“It’s Never Too Late”: High School Counselors’ Support of Underrepresented Students’ Interest in STEM

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The purpose of this study was to contribute to the literature surrounding school counselors and their support of underrepresented high school students who are interested in science, technology, engineering, and math (STEM). The influence of context on school counseling was also explored, in particular practicing during the COVID-19 pandemic. Through this phenomenological study, nine high school counselors were individually interviewed, and four themes emerged. These themes were: (a) professional knowledge surrounding issues of diversity in STEM, (b) training related to the needs of underrepresented students in STEM, (c) active engagement in supporting underrepresented students’ STEM career interests, and (d) barriers related to supporting underrepresented students’ STEM interests. This article includes implications for (a) how school counselors can support underrepresented students’ STEM interests, particularly during the COVID-19 pandemic; (b) how counselor educators can contribute to STEM-related research and training; and (c) how school administrators can support school counselors’ STEM initiatives.

Keywords: **STEM, school counseling, underrepresented students, high school, COVID-19**

The science, technology, engineering, and math (STEM) fields in the United States comprise a large and growing sector of the economy (National Science and Technology Council [NSTC], 2018). Currently, there are more than 9 million people employed in STEM careers (U.S. Bureau of Labor Statistics [BLS], 2020). This is approximately 6% of the United States workforce (BLS, 2020). According to the BLS (2020), computer science, engineering, and physical science occupations; managerial and postsecondary teaching occupations related to those areas; and sales occupations requiring scientific knowledge at the postsecondary level are considered STEM occupations. STEM occupations require the knowledge and skills to solve problems, make sense of information, and gather and evaluate evidence to make decisions (U.S. Department of Education [U.S. ED], n.d.). In order to meet the demands of the evolving workforce and society, the United States needs students who are fluent in STEM fields and are pursuing careers in STEM (U.S. ED, n.d.).

The demand for professionals and employees with STEM skill sets is a national priority (NSTC, 2018). Estimates indicate that there will be a shortage of over 1 million STEM workers (Xue & Larson, 2015), and the need for workers will grow by 8% before 2030 (BLS, 2020). In contrast, non-STEM occupations are only projected to grow by 3% before 2030 (BLS, 2020). Because of the need for professionals with STEM skill sets, choosing to pursue a career in the STEM sector leads to the potential for positive job marketability. In addition, students who major in STEM programs during college may earn a higher salary upon graduation than other students (Cataldi et al., 2014; Vilorio, 2014). However, not all students have equitable opportunities to pursue careers in STEM.

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The Need for Diversity in STEM

Diversity in STEM continues to be a concern in the United States (National Science Foundation, 2019). Beginning in high school, fewer women and minorities expect to have a career in STEM at age 30 (Mau & Li, 2018). Then, in college, significantly more men than women declare STEM majors and significantly more Asian and White students declare STEM majors (Mau, 2016). Although women now make up over half of the overall workforce, they are underrepresented in certain STEM sectors, such as computer jobs and engineering (Funk & Parker, 2018). Relatedly, in 2015–2016, more bachelor's degrees were awarded to females (58%) than males (42%), yet females only made up 36% of bachelor's degrees in STEM fields (National Center for Education Statistics [NCES], 2019). Additionally, the gender wage gap is wider in the STEM fields than in non-STEM jobs (Funk & Parker, 2018).

Further, Black, Latinx, and Native American workers are underrepresented in STEM occupations when compared to White and Asian workers (Funk & Parker, 2018; Mau, 2016). Though racial minorities are gradually becoming more represented in STEM fields, there is still more work to be done. For example, in 2015–2016, White students were awarded approximately 90% of the bachelor's degrees in STEM fields (NCES, 2019). The percentages of Latinx (15%), Black (12%), and Native American (14%) students who received degrees in STEM was disproportionately lower than that of White students.

These gender and racial disparities in STEM begin even before students enter college. High school is a critical timepoint to address gender and racial disparities in STEM. High school provides students with an opportunity to engage in higher-level STEM coursework and gain self-efficacy in their STEM skills and abilities. Chen (2013) suggested that when students do not have the opportunity to engage with higher-level coursework in STEM, they are less likely to complete college degrees in STEM. Further, Grossman and Porche (2014) explained that during the high school years, encouragement to pursue STEM coursework is critical to developing students' STEM self-efficacy. Mau and Li (2018) found that ninth grade students with higher math and science self-efficacy were more likely to have STEM career expectations and aspirations.

However, girls and underrepresented minorities in K–12 are more likely to experience *stereotype threat* (i.e., anxiety about their performance or ability based on negative stereotypes) and less likely to be enrolled in advanced STEM coursework during high school (Curry & Shillingford, 2015; Hamilton et al., 2015). This results in gaps in advanced STEM skills and a lack of further interest in STEM careers. Thus, professional school counselors must address the inequities in opportunity for their students through targeted STEM career interventions. Often, high school is a student's last opportunity to develop their interest in STEM careers (Falco & Summers, 2019; Schmidt et al., 2012; Shillingford et al., 2017).

