call to address the status of rural education in the United States to better support rural schools and their students (Alliance for Excellent Education, 2016). With 18.7% of public school students in the United

States attending rural schools (Showalter, Klein, Johnson, & Hartman, 2017), this initiative is an acknowledgment that rural schools need support to meet the needs of these students who are at risk (Harris & Hodges, 2018). With the public attention on rural education matters, the role of school counselor within rural schools is of interest more than ever. School counselors have many roles today, including preparing students as early as elementary school for their futures after high school (Knight, 2015). Within the rural context,

the school counselor may be responsible for both college and career counseling, as well as other educational programs (Arrastia-Chisholm, Bright, & Grimes, 2017; Hines, 2002; Lapan, Aoyagi, & Kayson, 2007).

Despite ruralist, or discriminatory, views of achievement (Bassett, 2002), rural students perform just as well as suburban students in math and science on standardized tests and better than urban students (Showalter et al., 2017). However, in addition to task-specific knowledge, skills, and attitudes, many careers in science, technology, engineering, and mathematics (STEM) require college degrees. Despite having the talent in math and science, only 50% of the rural U.S. population had at least some college education in 2015, compared to 62% of the urban population (U.S. Department of Agriculture, 2017). Because of these patterns, Showalter et al. (2017) call for more focus on STEM education in rural schools, stating:

The disciplines of science, technology, engineering and mathematics, or “STEM,” hold a singular place in the nation’s rhetoric around schooling. They are seen as key to the future of the national primacy, indicators of students’ readiness for post-secondary opportunities, and socio-cultural markers for individual intelligence. These perceptions matter greatly to rural America in that they signal the relevance and contributory power of rural America’s physical and human capital to that of the nation overall. (p. 37)

STEM careers are of particular interest due to the growing need for diversification within the U.S. economy, and more specifically “the need to recruit and maintain a more diverse STEM workforce,” including students from rural areas (Falco, 2017, p. 360; see also Byars-Winston, 2014). Interestingly, the highest-performing students in rural areas are those with the greatest ties to the community (Petrin, Schafft, & Meece, 2014).

In theory, part of the purpose of education is to provide students with social capital, the intangible resources harnessed from networks and social institutions, which can propel social mobility and economic prosperity (Coleman,

1988; Cruz, Selby, & Durham, 2018; Gibbs, 2005; Plagens, 2011; Schafft, 2016). From this theoretical perspective, rural areas are in need of the social capital to support the STEM workforce and overcome unique challenges, such as lack of parental education (Bauer, Anderson, Hirko, & Wendling, 2019), limited networks (MacQueen et al., 2018), and generational poverty, when two or more generations have lived in poverty (Goodpaster, Adedokun, & Weaver, 2012; Morris, Santos, & Neumeyer, 2018; Nelson, 2016). Hence, school counseling directives stress including more STEM-focused career development (Falco, 2017; Schmidt, Hardinge, & Rokutani, 2012). This task may present unique challenges for rural school counselors (Arrastia-Chisholm et al., 2017; Grimes, Haskins, & Paisley, 2013; Grimes, Spencer, & Jones, 2014), the school personnel who provide social capital by advising students for college and careers (Bryan, Moore-Thomas, Day-Vines, & Holcomb-McCoy, 2011; Farmer-Hinton & Adams, 2006).

To provide social capital for students in rural areas despite a lack of resources (Stern, 1994; Thomas & Falls, 2019), place-based education become increasingly popular in the United States and abroad (Cruz et al., 2018; Gallay, Marckini-Polk, Schroeder, & Flanagan, 2016). Place-based education takes advantage of the unique characteristics of the rural setting (Shamah & MacTavish, 2009), such as the natural environment or the agricultural economy, to engage students in STEM topics (Bartholomaeus, 2006). These strategies can include making connections to students’ locality in stories (Waller & Barrentine, 2015), collecting oral histories of farmworkers (Sawyer, Rosales, Medina, & Sawyer, 2019), and becoming stewards of the local environment (Gallay et al., 2016). Although place-based education can connect students to their environment, the role rural school personnel and communities play in shaping rural students’ choices and future opportunities in STEM careers is still unclear. To better understand the development of social capital for STEM careers, researchers can explore the experiences of school counselors in the rural setting.

