Black Unicorns: STEM Access for Black Student-Athletes in Non-Revenue Sports

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Abstract

There is a shortage of literature investigating access to science, technology, engineering, and math (STEM) for Black student-athletes who pursue careers in engineering or a related field in STEM. Particularly, individuals who participate in non-revenue generating sports. This narrative inquiry explores the experiences of six (6) Black student-athletes (two male, four female) pursuing degrees in engineering or a related field in STEM, while participating in soccer and lacrosse at their respective institutions. Through personal narratives, the authors critically analyze Black STEM student-athletes' access to college preparatory courses and STEM camps. Findings and recommendations are discussed.

Introduction

Like Verizon's #WeNeedMore campaign and commercials, one could argue that we don't need more professional athletes or entertainers but more science, technology, engineering and math (STEM) professionals (Coffee, 2017). In one of the commercials, professional athletes and entertainers offer support for STEM, including legendary NBA basketball player LeBron James, elite NFL quarterback Drew Brees, soccer phenom David Villa, and stunning supermodel Adriana Lima. The commercials highlight how many kids in the US aspire to become professional athletes and entertainers. However, one commercial states millions of youth still lack access to resources needed to fully realize their potential in STEM.

During the Civil Rights Movement, the landmark case of Brown v. Board of Education desegregated US public schools (Alexander, 2012). The case was seen as a huge win for the Civil Rights Movement and an opportunity for "equal" access to education, including subjects like STEM. However, less than a half a century after the court decision, US schools have resegregated as a result of housing and privatization (Alexander, 2012; Tatum, 1997). Millions of low-income and minoritized students currently lack access to a quality education in STEM and other school subjects (Tatum, 1997).

Like access to quality K-12 curriculum, rising costs also make it difficult for low-income and minoritized youth to enroll in college or become STEM professionals (Maldonado, 2018). Sports participation has historically helped low-income and minoritized youth gain access to college and careers (NCAAa, 2018). Participation in low-profile rather than high-profile sports has led to increased "educational benefits" for student-athletes (Gayles & Hu, 2009). However, student-athletes in low-profile and high-profile sports have been discouraged from pursuing perceivably rigorous degrees in STEM fields like engineering (Wininger and White, 2008).

Diverse people and perspectives are needed to spur innovation and tackle societal problems. A wealth of untapped intellectual and economic potential exists among Black student-athletes – who have not had equitable access to engineering and related fields in STEM.

Purpose

The purpose of this work is to present qualitative findings from an investigation exploring athletic participation and access to science, technology, engineering, and math (STEM) with a particular focus on Black student-athletes who major in STEM and participate in non-revenue sports (for example, soccer and lacrosse).

Review of Literature

Limited research has investigated access to science, technology, engineering, and math (STEM) for Black student-athletes who pursue careers in engineering or related fields in STEM. To address the gap in current literature, this paper will focus on Black STEM student-athletes' access to college preparatory courses and STEM camps.

Pre-College STEM and Sports Participation

Resegregation of US public schools has led to unequal and inequitable access to K-12 STEM curriculum and sports (Alexander, 2012; Tatum, 1997). K-12 schools with predominantly Black and Latinx student populations receive $23 billion less in funding than predominantly white K-12 schools (EdBuild.org, 2019). Although over 7 million American high school students play a sport, Black and Latinx students are highly concentrated in low resource sports (NCAA, 2018b). Black and Latinx students limited exposure to expensive sports can hinder their ability to receive athletic scholarships.

Among high schools that serve predominantly Black and Latinx students, just 29 percent offer a calculus class and only 40 percent offer physics. Nationwide, 50% of high schools offer calculus, and 63% offer physics (Simon, 2012). A quarter of high schools with the highest percentage of Black and Latinx students do not offer Algebra II; a third of these schools do not offer chemistry (Simon, 2012). Only 47 percent of Black students nationwide attend schools that have courses in computer science, compared to 58 percent of White students (The Journal of Blacks in Higher Education, 2016). Courses such as calculus, physics, chemistry and computer science have historically been gateway courses for STEM degree completion. Therefore, Black and Latinx students limited access to K-12 STEM courses can hinder their pursuit of STEM degrees.