School Counselors and STEM

Under their role as defined by the American School Counselor Association (ASCA) National Model (2012), professional school counselors play an integral part in utilizing career counseling to support and encourage students to pursue STEM education and careers (Schmidt et al., 2012). Falco (2017) provided a conceptual model for school counselors to guide their STEM academic and career support with their students, including: (a) encouraging students to take advanced math and science courses, (b) providing classroom instruction on the benefits of pursuing STEM education, and (c) improving self-efficacy through providing mentoring and small group counseling opportunities. Other suggested roles for professional school counselors in STEM counseling involve ensuring equitable gender and racial ethnic ratios in STEM classes, integrating STEM knowledge into goal setting, and involving parents and guardians in academic and career planning (Schmidt et al., 2012). Although the topic of STEM counseling within the school counseling profession is still emerging, school counselors

and researchers have highlighted the importance of working with girls and underrepresented racial minorities regarding STEM pursuits (Falco & Summers, 2019; Shillingford et al., 2017).

School Counselors and STEM for Girls and Underrepresented Racial Minorities

In order to provide equitable and anti-racist school counseling services, professional school counselors must be knowledgeable and aware of the factors perpetuating the opportunity gaps in STEM for girls and underrepresented minorities. Potential reasons for the opportunity gaps in STEM higher education include: (a) young people not being engaged in higher-level STEM coursework in high school, (b) inability to meet the financial or time commitment required by STEM programs, and (c) motivation and confidence concerns (Chen, 2013). Additionally, starting in adolescence, underrepresented students in the STEM fields also face a lack of support and encouragement and, oftentimes, direct discouragement from educators regarding enrollment in rigorous STEM coursework (Grossman & Porche, 2014).

Unfortunately, underrepresented students are less likely to expect their school counselors to share postsecondary information with them, and school counselors often miss opportunities to improve underrepresented students' STEM outcomes (Dockery & McKelvey, 2013; Shillingford et al., 2017). Yet, emerging evidence shows that school counselors can impact STEM aspirations in students. For instance, one school counseling intervention that showed promising results in promoting STEM self-efficacy was a career group intervention with adolescent girls, half of whom identified as Latina (Falco & Summers, 2019). The school counseling intervention focused on targeting STEM self-efficacy and career decision self-efficacy. The results indicated that participants in the treatment group improved significantly on both outcomes and even increased those gains 3 months post-intervention when compared to the control group (Falco & Summers, 2019).

In another study, researchers aimed to investigate the influence that school counselors' leadership had on STEM engagement, their collaboration between parents and students of color, and barriers that inhibited them from giving students more tools and resources to contribute to their success (Shillingford et al., 2017). The school counselors in the study aligned with a leadership style that integrated collaborative and motivational techniques and suggested other school counselors can utilize their leadership style to communicate more effectively with parents and support racially underrepresented students' STEM aspirations (Shillingford et al., 2017). However, there are barriers surrounding these efforts, including inadequacy of education around STEM for school counselors; challenges with supporting parents, especially parents from marginalized racial identities; and having insufficient resources to benefit students (Shillingford et al., 2017). These studies show that school counselors can target STEM self-efficacy and emphasize school counselors' roles in promoting STEM career aspirations with racially underrepresented students. However, the current context of the COVID-19 pandemic should be taken into consideration when surveying the current climate of STEM counseling with students.

COVID-19 and School Counselors

The COVID-19 pandemic has highlighted the inequities within our education system (Aguilar, 2020). For example, there is a digital equity gap, which includes a lack of access to adequate technology or internet, which must be taken into consideration and addressed in the virtual and hybrid learning settings many school divisions have adopted (Aguilar, 2020). During the pandemic, students often come to their virtual learning environments disengaged and having experienced various traumas (Savitz-Romer et al., 2020). These considerations call for flexibility, empathy, and perseverance from educators, including school counselors.

School counselors are trained in promoting students' social-emotional, academic, and postsecondary development and hence are key to supporting students' readjustment, learning, and continued college and career readiness progress during this time (Savitz-Romer et al., 2020). The work of the school counselor has not halted, especially with the challenges inherent in transitioning to a new way of school counseling. These challenges during the pandemic have led to less time spent in their usual counseling about social-emotional issues, career development, or postsecondary plans; notably, 50% of school counselors reported they spent less time than usual on career planning, and 25% reported less time spent on college planning (Savitz-Romer et al., 2020). Still, school counselors are pushing forward and adapting their practices to continue their work, including STEM counseling (ASCA, 2021).

Purpose of the Current Study

As reviewed, professional school counselors play a vital role in the development and motivation of students interested in STEM. Shillingford and colleagues (2017) called attention to the necessity of educating school counselors on how to support students of color interested in the STEM fields, as well as the influence of having a collaborative relationship between parents, students, and school counselors to assist with students' STEM career development and exploration. Although Shillingford et al. emphasized the leadership role school counselors take in impacting the pipeline of students of color in STEM, their work (a) does not address the intersectionality of the race and gender disparities in STEM and (b) does not specifically address the critical, and perhaps last, opportunity for counseling intervention that can take place at the high school level.

Given the need for gender and racial diversity in STEM and the limited literature that emphasizes the role of school counselors in STEM counseling and education, the purpose of this transcendental phenomenological study was to increase understanding of the lived experiences of high school counselors who support girls' and underrepresented minority students' interests in STEM. As students begin to prepare for their next step in life, high school is the last chance school counselors have to intervene and influence students who have shown interest in STEM-related careers and minimize potential barriers that may come their way. Thus, the following research questions guided this inquiry: 1) What are the experiences of high school counselors who support girls' and underrepresented minority students' STEM interests and career aspirations? and 2) What contexts (including the COVID-19 pandemic) influence high school counselors' support of girls' and underrepresented minority students' STEM interests and career aspirations?