Career Counseling in Rural Schools

Being a school counselor in a rural area can come with specific challenges. Bray (2016) interviewed counselors in rural areas about the need for more personnel. For example, to meet student needs, school counselors may have to commute or travel long distances. If the school counselor is not from the area originally, one may also have to take time to learn about the area and make community connections to overcome cultural boundaries in places where everyone knows each other. This is particularly straining due to the likelihood that school counselors will play more than one role in the community (coach, church member, etc.). Unfortunately, this can lead to role confusion, isolation, and a lack of privacy (Wood & Lane, 2015).

Many models for high school interventions have been developed, including the College Ambition Program, which helps students become familiar with all of the postsecondary options available and how to cultivate a competitive edge for careers in STEM (Goodwin, Li, Broda, Johnson, & Schneider, 2016; Schneider, Broda, Judy, & Burkander, 2013). However, multicultural educators and diversity researchers have not specifically designed interventions such as these for rural students (Byars-Winston, 2014). Yet school counselors are still responsible for helping students gather and interpret information to make informed career decisions (San Antonio, 2016); in fact, over half of juniors and seniors in rural settings reported getting information about college and careers from school counselors (Griffin, Hutchins, & Meece, 2011). However, rural minority students were less likely to report getting this information from school counselors. Instead, these students rely on parents and community members for information. Making these opportunities visible and accessible for parents, in addition to students, is key to student success (Griffin & Galassi, 2010; Tieken, 2016; Wood & Lane, 2015).

Despite these efforts, perceptions about the importance rural schools place on STEM education is low, which in turn affects students' aspirations regardless of socioeconomic status (Irvin, Meece, Byun, Farmer, & Hutchins, 2011; Tieken, 2016).

Showalter et al. (2017, p. 40) highlight a study that found "only about one of five rural students perceive their schools as placing high value on STEM subjects." It is unclear which factors contribute to these perceptions, including the lack of information about such career choices, unfamiliarity with the educational paths required, lack of support, and uneven exposure to various technical careers within students' hometowns via mentoring and shadowing (Harris & Hodges, 2018). Insights from the school counselors that serve this population every day could start to explain the phenomenon of the STEM career choice disparity among rural youth.

Purpose of the Study

Additional research is needed on rural school counseling overall, and specifically on STEM career advising in rural areas (Arnold, Newman, Gaddy, & Dean, 2005; Griffin et al., 2011; Monteiro-Leitner, Asner-Self, Milde, Leitner, & Skelton, 2006; Peters Burton et al., 2014). With careers in STEM growing (Fayer, Lacey, & Watson, 2017; Vilorio, 2014), understanding the beliefs and experiences that rural school counselors have about guiding their students toward STEM careers is important. To do so, we chose the qualitative methods of phenomenology.

The purpose of the present study is to investigate the experiences of rural school counselors in the light of STEM-focused career development. We followed the traditions of phenomenology as we examined the following research question: what are the beliefs and experiences of school counselors in rural areas about advising students regarding careers in STEM fields?

Method

We choose empirical phenomenology to describe the lived experiences of individuals around a shared experience: STEM career counseling in rural schools. This process involves researchers assuming the role of the primary instrument of inquiry (Moustakas, 1994) to collect data through in-depth interviews with individuals who have a shared experience of a concept or phenomenon, analyze the data for meaning, and

Table 1
Participant and School Demographics

Participant	Gender	Ethnicity	Years of experience	Current setting	Enrollment
Stephanie	Female	White	25	High school	200
Ree	Female	White	20	Elementary	600
Elizabeth	Female	White	20	Elementary	600
George	Male	White	22	High school	2,800
Sam	Female	White	15	Elementary	700
Boo	Female	White	25	High school	1,400
Scout	Female	White	15	High school	1,900
Eight	Female	Hispanic	3	High school	1,300

Note. Participant names are pseudonyms.

then write a composite description that presents the common participant experiences (Creswell, 2017; Hays & Wood, 2011).