Some programs have provided more equitable access to STEM for minoritized students long before Verizon's #WeNeedMore campaign. In the 1980s, civil rights hero Dr. Robert "Bob" Moses created the successful Algebra Project to provide low-income and minoritized youth with access to college prep curriculum in STEM subjects like math (Wilgoren, 2001). He has a PhD in math from Harvard University and experience teaching in New York K-12 schools (Wilgoren, 2001). Dr. Moses believes "the demands of a high-tech age make math literacy as much an issue today as voting was in the Jim Crow South a half century ago" (PBS, 2002).

A small number of programs across the nation matriculate significant numbers of students from underrepresented and economically disadvantaged backgrounds into engineering programs. Some of the most successful programs are: Detroit Area Pre-College Engineering Program (DAPCEP), SECME formerly known as the Southeastern Consortium for Minorities in Engineering by the Engineering Deans (SECME), Mathematics, Engineering, and Science Achievement (MESA), as well as Minority Introduction to Engineering and Science (MITES) at MIT. From informal interviews with program directors, we learned that some common characteristics of these programs include: staff support and training, internal and external funding, mentors and role models, academic and cognitive activities, industry engagement, k-14 school resources, sense of community for participants, and parental engagement (T. Smith, personal interview, May 4, 2016; B. Watford, personal interview, June 7, 2016; S. Young, personal interview, June 17, 2016; S. Waters, personal interview, June 17, 2016). Also, at least 70% of underrepresented racial-ethnic and/or economically disadvantaged students from the aforementioned programs have matriculated into 4-year engineering and computer science degree programs. None of the above programs had a focus on sports or hobbies which could increase the engagement of Black student-athletes in STEM.

Theoretical Frameworks

Given the importance of social justice and equity that shape Black students' access to pre-college STEM coursework, the authors of this paper employed Ladson-Billings & Tate's (1995) critical race theoretical (CRT) framework as well as Conley's (2012) college and career readiness framework.

Critical Race Theory (CRT)

Critical race theory (CRT) is a helpful theoretical lens for recognizing and challenging the interconnected role of race, racism and power in US society (Delgado & Stefancic, 2001; Ladson-Billings & Tate, 1995). CRT suggests race is socially constructed and racism is permanent (Delgado & Stefancic, 2001). As a result, people who are labeled "White" have the power to access societal privileges involving education, employment, etc. (Ladson-Billings &

Tate, 1995). People who are not viewed as "White" are subject to overt and subtle forms of discrimination and oppression. This highlights the ways in which racism is deeply embedded within US institutions. CRT notes that racial progress is only made through interest convergence, in which the interest of Blacks must connect with those of Whites (Delgado & Stefancic). Within the context of the present study, CRT allows researchers to understand how and why Black athletes may benefit from the entertainment and economic gains they provide to White society.

College and Career Readiness Theory

Students' college readiness is "the degree to which previous educational and personal experiences have equipped them for the expectations and demands they will encounter in college" (Conley, 2008). Broadly speaking, "a student who is ready for college and career can qualify for and succeed in entry-level, credit-bearing college courses leading to a baccalaureate or certificate, or career pathway-oriented training programs without the need for remedial or developmental coursework" (Conley, 2012). There are four keys to college and career readiness: think, know, act and go (Conley, 2012). Students must "think" by developing key cognitive strategies, "know" by possessing key content knowledge, "act" by displaying key learning skills and techniques, as well as "go" by utilizing key transition knowledge and skills. Information under the "go" category is not equally accessible to all students; especially those who are not privileged (Conley, 2012). For this study, college and career readiness provides a tool for better understanding the educational and occupational expectations placed on Black student-athletes.