Method

A transcendental phenomenological approach was used to develop understanding of the experiences of high school counselors who support underrepresented students' STEM career interests and the contexts that influence their support. Transcendental phenomenology is a suitable design when the aim is to discover the *essence,* or the nature, of a phenomenon, experience, or concept (Moustakas, 1994). Our research team included four members. Our first author, Cabell, is a Black, cisgender female counselor educator. As the primary researcher, her role was to recruit and interview participants and to assist with coding. The research team also included two Black, cisgender female counselor education and supervision doctoral students, Livingston and Cartwright, and one White, cisgender female counselor education doctoral candidate, Brookover. Cabell, Brookover, and Cartwright hold master's degrees in school counseling. Cabell and Brookover previously worked as high school counselors and Cartwright worked as an elementary school counselor at the time of the study. In addition, Cabell has professional experience providing career counseling to undergraduate engineering students. Livingston earned a master's degree in college counseling and has professional experience working with diverse populations of college students.

Sample

The recommended sample size for phenomenological qualitative research is 5–25; thus, participants were recruited with this range in mind (Creswell & Poth, 2017), using purposeful sampling. Criteria for inclusion were school counselors or school counselor interns who worked in a high school within the past 2 years. A total of nine school counselors participated in this study.

Participants were seven school counselors who worked in a high school at the time of the study, one school counselor who worked in a high school within the past 2 years, and one college counselor who worked in a high school at the time of the study. Participants were racially diverse with six identifying as Black, two identifying as White, and one identifying as Mexican American/Chicano. Regarding gender, seven identified as cisgender women and two identified as cisgender men. Participants' ages ranged from 26 to 46. In addition, the sample included participants who worked in various states, including two each in California and Virginia; one each in Indiana, Maryland, Michigan, and Washington, D.C.; and one who worked in both Kansas and Missouri. Three participants stated that they worked at a Catholic private high school. As part of their role, all participants stated that they provided career counseling services to students on a weekly basis. Most participants ($n = 5$) explained that the high school where they worked was diverse with regard to students' race and gender. Lastly, participants had 4–18 years of experience working as high school counselors. See Table 1 for participant pseudonyms and demographics.

Table 1

Participant Pseudonyms and Demographics

Pseudonym	Gender	Age	Race	State	Years of Experience	Role and Work Experience
Jane	Female	38	Black	MD	7	Counselor at a Catholic high school
Kate	Female	40	Black	CA	5	College counselor at a Catholic high school
Christy	Female	26	Black	D.C.	4	Counselor at a Catholic high school
Lauren	Female	37	White	KS/MO	7	Counselor who just switched from high school to elementary school
Dawn	Female	30	Black	VA	4	Counselor at a public high school
Kelly	Female	37	Black	MI	13	Counselor at a public high school
Jo	Male	46	Mexican American/ Chicano	CA	18	Counselor at a public high school
Tina	Female	35	Black	IN	4	Counselor at a public high school
Mark	Male	38	White	VA	6	Counselor at a public high school

Data Collection

First, the study was approved by the university's IRB. After approval, our first author, Cabell, sent recruitment flyers and emails to high school counselors using social media platforms (e.g., Twitter, Facebook, and LinkedIn) and state and national school counseling listservs (e.g., ASCA SCENE). Volunteers who met the eligibility criteria were encouraged to email Cabell in order to schedule a virtual interview through Zoom. Volunteers confirmed via email that they were a school counselor or school counseling intern at a high school within the past 2 years. Then, volunteers were sent the informed consent form and information on how to schedule their interview. Once scheduled, participants were emailed a Zoom link and directions on how to start their interview. Each interview lasted approximately 30–45 minutes and was audio-recorded.

At the beginning of each semi-structured interview, participants were asked demographic questions. Cabell developed interview questions based on the literature regarding (a) school counselors' involvement in STEM education, (b) the underrepresentation of girls and racial minorities (e.g., Black, Latinx, and Native American) in STEM, and (c) the impact of COVID-19 on school counseling and K–12 education. The interview included 11 questions (see Appendix for the full list). Example interview questions included: What is your understanding of the issues of diversity in STEM? What has been your experience in promoting STEM careers to underrepresented students? What barriers do you face in promoting STEM careers to underrepresented students? and How has the COVID-19 pandemic impacted your role in supporting underrepresented students' STEM career aspirations and interests? Following each interview, the audio recordings were transcribed using a website (Rev.com) and checked for accuracy by both Cabell and the participants. Cabell reviewed the transcripts for accuracy and made any changes due to typographical errors. She then emailed the transcripts to participants to review and make any changes. Two participants identified typographical errors in their transcript and emailed Cabell with edits.

Data Analysis

Data from the interview transcripts were analyzed. First, the raw data from the transcripts were examined to note significant quotes (i.e., horizontalization). Each transcript was reviewed individually by Cabell and Cartwright for exemplary quotes related to the research questions. Then, clusters of meaning were developed from these quotes and compiled into themes. These themes were used to develop descriptions of the participants' experiences and explain how contextual factors influenced their support of underrepresented students' STEM career interests and aspirations.