Participants and Procedures

We used purposeful sampling to identify participants for the study (Polkinghorne, 2005). The criteria for inclusion were (a) being a school counselor in a self-defined rural area and (b) recognizing the focus on STEM careers. The primary researcher (L.E.G.) recruited participants mostly through her work in her state school counseling professional organization. Recently the organization added a Rural School Counseling Network as a committee, and she met and was connected to rural school counselors around the state through this committee. After institutional review board approval, she personally contacted 11 rural school counselors either face to face or through e-mail in different regions of the state. Ultimately, this study included eight participants: six from the pool first contacted and two additional participants via snowball sampling (Gentles, Charles, Ploeg, & McKibbin, 2015). All of the school counselors worked in schools in rural areas

of a southeastern state. See Table 1 for more information about the participants.

Data Collection

The primary researcher developed a semistructured interview protocol based on a review of the literature (see Table 2). For six of the interviews, she traveled to the participants' community and audio recorded the interview using the iTalk app. Two of the interviews were conducted by phone, also using iTalk for recording. The average length of each interview was 1 hour. Each audio-recorded interview was saved under the pseudonym the participant chose and given to a hired transcriptionist to transcribe. Recorded interviews were destroyed at the end of the research process.

Data Analysis

In keeping with Creswell's (2014) recommendations regarding researcher bias, we each discussed our biases about the rural setting. The researchers attempted to set aside their personal biases regarding rural areas and rural people through a process called bracketing (Hays

Table 2
Semistructured Interview Protocol: Sample Questions

Interview Questions
1. What do you believe characterizes the rural area and school in which you work?
2. Is there a need for STEM advising in rural schools—why or why not?
3. How does the role of the school counselor address the need for STEM advising?
4. What are your beliefs about the preparation of rural school counselors to STEM advise?
5. How can the rural community support their students toward STEM careers?

& Singh, 2012). By reflecting, identifying, and sharing their personal biases regarding rural settings and populations, the researchers attempted to analyze the data without influence of their personal presumptions.

Next, the researchers meticulously read the transcripts and found statements about how participants experienced the phenomenon of STEM career advising in the rural setting, and listed these statements, treating each with equal worth (Creswell, 2007). Line-by-line analysis of the participants' statements allowed us to identify key ideas in each of the interviews. Next, we synthesized and combined these key ideas. This process of "horizontalization" allowed us to develop a list of statements we used to create meaning units (Creswell, 2014; Moustakas, 1994). We clustered meaning units by similarity. These clusters, or themes, emerged across the interviews, capturing the essence of the participants' lived experiences (Moustakas, 1994).

Trustworthiness

We employed multiple strategies to establish trustworthiness (Lincoln & Guba, 1985) in this qualitative study, and we employed member checks and a peer research team to build credibility. The primary researcher sent transcripts of the interviews to the participants and asked that they offer feedback in terms of any inconsistencies; none asked to make changes. For transferability, the findings include thick, rich descriptions so that readers might draw conclusions that may be transferable to other settings. To strengthen dependability, the primary researcher documented the steps of the research process through an audit trail (Creswell, 2017), which contained such information as methodological decisions, steps during participant contact, and themes identified during analysis.

Findings

Through data analysis, three themes emerged that describe the participants' beliefs and experiences of STEM advising in rural schools: (a) opportunities and resources, (b)

local influences, and (c) place-based innovations.

Opportunities and Resources

Although research on rural schools often paints a bleak picture of opportunities, the school counselors in this study discussed both opportunities and resource challenges. In keeping with the literature on rural education, the participants described their rural settings in terms of smaller populations, expanses of land, distance from urban areas, fewer businesses, and for some a focus on agriculture. Stephanie¹ described her rural area as family oriented, where people all know one another: "I'd say we're a close-knit network of community and education, and everything is tied together." She added that the connections provide opportunities for her students because students feel like individuals there.

Despite the relational opportunities that arise from close connections, these school counselors each described their rural settings as lacking in terms of resources. The phrase "lack of resources" came up in the descriptions of every participant. The participants described the financial poverty that characterizes each of their settings and sometimes offered examples of insufficiency in infrastructure. For example, Boo said:

We have no Internet in a lot of our areas. We do not have paved roads. We truly have all of the characteristics of being rural that define who we are, like one high school for the entire county whereas the same square footage in (a metro area) would have many high schools.

The challenge Boo identified also was noted by George:

Away from a large city, we just don't have the resources . . . and we have students who are on the bus an hour to get to school. Our high school is located in the lower part of the county. There's a disadvantage for the kids. Two hours a day on the school bus.