Methods

The present study is based on qualitative data from a larger study, which focuses on minoritzed STEM student-athletes' career aspirations, readiness and expected earnings (Conley, 2012). Some of the findings presented in this paper are from a specific project titled, Gamified Online Platform to Support Student-Athlete Career Readiness, funded by the NCAA Innovations in Research and Practice Grant Program. The present study sought to answer the following research question:

> RQ1: How did Black STEM student-athletes' high school demographics and participation in varsity sports affect their access to pre-college STEM courses and clubs?

This paper includes qualitative data, which specifically focuses on student-athletes in STEM majors' career aspirations, readiness and earnings. Given the centrality of participants' lived experiences combined with the role of social, cultural, and institutional factors, the present study drew on a narrative methodological design. Using narrative inquiry

allowed the authors of this paper to explore the relationship between individual stories, identities, and meaning making that inform a more holistic narrative (Jones, Torres, & Armino, 2014). The expected outcome was "to illuminate human experience as it is presented in textual form in order to reveal layered meanings people assign to aspects of their lives" (Josselson, 2011, p. 240). This paper's authors felt it was necessary to bring the voices of our participants to the forefront of this study to highlight their collective narratives as a Black STEM student-athlete in a non-revenue sport.

As researchers, the authors believe in the construction of knowledge and the shared meaning that is formed through interaction with others. As such, this paper's authors deem a constructivist epistemological approach most appropriate for this investigation. Constructivism is defined as "the view that all knowledge, and therefore all meaningful reality…is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context" (Crotty, 1998, p. 42). The epistemic underpinnings of constructivism indicate a shared meaning-making experience between participants who express their perceptions of careers in sports and STEM and researchers as the interpreters and storytellers of these lived experiences. Further, the constructivist tradition is consistent with the authors' view of the world, knowledge construction, and the importance of co-construction in the research process.

Data Collection and Analysis

The authors of this paper selected participants for the present research study via a convenience sampling approach. Convenience sampling is a form of sampling in social science research that is most often used for the purpose of accessibility and availability of the research participants (Creswell, 2013). The initial convenience sampling approach also led to snowball sampling, since some participants recruited others (Creswell, 2013). Although a convenience and snowball sampling approach were used, the authors targeted the Southeast region of the US due to the increasing popularity of non-revenue sports and the increasingly diverse populations within the region. Participants came from predominantly White institutions (PWIs) and historically Black colleges or universities (HBCUs).

Table 1, below, summarizes details about the six research participants. To protect the identity of study participants who may have online profiles from their athletic pursuits, the authors will not reveal specific details about participants' institutions, majors or collegiate sports. Table 1 contains a list each participants access to advanced placement (AP), international baccalaureate (IB), and project lead the way (PLTW) courses along with their pre-college sports.

Table 1. Participant demographics

Pseudonym	Class Rank	Pre-College STEM Access	Pre-College Sports
Dwight	Sixth Year	AP & honors courses; Science, comp. science & general STEM club	Basketball, cross country, soccer, track
Ryan	Fourth Year	AP & tech. courses; Robotics club; After-school STEM program	Basketball, track, soccer, softball, swimming
Azahra	Third Year	IB courses; Physics club; STEM camp	Soccer
Nome	Third Year	Physical science, biology and math courses	Soccer, track
Kenzie	Third Year	AP & honors courses; After-school STEM program	Basketball, lacrosse, softball, volleyball
Larry	First Year	AP, PLTW & dual enrollment; Comp. science & robotics clubs	Lacrosse, soccer

The primary method of data collection for this study was in-depth, semi-structured, one-on-one interviews (Kvale, 1996). This paper's authors designed interview questions to prompt participant responses that provided thick, rich descriptions of their experiences (Guba & Lincoln, 1981). The interview protocol consisted of questions eliciting information about participants' background, experiences in sports and STEM along with their career aspirations, readiness and expected earnings. The authors used Ladson-Billings & Tate's (1995) critical race theory (CRT), Conley's (2012) college and career readiness framework along with extant literature to craft interview questions and analyze findings.

Trustworthiness

The authors of this paper employed several strategies to establish trustworthiness and credibility: member checking (i.e., asking a participant to review his transcript for accuracy and completeness), triangulation of data sources (e.g., interviews, demographic questionnaire), and peer debriefing (i.e., researchers talked with colleagues regularly for the purpose of exploring implicit aspects of the study).