Trustworthiness

Trustworthiness is critical to establishing the validity of qualitative research; thus, several measures were implemented (Maxwell, 2005). First, in order to set aside personal biases, experiences, and feelings regarding the purpose of the research, all members of our research team engaged in bracketing our own experiences (i.e., epoché) before beginning this research (Creswell & Poth, 2017; Moustakas, 1994). Bracketing was completed in the form of concept maps and journaling. We individually bracketed our potential biases and then discussed our process with the team. Potential biases that were discussed included: (a) the impact of our first author's experience providing career counseling to engineering undergraduate students, (b) our race and gender, and (c) our prior school counseling experience with underrepresented minorities.

In addition, throughout each semi-structured interview, Cabell completed check-ins to ensure understanding of the participant's experience and perspective. Also, after each interview was transcribed, participants were sent their transcripts for member checking. Any inaccuracies in the transcript were

changed based on the participant's responses. Only transcripts that were reviewed by the participant were analyzed. Next, Cabell and Cartwright independently coded each transcript. Then, we established group consensus for all themes and exemplary quotes. Lastly, after the codebook was developed with themes and participant quotes, we sent the codebook to two counseling graduate students, who served as external auditors after being trained by Cabell on qualitative research and auditing. They reviewed the codebook to identify any discrepancies and ensure the significant quotes, themes, and codes aligned.

Results

We sought to (a) highlight the experiences of high school counselors who support the STEM interests of girls and underrepresented minority students and (b) identify the contexts that impact their ability to support these students, particularly taking into account the COVID-19 pandemic. Specifically, participants reflected on supporting girls; Black, Latinx, and Native American students; and those students at the intersections of both identities (e.g., Black girls, Latinx girls). We identified four themes in the analysis of the high school counselors' experiences: 1) professional knowledge of issues of diversity in STEM; 2) training related to the needs of underrepresented students in STEM; 3) active engagement or taking an active role in supporting underrepresented students' STEM career interests; and 4) barriers related to supporting underrepresented students' STEM interests, including COVID-19, school, administration, students' self-efficacy, and language.

Theme 1: Professional Knowledge

The first theme of professional knowledge of issues of diversity in STEM encompassed participants' knowledge of the issues of gender and racial disparities in STEM fields nationally (i.e., representation in STEM occupations) and issues of diversity in STEM at their school (i.e., STEM courses). All participants were aware of the lack of racial and gender diversity in STEM nationally. Jane explained:

> People of color, especially Black students, people who identify as female or women are vastly underrepresented in many of the STEM fields. . . . I know that there are many initiatives in K–12 [and] higher education to bring in or recruit or encourage students of color in particular and female students of color to explore STEM.

Similarly, Kate discussed that the STEM fields overall are "moving in a more diverse direction" yet are still dominated by men. She noticed that the majority of the students at her high school who are interested in STEM "are not Black or Brown students, they're usually everything else." According to Christy, "there's a huge gap with our minorities. They don't have the access to the education of the different jobs in STEM, and how to even reach those positions. . . . It ends up being a cyclical effect."

Further, Dawn reflected on the lack of representation in STEM fields and the initiatives that she knows aim to diversify the images of STEM professionals. For example, Dawn discussed a social media campaign and stated:

> There's been a cool campaign, like what a scientist looks like. And it's all of these cool Black women in lab coats. . . . So I'm pretty sure it's just fighting against stereotypes of who should be in STEM, and what kind of person.

Kelly also spoke to the lack of diversity in STEM, not only as a national issue but also in her high school. Kelly mentioned the STEM opportunity gap: "If students are in STEM programs and they are of color, they don't really see a lot of support, and they definitely don't see teachers and staff that look like

them." Likewise, Jo explained that girls in particular "sometimes doubt their ability even though they're within our top 5% of our school." Tina acknowledged that there is a need for more girls in STEM and girls of color in STEM nationally, so she explained, "I've definitely been pushing my girls, especially my girls of color, my Latinx and my Black girls to definitely go out" and "I often tell them 'paint engineering with your red lipstick,' because I think that's what we need to see is more women out there."

Theme 2: Training

The second theme of training related to the needs of underrepresented students in STEM was identified through participants' reflections on formal and informal training opportunities they completed to effectively meet their students' needs. Some of the participants received informal training with regard to STEM counseling and education. For example, Jane explained that when she first became a school counselor, she "became friends with a few school counselors who were also women of color. And they were . . . fierce advocates for girls of color in the computer science field specifically." The informal professional development that this group of school counseling peers provided her then led to more formal training on "some of the various tools that are out there, programs that are available, ways in which you can target girls of color and just some of the roadblocks that we as school counselors might run into." Though Jane received both formal and informal training, she explained, "I'm still learning . . . ways in which we can do better in terms of exposing students, building it into our program, collecting data around it." Similar to Jane, Mark also had the opportunity to attend both formal and informal training. Mark stated, "I've attended the occasional webinar here and there that focuses specifically on that particular demographic." He also added that he had conversations with "some of the professors and the advisors [at neighboring colleges] within those STEM programs that really helped develop a broader understanding."