Boo explained that, in a large county with one high school, students spend so much time on the bus that it cuts into their homework or

¹ All participant names are pseudonyms.

extracurricular time. At the same time, three of the eight participants noted that the lack of resources means little to no funding for extracurricular opportunities such as field trips. Ironically, the seclusion described by participants is compounded by the lack of opportunity for the schools to provide trips to see and learn outside of their rural area. Eight said:

We have a limited number of AP courses . . . and limited field trips, [that then limits] promoting and advising students to see what's outside the rural community. Many of the students I work with have no idea what's outside the borderline of the county.

When the school system is resource poor, many times lower-income students suffer the twofold blow of a lack of opportunities both in their family and through their education. Similarly, participants described their rural areas as often lacking the teachers needed for specialized courses. Boo pointed out that her system recognizes the importance of STEM, interestingly tied to their farming tradition and its dependence on a healthy environment. Eight expounded on the challenge teachers of STEM face in the rural classroom:

Like coding, which is part of STEM. Coding and technology. We don't have the resources. Teachers don't have enough computer devices or Internet, even throughout the school levels. They limit the lessons that they facilitate because of the limited technology we have.

Limited technology is not the only lack of resources described for educators. Not one of the eight participants described receiving any formal training on STEM advising/STEM careers in their districts, despite widespread acknowledgement that STEM careers are a path into a successful future. Elizabeth and Sam, both elementary school counselors, discussed the importance they place on teaching career clusters at their schools. When asked did she receive formal training, Sam responded, "No, no, no (laughter). Not one bit. Well, I should say not formal training, but I have gotten some professional development." Elizabeth explained that her state school counseling organization provided her with professional

development on STEM advising. Only one participant, Boo, explained that she received some training from a local educational agency. Boo added that she relies on typical counseling interventions to impress upon students the opportunities:

I do it through individual counseling and saying, "Do you understand the importance of what you're doing in class that will make a difference in your future?" Not only through individual counseling, but by going into classrooms and saying, "Here are the top ways to make a living. This involves sciences and math. This involves technology. This is the direction we are going in . . ." [and I do it] to improve the quality of [their] rural life.

Sam summed up her belief about the opportunities she seeks to bring to her students through school counseling interventions:

I guess it's just my belief that every child deserves a fair shot at their future. And the only way they can have a fair shot at being whoever they want to be is having the same education, the same knowledge, I should say. Because the education is not going to be exactly the same in every area, but the knowledge can be.

These rural school counselors described their beliefs about the opportunities available to their students mostly through community, but they recognized that local influences, like the lack of resources, presents challenges.

Local Influences

Just as these eight rural school counselors described limited or nonexistent opportunities and resources, each participant discussed the power of local influences on STEM advising. For the purposes of this study, *local influences* means the effect of family and role models in the rural setting. Each of the eight participants discussed the general lack of higher education among the families in their rural setting. When asked about the prospect of secondary training in STEM, Ree stated the following of her experience with many rural people, "Their mind-set is still on that \$8.00 an hour job on the production line . . . the parents

don't have the college education, and that's just what they've always done." Boo stated that, in her high school senior class, she is supporting many graduates who are the first to finish high school. Sam added that the very prospect of attempting higher education in a field such as STEM can produce reluctance that she sees as generational poverty:

My students in elementary school say, "I'm not gonna work; I'm gonna stay at home because my mama stays at home and my grandma stays at home." Or "I'm gonna paint houses because that's what my dad, my uncle, my grandpa does." And even though these may be children who are very bright, are excelling in math, excelling in science, but they don't have the home support. They don't have anyone saying "you can be anybody you want to be."

George added of his students from very low-socioeconomic-status families, "It's part of that cycle of poverty. They just can't leave because they feel like they're leaving their parents, their mother or father, or what have you. So they stay to try to make money to support them." He added that most of his rural students are reluctant to leave their area and prefer to stay local rather than to choose a career that would require them to leave. Scout described the mind-set bred and fostered in her rural families:

In our area, there's a lot of agriculture and farming, and they have the land, this is what they've grown up doing, this is their belief that they're going to stay here. I think that's part of the reluctance and just the fact that it's the way it is; it's the way it's been. . . . "I'm secure here, and this is what I'm going to do."