Positionality

Author 1: Several attributes of my identity inform my positionality as a researcher on this study involving Black student-athletes in non-revenue sports and STEM. First, I identify as a straight Black cisgender married man. Second, I am an engineering professor at a mid-sized private, PWI in the Southeastern region of the US who became interested in engineering after attending a science, technology, engineering and math (STEM) summer-enrichment program in middle school. Third, prior to college, I played organized sports that do and do not generate revenue at the collegiate level such as baseball, basketball, track and bowling. Other attributes of my identity include my upbringing in a racially and ethnically segregated mid-sized city in the Midwest as well as my previous attendance at two public PWIs in the Midwest. As a Christian, I believe in God and my spirituality guides my work. As a result of my aforementioned positionality, most of my research has focused on the academic and social experiences of Black and Latino students as well as student-athletes in engineering and related fields in STEM.

Author 2: Several attributes of my identity inform my positionality as a researcher on this study involving Black student-athletes in non-revenue sports and STEM. First, I identify as a straight Black cisgender married man. Second, I am a first generation college student who utilized sport (i.e., a Division 1 football scholarship) to advance my educational aspirations. Third, I have several years' experience working as a tutor, learning specialist, and football academic specialist for various Division I student-athlete support service offices. My aforementioned positionality has guided my research on Black student-athletes and student-athlete academic support services for collegiate student-athletes who demonstrate academic and social risk.

Author 3: As a researcher, there are different attributes of my identity that inform my positionality as a researcher on this study involving Black student-athletes in engineering and related fields. First, I identify as a Black female engineer, educator, and administrator at a Hispanic Serving Institution. Second, I am a first generation college student who played competitive high-school sports and received merit-based and Division I athletic scholarships to pursue higher education. Third, I have experience working as a tutor with Division I student-athletes.

Findings

Some common themes from the interviews were around accessibility to STEM educational opportunities. Participants shared experiences that demonstrated their lack of access to pre-college STEM courses and pre-college STEM clubs.

Access to Pre-College STEM Courses

When sharing stories about their K-12 educational experiences, several current or former Black STEM student-athletes mentioned their access to college prep courses such as Advanced Placement (AP), International Baccalaureate (IB), dual enrollment and Project Lead the Way (PLTW). Participants also described their families and neighborhoods. Furthermore, they mentioned the racial and socio-economic demographics of their high schools. Some schools provided students with access to more advanced coursework and more expensive sports.

Larry, a first-year Black male student-athlete majoring in an engineering or related STEM field, completed AP, PLTW, and dual enrollment courses while playing sports before college. He mentioned,

> [Where I grew up in the Southeast] it was an urban area, wasn't the nicest ... was low income, middle class kind of … I grew up in a single parent mother household, but my dad is around, they're just not together … middle-class American household, well my family is from Jamaica, so Caribbean heritage … My dad has completed technical school, so he has a certificate in HVAC because he has his own company. My mom has her Associate's … I went to school with a lot of Caucasians. There were African-Americans also, and a mix of Asian, Hispanic … Probably about middle-class, too. But, until high school it was ... above to higher end [socio-economic classes]… [in high school] I took AP Human Geography, AP Biology, AP World History ... I took chemistry in high school, biology, AP biology … AP physics ... And, then I took classes at [the local community college], I took [a communications course]. I basically took all the english classes, math … I took Intermediate Algebra and college algebra … My school was a PLTW school … my school had an engineering magnet, which is why I went there. From freshman year up until senior year I took an engineering course every year … I also did soccer and lacrosse.

Larry took full advantage of the plethora of college-preparatory (college prep) courses his predominantly White Southeastern high school offered. He attended a local college for dual enrollment courses. Larry took AP courses at his high school. He also completed STEM-focused college prep courses via PTLW. In addition to an abundance of college prep courses, his high school had costly sports like lacrosse. Larry first "started playing soccer" but he "decided to give it [lacrosse] a try" since the "coach really wanted … [him] to play."