In contrast, many participants ($n = 7$) could not discuss informal or formal training opportunities with regard to STEM and supporting underrepresented students. Kate explained that she received "nothing in the formal sense" with regard to STEM counseling or education training. Similarly, Christy stated, "I would say formally none, nothing professional regarding development, or seminars, workshops, or anything like that." However, she did have some informal training because supporting underrepresented students' STEM interests has been "a conversation that we have had with our counseling department of how to bring different types of professionals into the school and bringing them into the career days." Dawn expressed that "STEM is such a big field. I still need help learning and understanding everything that STEM offers." Sharing a similar sentiment in needing to know more, Tina explained, "I wish I knew more. . . . It's just, I want to know more. I want to be able to support them. My goodness."

Theme 3: Active Engagement

The third theme of active engagement in supporting underrepresented students' STEM career interests emphasized the roles the high school counselors took to support students with STEM career interests. Many participants recognized their role as high school counselors in providing students with exposure to STEM career fields and supporting students' prior knowledge of STEM. Embedded into the interviews with participants was the role of the school counselor and STEM. Christy stated, "It's really our role to bridge that gap and make the connections that may not have been made previously, or the students might not have had access to before." Mark shared his role in optimizing students' strengths: "Every student is going to present his or her own set of talents and abilities. . . . it's my job to make sure that I can help them recognize what those talents and abilities are and help them cultivate a passion."

Participants also took pride in building relationships with students early in their high school experience to assist them in discovering STEM careers. Kelly stated, "We definitely talk about it when

students come to our offices. When we meet with our eighth graders coming into high school, we definitely let them know, here are your options."

A method of bridging the gap for underrepresented students is by providing access to academic and postsecondary STEM opportunities. Christy spoke to her experience of supporting underrepresented students by providing that access:

> We introduced that summer bridge class for the students. So, this will be the first year that we will potentially see the benefit of that. And hopefully seeing stronger grades in those students, especially students coming from public schools, minority students who are just now having access to the private school resources.

Similarly, Jane found value in encouraging her underrepresented students with passions in STEM to take advantage of all opportunities. Jane spoke of an encounter with a previous student. She recalled, "Last year I had a Black female student who said that she had started coding classes in middle school. . . . She really liked it, so I was like, 'Great. We're going to do all of them.'" In increasing access for students, the participants were intentional to ensure underrepresented students have opportunities. Kate stated, "I keep a lookout for virtual fly-in opportunities, especially when I know I have a student that's interested in STEM and they are of a minority group, I always nominate them for those fly-ins."

Jane summarized her role in supporting underrepresented students' interests in STEM by saying: "The school counselor has a huge role in not only exposing students to the possibilities of STEM careers but really targeting and explicitly encouraging Black students, Latino students to participate in and learn more about the STEM field."

Further, regarding taking an active role in encouraging underrepresented students to pursue STEM, one participant, Kate, reflected on how her own racial identity motivates her to encourage students of color:

> Me being a woman of color, I can't help but feel like I'm rooting for everybody Black. . . . That's not to say that I don't encourage my non-students of color to also pursue STEM. . . . I feel like I have to really look out for my students of color, in my counseling department, I'm the only Black counselor. So, I do feel more pressure to really look out for them because I know, prior to me getting there, they weren't inviting Historical Black Colleges and Universities [HBCUs] to come out. There was no HBCU session at our college fairs and so forth. No one was sending out information about the multicultural fly-ins. . . . Now I'm doing it and I forward it to my coworkers.

Lauren discussed how she actively identifies underrepresented students for STEM-related opportunities. Communication is key, she said: "Good communication with my teachers, so of course, math and science teachers, if they're in tune with their students, that's really helpful, identify the students and let me know." In addition to communication with teachers, Lauren found value in using college and career cluster surveys with students. Lauren said the most impact her role has with students with regard to STEM is during career assessments "when they're identifying that their talents or their personality matches up with any of the STEM fields." She noted, "I think that's brought in the most numbers of kids." Other participants also used more formal career development tools. Christy stated, "We use Naviance at our school for college planning," and Jo stated, "Our school uses Xello. It does a lot of interest surveys and gets students to see where they're at, their personality, their interests and then matches it to careers."

Theme 4: Barriers

Barriers related to supporting underrepresented students' STEM interests emerged as the fourth theme, with participants reflecting on hindrances to their ability to support underrepresented students' STEM careers and opportunities. These barriers included: COVID-19, school, administration, students' self-efficacy, and language.

COVID-19

COVID-19 is a barrier that was presented in most of the participants' interviews ($n = 8$). It was primarily identified as a context impacting students negatively and also one that resulted in changes to school counselors' roles and day-to-day practice. When reflecting on the beginning of the pandemic, Lauren expressed, "All I did from March through May was call, email, and bother parents and seniors about graduation and making sure they were alive. That completely impacted my role for minority students pursuing STEM. . . . We were down to basic needs." Christy also reflected on COVID-19 and said, "It's really been bad. I would say that minorities in general, that's probably the hardest group to get to virtually" with regard to communicating with students as a result of virtual schooling. Jo echoed Christy's sentiments and stated, "I think the biggest challenge has been the distance, like not being able to meet them one-on-one." Jo further explained, "Some of our students do not have all the technology they need, so they can't jump on a Zoom, or maybe they do and the Wi-Fi is really bad."