Eight noted the effects of family poverty in what parents are able to offer:

It's the low socioeconomics, and from what I've seen, there's a lack of Internet. Many of our students don't have the Internet because there's a monopoly with one Internet provider. . . . Most parents don't make enough money working in the farming industry, the vineyards, and the orchards or the poultry industry. So it's a huge cycle.

Each of these participants related that family influence, with poverty and a lack of higher education at the root, can dissuade students from considering STEM as a career.

If families do not offer motivational influence toward unfamiliar STEM careers, what about other local influences? Stephanie offered that STEM careers and the individuals within the careers are not

in their face so to speak. Like the farming industry or the timber industry or the agricultural jobs that they're exposed to on a day-to-day basis. . . . We have talented students, but they're not familiar with the [STEM] jobs here.

Stephanie uses the technology she has available to give students career inventories that help them discover a variety of careers, including those in STEM, but realizes that the students do not have a concept of many STEM careers when they are suggested on the inventory. However, George and Boo described that their rural students often are fearful of careers unfamiliar to them due to a lack of local role models. Ree offered that her rural students often are not exposed to any career choices beyond the county line and that their ideas of a STEM career might be misconstrued due to a lack of local role models. She stated:

I think if our kids realize that they don't have to wear a business suit to be successful and have a [STEM] career, that they can be successful and have a higher end career in the community that they're in, that they don't have to leave, you know. . . . It's like they don't know how to wish for more because they don't know it is possible.

In response to much of the lack of awareness about STEM careers in rural areas, Scout brought the focus back to the parents:

A lot of times in these areas, it's difficult to get the families to come into the school. Some of them have felt unwelcome, or maybe not worthy to come into the school and talk with people. . . . [We need] advisement programs where parents are involved in some form.

Influence from parents who may be unprepared to advise their sons and daughters toward unfamiliar STEM careers also characterizes the experience of STEM advising for school counselors in the rural setting.

Place-Based Innovations

Although rural school counselors expressed that a lack of resources and motivating influences characterizes their experience of STEM advising negatively, they also shared their positive experiences of place-based, innovative advising methods. These are similar to the concepts adapted for rural students in place-based education for math (Howley et al., 2011). The participants seemed to believe that these approaches reach their rural students in unique and well-suited ways. In a state where the National Career Clusters, the sixteen groups of related careers, are emphasized, the three rural elementary school counselors described attempting to set the stage for STEM careers.

Each of these participants described how they partner with industry in their rural places and, in the case of two of the elementary school counselors, military bases adjacent to their rural places, to have individuals close by and familiar speak to their students on career days. These participants shared that representatives from the military bases and local business are able to explain how training for a skill or trade related to STEM, not just a four-year college degree, can provide a successful career—important in disputing the myth that STEM careers are far away and require a business suit.

Extending this idea, three of the rural high school counselors expressed the importance of connecting with the technical schools near their rural places to prepare students for STEM skills, to possibly allow them to stay closer to home. Only one of the high school counselors participating in this study has a STEM academy as a part of his school: George is the engineering counselor, his designated role in the STEM academy. He related that the students who have educated parents require little of his career advice, as they “go off to college . . . because their families know how to help them.” He added, “The ones that I like to work with, and the ones that at the end of the day make

you feel good, are the ones you’ve helped get into a tech school.” This rural school counselor goes to great lengths to assure that the lower-income students are aware of scholarships and grants for technical school near their rural place. Related to skills and trades is career technical agricultural education (CTAE). Stephanie stressed the importance of CTAE teachers in her attempts to advise students about STEM careers. Stephanie also related the same importance in her connection with businesses near her rural place. She actively reaches out to businesses in the nearby town but outside of her rural setting for apprenticeships in trades such as electrician. In short, the high school counselors in this study relate that their experience with STEM career advising more often than not means advising about technical school careers rather than college and university ones.

In terms of college and universities, though, several participants in this study suggested that they need the institutions of higher education to reach out and connect in their rural place. Three of the eight participants lament that, although they are within 1 hour of a university, the university does not reach out to them to share resources on STEM careers. Eight stated of her wish for the university near her rural place:

Don't forget about us. Don't forget about these students that can also be pioneers in the STEM fields, and if we can't come, if the students can't come to you, you go look for them. And for the school counselors. The more information we can provide, that we get, the more information we can provide to our students and parents.