Like Larry, other research participants (see Table 1 above) attended high schools that offered college prep courses such as AP. For example, Kenzie, a third-year Black female student-athlete majoring in an engineering or related STEM field, was able to take honors, AP and STEM-focused courses in high school. She stated, "[In high school] we had regular

classes… honor's… AP … I was in the engineering program … Mainly Black and Hispanic school … Private school … Basketball was definitely the most popular. We had soccer, track, swimming, volleyball, golf, tennis, lacrosse... softball."

Similar to Larry and Kenzie, Dwight, a sixth year Black male former student-athlete majoring in an engineering or related STEM field, had access to honors and AP courses before college. His high school was located in "a majority White town [outside of a more diverse mid-sized city in the Southeast]... middle class to some wealthy, mainly middle class." Dwight said, "in elementary and middle school they had gifted classes. And, then high school they had gifted [AP] as well as honors and standard classes. And, middle school they had honors as well."

Ryan, a fourth year Black female student-athlete majoring in an engineering or related STEM field attended two high schools. She shared, "I moved … in 11th grade … at first, it was just all Black people … we all kind of were well off or we had what we needed … Then, I moved ... there were a lot of Asians, White people. Still a suburban area." She goes on to describe her access to AP courses when stating, "[at the majority Black high school] there were a few AP classes but they were kind of hard to get into … when I transferred … there was, like a range of stuff to take. Um, you could get into an AP class easier … We had SAT prep as an elective … field hockey … lacrosse … more sports."

Azahra, a third-year Black female former student-athlete majoring in an engineering or related STEM field, had access to IB courses in high school while playing sports before college. She switched schools like Ryan. Azahra said,

> I grew up in [the Southeast] ... strongly lower middle class I'd say. My family's Jamaican, so Black … Mostly, I grew up around people who high school was the highest that they went. My mom only got a high school diploma and my dad, I don't even think finished high school … I think my neighbors were Caucasian, White for the most part. And, obviously my family is Black. And, then like growing up in school I was surrounded [at first by non-Black people], I went to private school for my elementary school and then after that, which was, you know, primarily White. And, then as I grew up I was surrounded more and more by Black people and Black culture, which was I think good … my mom took me out of private school, put me in some more public schools ... so, there was still a very solid mix [of races] I think, but I just got more exposure to people who looked like me, which was I think very good for me growing up … elementary school, they had ... gifted. Yeah, they had that, but I was not a part of it. [In middle school] they had a few honors [classes]. They had like [gifted] ... and then honors and then regular, and I was part of the honors ... [Of the available IB courses in high school, I took] all of them. So, I think in junior year, you take more specified IB classes.

> So, I took Physics, Chemistry, English, Psychology. Those were the main ones. I can't think of the other ones, 'cause those are the ones that actually helped me in college … Oh yeah. I took [math courses too], I don't remember what, specifically calculus? Calculus I and II.

Azahra's family members had no more than a high school education but she excelled in high school. Her mom switched her from a predominantly White private elementary school to a more racially diverse public middle school. Azahra took honors classes in middle school and she enrolled in all of the IB courses that were available at her public high school. It's interesting that Azahra was not selected for gifted courses in her predominantly White private elementary school although she later took honors and IB courses in her more racially diverse public schools.

Nome, a third-year international Black female former student-athlete majoring in an engineering or related STEM field, lacked access to college prep courses. She stated,

> [Where I grew up in Southern Africa] it was quite a rural area, I would say a very remote environment, in the sense that most people in that area, we did not have electricity until maybe the past six years or so. We also struggled with clean water or stuff like that, so it was a normal thing for people to walk a distance of at least three miles to fetch water from the river, a kind of a lifestyle. And transportation systems too, they really was bad … I went to a very terrible high school in the country … for two years … I took physics, which was called physical science. It has physics and chemistry in it. I took mathematics, I took biology, I did geography, I did our native language called Siswati, I did English as a language, I did agriculture, I did business studies and accounting … Private school, they offer a very good curriculum. They have A-levels, we did not do A-levels. And that's it. And they also have computer based subjects, so they're pretty much advantaged than public schools I would say … The reason why I went to public [school] is I could not afford private school. It's very expensive. Even for the people who [can] afford to take their children to school, good school, they don't really go to private school. Because private school is more, as like paying [a] university fee for your child in high school, so it's pretty expensive.