School

Participants also highlighted requirements at the school level that hinder students from accessing STEM careers and opportunities. Jo stated, "A student could do everything they need to graduate high school but not necessarily be ready for the university." Jo was referring to the lack of college readiness and opportunity his school provides. Moreover, Kelly stated, "So they're interested in that… the medical or the engineering. But when they find out, 'I can get more credit in an AP,' it kind of turns them off a little bit." AP courses can help students with a weighted GPA, bring students closer to meeting graduation requirements, and give them college credits. In Kelly's experience, her students are interested in STEM fields; however, it is hard to combat the course credit hours linked to an AP course versus a STEM course. Furthermore, in relation to school barriers, Kate mentioned the importance of anti-racist school practices:

> I would probably even go as far as to say, knowing that all of our STEM teachers and faculty are anti-racist and I don't know that all of them are. And the reason why I think that that's important is because it's possible that they receive opportunities for students, and are they aggressively sending or communicating those opportunities out to students of color?

Administration

In addition to COVID-19 and school barriers, participants also highlighted the lack of time and some administrative issues as barriers to supporting underrepresented students who are interested in STEM. For example, Jane discussed that high school is late in a student's educational experience to only just begin discussing STEM:

> I think the primary barrier is getting them so late. I mean, high school is late. It's not too late, of course. It's never too late. Students can always find their interest and their passion. But it's not like the super early stages.

Jane further emphasized that by the time students of color are in high school, they may already lack the necessary exposure to STEM coursework:

> I don't know if any of my Black students are coming into ninth grade with that previous exposure. . . . I know that some of them are not. And so, I think that is a huge barrier. Not having them already exposed to a lot of what the STEM fields can offer.

Another challenge that participants highlighted was not having enough time to meet with students individually because of their caseload or administrative tasks. For example, Christy mentioned, "Another barrier is just time. Even with my caseload this year, I have 350 students." Similarly, Lauren discussed "the lack of time, and the bulk of so many other responsibilities being given to counselors by administrators" as an impediment.

She further explained that the wide list of administrative duties at the high school level not only impeded her ability to meet students' needs but also prompted her to leave high school and work at the elementary school level. Likewise, Kelly also explained how administrative tasks hinder her ability to have "meaningful conversations in a smaller school setting" because instead of meeting with students individually, she highlighted that she has "19 other things to do . . . because of the makeup of my job."

Students' Self-Efficacy

Participants also identified barriers regarding underrepresented students' beliefs about STEM and their STEM abilities. Mark explained that one of the biggest issues he faces in supporting students from diverse backgrounds who are interested in STEM "is that they struggle with some of the challenging courses." Similarly, Jane expressed that students may have struggled in STEM coursework during elementary and middle school, resulting in negative self-efficacy beliefs like "I'm not a math person or I'm not good at math." In a similar vein, Jo explained that some of his underrepresented students do have the academic foundation; however, they "sometimes don't feel as confident" about their STEM abilities. He stated, "I think a lot of my students, when they're looking at these careers, sometimes they don't see themselves in those careers and so that steers them away. . . . They just don't feel it's a possibility."

Language

Lastly, some participants recognized the prevalence of barriers specific to the Latinx community. Tina mentioned the role of a counselor when helping students make the connections to various career options:

> Working with Latinx and some undocumented or DACA students, the students of color, and even first-generation students . . . our role is very influential. In certain situations, especially for my kiddos whose parents don't speak English, we are the adult, we are the person that's helping them make those important decisions.

Some families Jo worked with did not always understand the materials about a STEM opportunity because of language barriers. He emphasized the importance of having materials in languages all families can understand:

> We can sometimes talk about opportunities, but if it's not getting into the hands of the families and if they're not understanding what the opportunity is, they may not be as willing to allow their kid to attend maybe a 6-week program or a college program.

Discussion

STEM fields are growing in demand and are in need of talented and diverse individuals from varying gender identities and racial backgrounds (BLS, 2020; NCES, 2019). High school is the last

opportunity in the K–12 system to promote and increase the pipeline of underrepresented students pursuing STEM careers. This study sought to support and extend the literature on the role of school counselors in supporting underrepresented students' STEM career interests while also exploring the impact of context, including the COVID-19 pandemic, on STEM counseling. The findings emphasize the importance of high school counselors in promoting, encouraging, and supporting girls, racial minorities, and students at the intersections of both identities who are interested in STEM careers.

The results of this study aligned with the findings of Shillingford and colleagues (2017) that knowledge and training related to STEM professions was lacking for school counselors. Similarly, in the present study, some participants were able to identify concrete formal and informal training that they received in regard to STEM careers and diversity issues, but many of the participants in this study stated that they either received no training or were in need of more information and training related to STEM careers and diversity concerns. Further, time was similarly identified as a barrier. In both studies, school counselors explained that there is not enough time in the day to dedicate to discussing STEM career pathways with students individually.

Our findings have added a more nuanced understanding of time as a barrier for students and school counselors given its emphasis on high school. School counselors ($n = 3$) discussed how lack of prior STEM academic experiences can have negative consequences for high school students' interest in STEM. For example, if a student is missing the foundational academic understanding of STEM before they get to high school, then they can fall further behind in the academic work even though they may express an interest in STEM careers. In addition, although high school is not too late to intervene and support students' STEM interests, it is late in the academic journey to both (a) supplement academic understanding and (b) combat the internalized beliefs that students may have because of their prior educational experiences with STEM.