Stephanie, a high school counselor, related the problem when universities simply invite students for STEM career days. “My problem is, if they're gonna go, we have to take them.” Rural school counselors expressed that STEM career knowledge for rural students works best when it is acquired in the rural place.

A unique innovation shared in this study was Boo's experiences with STEM career advising in her agricultural place. The innovation she shared is intricately connected to her rural place and, like others described in this study, combines her efforts

with CTAE teachers. In reference to their new building she stated:

When we moved here to this campus six years ago, the opportunities [for STEM] became endless. The property has a pond on it. It immediately got the attention of our Ag department. They began doing fish studies. They do water quality studies here. Our forestry teacher is going to be doing burns and land management of timber that we have behind the school. . . . We have the means now on this campus to draw in more student interest with technology and all of STEM.

In one of her state's most agricultural counties and with one of the lowest higher education rates, this high school counselor and others at her school see place-based education as a means to build student interest in STEM careers. Further, Boo stated:

Right now in this farming community, the biggest thing going is training our students to use the GPS on tractors and the irrigation systems. Everything is being done electronically with a computer. Our farmers are 65 and 70 years old and don't want to learn this, and our younger students are the ones learning how to make things more efficient.

Her final place-based innovation for connecting rural students to STEM careers is through solar energy, often captured on farmland in her area. Of farmers she stated, "They're the flag carriers of STEM!" Perhaps by expounding on the natural resources available to them in their rural areas, other rural school counselors can become the flag carriers of STEM as well through place-based innovations.

Discussion and Implications

The school counselors who participated in this study described advising rural students in STEM in terms of a lack of opportunities and resources available, local influences of families but a lack of role models, and unique place-based innovations. Regarding opportunities and resources, the participants were forthcoming about a lack of financial and cultural resources, as well as learning activities through which students could explore STEM careers. Specifically, participants described

working in remote areas often requiring long commutes for students and staff with limited educational opportunities, technology, and training for STEM advising. These descriptions reflect research on the broader challenges presented to school counselors in rural areas, including a lack of resources (Grimes et al., 2013, 2014). Without the needed resources, the gap in achievement between rural students and their counterparts may persist. Lower academic achievement is negatively related to STEM career choice and college attendance among rural students (Byun et al., 2015; Irvin et al., 2011).

Although a lack of educational opportunities in rural schools has been documented in the past (Harris & Hodges, 2018; Stern, 1994; Thomas & Falls, 2019), this study contributes to the literature by capturing the dismal absence of training for rural school counselors on how to conduct STEM advising. Although some of the participants reported attending professional development, these programs seemed to only stress that getting students into STEM fields is important, without including concrete strategies, tools, or interventions that have been used in the past. Despite not receiving training, the participants in this study clearly create opportunities to develop social capital and use the resources they find to advise their students with minimal training. However, the knowledge and skills that they describe using appear to be self-taught, and the resources they use are self-discovered.

The impact of ruralism and discrimination of rural educational institutions based on urban education models (Bassett, 2002; Hargrove, Curtin, & Kirschner, 2017) is highlighted in participant responses as an influence on student decision making when it comes to STEM careers. In fact, rural students are less likely to participate in certain opportunities like community service or job shadowing (Hutchins & Akos, 2013). This can be understood through the local influences described by the participants in this study. For example, from the position of school counselor the participants describe being able to witness the struggles of low-socioeconomic-status students and the pressure to stay in the rural community to assist family members financially. Without leaving the

community, it is less likely that students will pursue a STEM education.

In addition to the direct effect of poverty on these students, the lack of models in terms of mentors and STEM professionals was identified as local influences. Similar to the literature on the rural gifted (Wood & Lane, 2015), there is a lack of role models across STEM fields especially in nontraditional roles. The participants in this study explain that their students do not typically have family members that have pursued STEM careers or even higher education. In fact, many families are disadvantaged and live in poverty; many parents, like their students, do not have a concept of STEM careers, as they are underrepresented in their communities. Without the support of parents and families, the rural school counselors in this study found STEM advising challenging.