Larry, Kenzie and Ryan's affluent high schools offered more college prep courses (e.g., AP, SAT or dual enrollment) than at Azahra and Nomes' less affluent and more racially diverse public schools. Larry's predominantly White high school and Kenzie's diverse private school offered college prep courses specific to STEM (e.g., PLTW) even though Ryan, Dwight, Azahra and Nome's schools did not. Nome did not have access to any AP, IB, dual enrollment or PLTW courses in her international high school. Larry, Kenzie and Ryan's affluent high schools also gave them access to expensive sports like lacrosse, which wasn't available to other research

participants like Azahra and Nome. Essentially, at affluent high schools, student participants gain access to more college prep courses and sports teams, making them more competitive in terms of meeting admission and scholarship criteria.

Access to Pre-College STEM Clubs or Camps

In addition to sharing information about their access to pre-college STEM classes, Black STEM student-athletes responded to questions about their access to pre-college STEM clubs and camps. Not all students had access to even one pre-college STEM club or camp. Nome details the lack of available resources at her impoverished international high school. She compares her high school to others when revealing,

> We did not really have so many academic clubs, more especially something relating to science or something like that. We were pretty behind, that school was pretty behind. We did not even have computers for learning with the facility. And so, everything that was kind of in movement was an effort from the students themselves because the teachers, they did not really care that much. The school have doing bad for so long I think the teachers just lost the motivation to try to expose students to so many opportunities.

Unlike Nome, Kenzie did have access to a pre-college STEM club or camp. She talked about her access and interest in an afterschool STEM program. Kenzie recalled, “I joined ... an afterschool program because it’s what I was interested in. I knew a lot of … kids came from schools where they were getting in touch with programming. So, that’s why I did it, so I wouldn’t be too far behind.” When asked if any other STEM programs were available to her, she replied, “not really.” Kenzie seemed to understand the importance of equitable access to pre-college STEM programs. She also seemed to recognize future expectations of her STEM skills.

Similar to Kenzie, Ryan participated in an afterschool STEM program. She shared, "in elementary school, I was in this ... after-school program. And, I did that like every year ... building stuff for kids and introducing us to the science of stuff." Despite previous participation in a STEM the program Ryan said, "in high school I really wasn’t into STEM. Like that really wasn’t a thing. But, once I got to college, that’s when I started getting and participating more."

Like Kenzie and Ryan, Dwight described his participation in STEM clubs before college. He shared his motivation for joining one and his knowledge of other STEM clubs when saying,

> I grew up in a... it’s kind of like a majority White town [outside of a more diverse mid-sized city in the Southeast]... middle class to some wealthy, mainly middle class … I

> was in a STEM club in middle school but nothing else … my older brother was a part of it before when he was in middle school. So, when I got older, I joined the same club as well … In high school, I knew of them [the STEM clubs] but I never was interested in joining them. Middle school, I didn't know of any besides the one I was a part of.

Dwight's motivation for joining a STEM club was different from Kenzie's reasoning. It's noteworthy that Dwight joined a STEM club in middle school because of his older brother. He was not interested in joining any STEM clubs or camps in high school. Dwight did not provide details about what made his high school's STEM clubs uninteresting. However, he was interested enough in several sports to ultimately play them. Dwight also shared, "I always liked playing it [soccer], growing up as a kid … I played basketball growing up as well … I played cross country and then I ran track one year too."