Similar to the work of Falco and Summers (2019), the importance of self-efficacy was explained by the participants in this study. For example, both Jo and Jane explained how Black and Latinx girls may lack confidence in themselves and not see themselves as being capable of pursuing and excelling in STEM careers. In interviews, they both observed how students either struggling in STEM coursework previously or not seeing themselves represented in STEM careers experienced diminished self-confidence regarding STEM. Although none of the participants explicitly discussed the term *self-efficacy*, they explained that Black and Brown students and girls may have low STEM-related self-efficacy and school counselors can play a role in increasing students' exposure to STEM. The role high school counselors play in exposing students to diversity in STEM and diverse STEM careers is integral to challenging students' distorted STEM self-efficacy beliefs. Moreover, Christy discussed her role in supporting students with STEM bridge courses—school counselors' participation in these programs can help students develop STEM skills and self-efficacy.

Furthermore, in alignment with ASCA's (2021) emphasis on school counselors' role in supporting the social-emotional learning and career development of students, the findings in this study also revealed the importance of career development assessments in high school counselors' ability to support students. Career assessment tools and platforms such as Naviance, Xello, CollegeBoard, etc., provided participants in this study with the tools to 1) identify students who may be interested in STEM careers and 2) help students connect their interests and abilities to STEM careers. Though school counselors might be pressed for time, utilizing career assessments can help structure individual meetings with students and open the door to follow-up conversations and programming surrounding careers in STEM.

In addition, the findings also revealed the importance of making community connections and utilizing social media to further support underrepresented students as they pursue STEM careers. Participants mentioned the importance of connecting students with HBCUs or other colleges in the area in order to help underrepresented students explore postsecondary options in STEM. Moreover, to increase students' access to representation, as Dawn mentioned, high school counselors can expose students to social media campaigns that emphasize the representation of Black women in STEM, Latinx women in STEM, Native American men in STEM, and more. Increasing students' access to more diverse images and professionals in STEM can help students to think about what being in STEM can look like after high school and, therefore, begin to see themselves in those STEM positions.

With the current emphasis on anti-racist educational processes in mind, the findings revealed the importance of communication. Participants explained that specifically, communication with math and science teachers is critical to identifying and supporting underrepresented students who are exhibiting strong potential in STEM. Additionally, Kate pointed out the importance of knowing that everyone in the school, including teachers and school counselors, are engaging in anti-racist practices in order to communicate with underrepresented students surrounding opportunities that increase access to STEM. Schmidt and colleagues (2012) also emphasized the importance of school counselors encouraging teachers to remove systemic barriers to students' educational success. Moreover, Jo and Tina highlighted the importance of having materials for students and parents in various languages in order to communicate STEM possibilities. In engaging in anti-racist practices, it is important for school counselors to collaborate with school administrators to reduce barriers in communication, particularly surrounding the languages used to share STEM opportunities targeted to underrepresented students.

Overall, the findings of this study revealed that COVID-19 has resulted in additional barriers to supporting underrepresented high school students' STEM career interests. In alignment with the emerging literature surrounding COVID-19 and its impact on the educational system, participants explained the technology gap is even wider for their Black and Brown students (Aguilar, 2020). Students' inadequate access to technology has made it difficult for school counselors even to check in with students, much less discuss students' STEM career aspirations. As Lauren mentioned, many school counselors have been addressing students' basic needs during the pandemic. Although many STEM companies are still hiring during the pandemic and STEM careers are still projected to grow even after the pandemic, school counselors' conversations with underrepresented students regarding STEM may be stalled at this time.

Implications

The present study has implications for school counseling practice, counselor education, and school administration. As expressed in the participants' interviews, high school counselors care deeply about supporting underrepresented students' STEM interests, despite the barriers. At the same time, high school counselors may be limited in their own training and their knowledge of STEM opportunities. Furthermore, COVID-19 has resulted in additional barriers for school counselors who may already be confronted with limited time and resources.

School Counseling

Students may benefit from school counselors sharing more STEM postsecondary options. For example, when discussing postsecondary options related to STEM, none of the participants discussed students participating in apprenticeships. Most participants reflected on connecting students to universities, including HBCUs. However, apprenticeships are paid industry-driven experiences in which students

can receive specialized training with a company (U.S. Department of Labor, n.d.). Many apprenticeship programs are related to STEM. For example, there are apprenticeships for information technology specialists, medical laboratory specialists, and pharmacy technicians. In addition, a main benefit of completing an apprenticeship program in a STEM industry after high school is that after the completion of their apprenticeship, over 90% of employers retain their apprentices for full-time employment.

Moreover, although COVID-19 has shifted many schools to virtual formats, there are still opportunities for school counselors to help underrepresented students. For example, many STEM companies, such as Boeing, AT&T, Abbott, and more, are offering students virtual internship experiences. Websites such as Vault.com have offered virtual internship job search tools during the pandemic. In addition, online tools such as LinkedIn Learning can provide students ages 16 and above with access to training opportunities related to coding, math, and science concepts. School counselors increasing their knowledge about practical virtual STEM resources can help increase underrepresented students' access to STEM careers during the pandemic. Through connecting with local university and community college career services departments, school counselors can learn more about STEM resources to share with students. In addition, there are several STEM-focused social media groups that school counselors can join in order to learn more about STEM. School counselors with an interest in STEM can develop more state or regional interest networks within their school counseling organizations in order to share resources and information with each other.