Based on participant responses, there is a continued need for rural innovation of social capital and intervention strategies that address STEM educational and career counseling. Rural education interventions are unique and have not been fully addressed by multicultural education research (Byars-Winston, 2014; Harris & Hodges, 2018). The school counselors in this study describe having to understand industrial, agricultural, and military applications of STEM in order to present contexts that make sense to their students. The participants acknowledge needing to build relationships with local businesses and institutions of higher learning to provide their students with this valuable information and the opportunity to connect local faces with the STEM careers they discuss. This differs from the technological and online resources used to educate students on career and educational choices (Notestine & Notestine, 2015; Tovar, Conley, & Nassar-McMillan, 2013).

Through these partnerships, students could engage in social networks exemplifying how STEM truly is everywhere, including their hometown (O'Grady, 2015). Because of the lack of role models in rural areas, school counselors are encouraged to use online resources and create "games, competitions and structured programs [to] provide opportunities to create

vicarious learning experiences" for students (Tovar et al., 2013, p. 49). For instance, creating makerspaces can also help students get some hands-on experience even if lacking the technological resources (Notestine & Notestine, 2015). Makerspaces are physical spaces that contain the tools (both technological and nontechnological) for students and staff to use, such as sewing machines, electronics, 3D printers, Legos, and woodworking equipment. Users are allowed to openly create and learn through discovery. However, access to these resources depends on the equipment, Internet access, and personnel available in the area.

Limitations

A number of limitations affected this study. True of qualitative research, including this study, the findings cannot be generalized to other populations. This is important, given the diversity across rural populations (Hargrove et al., 2017). However, we included thick, rich quotations so that readers might find meaning in the statements, possibly applicable to their settings. Geographic location also limits this study, since all of the participants were located in the same state. Racial and gender representation in this study is limited since seven of the eight participants were White, and seven of the eight participants identified as female. Another limitation is the sampling procedure in which the primary researcher contacted members of a professional organization regarding participation. School counselors outside the professional organization were not represented, possibly overrepresenting efforts by the organization in participants' responses. A significant limitation is the possibility of researcher bias. We attempted to set aside our biases through bracketing and discussion during the data analysis process, but it is possible that researcher bias affected the findings of this study.

Implications

The results of this study imply suggestions for school counselors in practice, school counselor education, rural community efforts, and future research in order to continue to build social capital for STEM education.

Rural school counselors. Rural school counselors could consider implementing a number of initiatives discussed by participants. Rural school counselors across school districts could combine efforts to partner and present parent workshops offered during both daytime and evening hours to allow working parents better opportunity to attend (Tieken, 2016). Suggested topics include explanations of the potential in STEM trades, technical school degrees, and apprenticeships available locally, as well as discussions of STEM majors at colleges, particularly those with a potential for growth in their rural areas. Care should be given to explain the possibly intimidating postsecondary process. To reach parents in less intimidating venues, rural school counselors might consider outreach to parents about STEM possibilities in nontraditional places such as through faith-based events, often valued gatherings in rural areas, to distribute information.

Rural school counselors could consider expanding their role with local business and industry to provide the connection between local technical schools and needed skills and trades for the community. Rural school counselors could actively reach out to businesses in the nearby town, outside the rural setting, for information about apprenticeships in trades such as electrician so that her students can apply for these opportunities. Connecting with math and science teachers offers rural school counselors the potential for focusing on rural STEM careers. Perhaps by expounding on the natural resources available to them in their rural areas with math and science teachers, as described by participants in this study (Gallay et al., 2016), rural school counselors can become the flag carriers of STEM through place-based innovations. With their math and science colleagues, rural school counselors can identify talented students who show an interest in becoming teachers in the STEM areas, encouraging them to pursue the field. In doing so, rural school counselors can participate in the efforts to “grow your own” (Sipple & Brent, 2015): to find, train, and retain rural scholars in their rural settings. Although some of the participants reported attending professional development,

these programs seemed to only stress that getting students into STEM fields is important without including concrete strategies, tools, or interventions that have been used in the past. However, the knowledge and skills that they describe using appear to be self-taught, and the resources that they use are self-discovered.

School counselor education. Several participants noted that the efforts of college and universities to reach out to their rural areas were lacking. Departments and faculty in the STEM disciplines need to consider meeting rural students, teachers, and school counselors in their areas rather than requiring them to come to the colleges for outreach. Groups in the fine arts can travel to rural areas to broaden perspectives and interests of rural inhabitants in the less intimidating location of their local area. Even in teacher education programs, intentional efforts to assign teaching interns to rural areas, particularly those in the math and science certification areas, would allow teachers to begin to understand and connect with the rural setting. Perhaps more important is the recognition within school counselor training programs that practicing in the rural setting brings unique challenges. Modules in courses such as orientation to counseling And ethics, Multiculturalism, and particularly career development in light of STEM advising need to include readings and assignments on working with rural students and in rural communities.

Community efforts. With the growth in STEM careers, rural school counselors are uniquely positioned to support economic development in their declining rural economies if intentional partnerships are built between rural education and business and industry (Gibbs, 2005; Schafft, 2016). School counselors in every setting provide college and career development and are, through their training, the school specialists on postsecondary opportunities. In working with local chambers of commerce, state and local workforce development, and private business initiatives and startups, rural school counselors need to use their collaborative skills to identify the skills needed in their STEM-driven workforce. Rural school counselors could then help their schools develop the training to meet the needs identified with local business and industry.

Similar to their work with teachers to expound upon STEM-connected natural resources in their rural areas, rural school counselors can partner with local businesses leaders to identify the endowments of their areas—solar, agricultural, forestry, marine, transportation, even tourism in often picturesque rural settings—to help build or attract STEM-related business and industry to rural areas. With resources slight and economies declining (Van Gundy et al., 2016), rural school counselors can be on the front line in combating “brain drain” (Carr & Kefalas, 2009), or outward migration, when they take part in economic development partnerships that create STEM-related jobs and retain the rural students who want to stay (San Antonio, 2016). A stark realization, though, is that for efforts such as these to occur, rural school counselors need to be supported by their principals in terms of time and resources. Community resources in the form of scholarships to support the education of talented youth to study in STEM areas and return to their rural communities would be an asset.

Community business leaders could consider lobbying their state governments to provide financial support for programs such as those described here to fund the educational and business partnerships. Already states are taking a hard look at their declining rural areas and realizing that, without providing resources, entire state economies will suffer. A final and critical form of lobbying is that around consistent and affordable Internet availability in rural areas. This article began by mentioning the Every Student Succeeds Act (ESSA). Section 5005 of this act focuses on the status of rural schools, yet basic requirements of ESSA are a challenge in rural areas. ESSA calls for the appropriate use and sharing of data through an accountability system that includes overall student success with stakeholders. Zinskie and Rea (2006, p. 5) explain their concern: “Some rural schools and households may not have the internet capacity to handle the data-rich environment created by the accountability system.” As described here, without Internet access, STEM initiatives cannot begin, much less thrive.

Future Research

To inform many of the initiatives recommended here, researchers must increase inquire into rural

educational issues, including the educational experiences of racial and ethnic minorities (Irvin, Byun, Meece, Reed, & Farmer, 2016). Additional research on how to identify and build talent in STEM careers in P-12 students is needed. Research on how rural school counselors can collaborate with STEM teachers to support interest in STEM careers would further this research. In the higher education setting, research with rural technical and college students majoring in STEM areas to determine the factors that led to their success would inform efforts to inspire other rural students. Finally, research that follows and describes collaborations between school counselors and STEM business and industry leaders as they work together toward building a work-ready force for STEM-related jobs needs to be documented through collaborative efforts by scholars in both education and business colleges.

Conclusion

How can rural students realize what they do not know about STEM careers? Likewise, how can school counselors in rural areas know about ways to advise and guide students without guidance themselves? The beliefs and experiences of these participants revealed a lack of opportunities within their communities, including little training on how to advise rural students into STEM careers, and that place-based innovations are needed to better serve their students. Further research could identify efforts that are working and areas where assistance is still needed for rural school counselors and their students, who are often challenged due to the lack of resources and role models. People in rural areas pride themselves on their close connections, sense of place, and strong desire to stay and contribute to their rural area. By focusing on these qualities while creating opportunities for students through STEM careers, rural school counselors can help preserve a way of life while at the same time contributing to its growth.

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