Counselor Education

This study also has several implications for counselor educators who will train the next generation of school counselors. Several participants highlighted that they had limited or no training on STEM career opportunities. In order to help increase school counselors' knowledge regarding the need for STEM professionals and the ways that they can support underrepresented students, counselor educators can incorporate this learning into career counseling coursework. For instance, as an assignment, counselor educators can help school counseling graduate students utilize career counseling theory to develop a program aimed at promoting STEM to underrepresented high school students. Utilizing career counseling coursework to encourage students to find creative solutions to career-related issues can help make this course more meaningful and practically significant for future school counselors.

In addition, counselor educators can engage in research endeavors to build the literature connecting school counseling and STEM education. In doing so, counselor educators can host webinars, present at conferences, and disseminate information in both school counseling newsletters and professional journals in order to help increase school counselors' knowledge on the needs of underrepresented students who may be interested in STEM. Additionally, counselor educators can collaborate with ASCA to conduct professional development opportunities for school counselors that explain relevant literature on STEM and how school counselors help develop students' STEM career aspirations.

School Administration

Similarly, school administrators can support and encourage school counselors to attend professional development opportunities regarding STEM. This support can entail sharing STEM-related professional development opportunities with school counselors and giving school counselors the time to attend these professional development opportunities. Additionally, school administrators could benefit from listening to school counselors' recommendations for how schools can better support underrepresented students and ensure equitable access to STEM coursework. Further, school administrators can review policies to incorporate anti-racist practices that promote STEM to diverse populations of students. These practices can include: (a) reviewing the racial and gender makeup of STEM courses to ensure equitable

representation of students in STEM courses; (b) building connections with community organizations and stakeholders that provide resources to underrepresented students who are interested in STEM; and (c) ensuring that school counselors have access to documents regarding STEM opportunities to share with students and their parents in multiple languages, including both English and Spanish. Moreover, school administrators can work to ensure that the duties assigned to school counselors align with the ASCA National Model (2012) and allow school counselors to focus on STEM-related career development interventions for students.

Limitations and Future Research

There are several limitations to this study that warrant discussion. First, many of the participants in this study were counselors of color. Thus, there may be an element of self-selection bias wherein participants (school counselors of color) were more inclined to value the purpose of the study and be more connected to the experiences of underrepresented students. Hence, future research can emphasize the importance of all school counselors, regardless of race, addressing the needs of underrepresented students in STEM. Similarly, all the counselors in this study were several years removed from their graduate school experience. School counselors who have graduated recently may have more training and awareness of the disparities in STEM; thus, future studies can explore beginning counselors' knowledge of STEM issues and support of underrepresented students.

In addition, all interviews were conducted virtually, which can increase the likelihood of response inhibition, wherein participants were uncomfortable with confidentiality and privacy when speaking across the internet (Janghorban et al., 2014). Future studies that are not limited by a pandemic or geography may benefit from doing in-person interviews in participants' schools or an environment where the participants feel more comfortable. Although validity practices such as journaling, external auditing, and check-ins were utilized by our lead researcher, her closeness to the topic as both a professional and a Black woman may have impacted the objectivity of the study. The sample size was in accordance with phenomenological research; however, an increased sample size that is even more representative of school counselors from high schools across the nation could help increase this study's generalizability.

Future research studies can explore the educational experiences of underrepresented professionals (e.g., Black women) in STEM in order to better understand what makes students pursue and stay in STEM fields as well as the role of the school counselor in their future success in STEM. In addition, future studies can explore how school counselors can collaborate with career advisors at local colleges in order to increase diversity in the STEM pipeline. In a similar vein, future studies can explore the experiences of underrepresented high school students who received STEM-related support from their school counselors and transitioned to college to pursue a major in STEM. Also, very few of the participants in this study explicitly spoke to their experience supporting Native American and Indigenous students. Given the lack of Indigenous and Native American professionals in STEM, future studies can specifically focus on their needs with regard to STEM education.

Conclusion

In sum, school counselors play a vital role in supporting the academic and career success of all students. For students who may find themselves underrepresented in STEM, high school counselors can make the difference by exposing them to possibilities and opportunities in STEM. High school might be some students' last opportunity to (a) explore and discover varying career paths, (b) complete the

preparation needed for a smooth transition to college, and/or (c) access resources to support diversity in STEM. In spite of barriers and limitations, school counselors ensure that students, regardless of gender or race, do not fall through the cracks and are encouraged to pursue any profession they desire, including a career in STEM.

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Appendix
Interview Questions

1. What is your understanding of the issues of diversity in STEM?
2. What training did you receive regarding the needs of underrepresented students who are interested in STEM?
3. What do you believe is the role of a school counselor in supporting underrepresented students' interest in STEM careers?
4. What is your role in supporting STEM academic and career opportunities for underrepresented students?
5. What has been your experience in promoting STEM careers to underrepresented students?
6. How do you identify underrepresented students who may have potential or interest in STEM careers?
7. What barriers do you face in promoting STEM careers to underrepresented students?
8. What school and community factors influence your ability to support underrepresented students' STEM career aspirations and interests?
9. How do you prepare underrepresented students for postsecondary opportunities in STEM?
10. What do you wish was different about how you support underrepresented students' STEM career interests and aspirations?
11. How has the COVID-19 pandemic impacted your role in supporting underrepresented students' STEM career aspirations and interests?