When recalling what STEM clubs or camps she participated in before college, Azahra responded,

> I think I did like a summer camp once that was about robotics and I joined because my mom forced me to. I didn't love it, so I didn't really like seek out anything after that. That was the only STEM related things I did before college … I had access to the ones [or STEM clubs] in high school, like the physics one. I think I'm pretty sure they had a robotics team that was well known in the physics world I guess. But, I just never had any time with soccer and homework … So, with varsity and playing club [soccer] on top of IB, so IB is supposed to be a bit above AP and honors. So, I had a lot of homework all the time. I was drowning in homework, and then on top of having, sometimes my high school soccer would overlap with club soccer. So, I'd have two different practices a day on top of having to go home and then do homework. So, I just did not have any time to do anything else.

Azahra speaks to a lack of interest and enjoyment in a robotics summer camp. She also talks about being forced rather than motivated to join. Like Dwight, Azahra only participated in one STEM club or camp. Their experiences in pre-college STEM clubs or camps seemed to weaken rather than strengthen their interests in STEM.

Larry remembered his brief participation in a pre-college STEM club that was offered at his high school, when stating,

> I joined the robotics club because I wanted to learn more about robotics systems and stuff like that. So, I joined because of that. Basically just curiosity, really … There was a computer science club, and I'm not a big computer science guy. And also, I didn't do the

> robotics thing two years in a row, I only did it once … [since the] next year's workload it was more.

If time is a limiting factor, as it was for Azahra and Larry, then STEM activities can potentially be incorporated into sports practices and camps. It's possible both Azahra and Dwight would have been interested in joining more STEM clubs and camps if the STEM clubs and camps had involved or connected to their interest in sports. Traditional math and science courses like physics and calculus can also use examples from sports to increase interest among student-athletes.

Recommendations & Conclusion

Limited research has investigated access to science, technology, engineering, and math (STEM) for Black student-athletes who pursue careers in engineering or a related field in STEM. Unlike many other studies concerning STEM majors or Black students, the present study focused exclusively on Black student-athletes who major in STEM and participate in non-revenue sports (e.g., soccer and lacrosse). Findings focused on two major themes that emerged from one-on-one interviews with student participants, (a) access to pre-college STEM courses and (b) access to pre-college STEM clubs or camps. Overall, some systemic barriers for Black STEM student-athletes include limited K-12 STEM course offerings, insufficient time while playing pre-college sports and lack of exposure to STEM opportunities.

Several current or former Black STEM student-athletes mentioned their access to college prep courses such as Advanced Placement (AP), International Baccalaureate (IB), dual enrollment and Project Lead the Way (PLTW). However, not all Black STEM student-athletes had access to many, if any, college prep courses in high school. Some current or former Black STEM student-athletes described having access to specific pre-college STEM clubs or camps. A few participants were not interested in available STEM clubs or camps. What if the STEM clubs and camps had involved or connected to participants' interest in sports?

Many American universities expect first-year engineering students to be "calculus and physics ready," meaning students are expected to have had adequate access and preparation in STEM subjects so they are on track to succeed academically and graduate in four years. Segregated housing and schooling in the US (i.e., due to race and class) limit some Black students' access to pre-college STEM courses and camps (Alexander, 2012; Tatum, 1997). Having more affluent parents or excelling at a sport may provide a pathway for some Black students to gain access to K-12 schools with more robust STEM curriculum. The moral and ethical question remains, why don't all K-12 students (i.e., regardless of race or socio-economic class) have access to a quality education in STEM and other school subjects?

In order to improve Black STEM student-athletes' access to pre-college STEM courses, clubs and camps, we offer the following recommendations to politicians, educators and practitioners:

- Politicians can ensure equitable funding of STEM curriculum and sports programs in K-12 public schools, regardless of students' race, socio-economic status or zip code
- Educators can partner with organizations like PLTW for access to STEM curriculum
- Educators can partner with coaches to cover curriculum that involves sports and STEM
- Coaches can encourage student-athletes to explore pre-college STEM opportunities
- Educators can partner with STEM companies and organizations such as the National Society of Black Engineers (NSBE) to establish K-12 STEM clubs at their schools
- Educators can promote STEM clubs and camps by organizations such as NSBE via social media, emails, pamphlets, bulletin boards, school websites, etc.
- News media outlets can frequently highlight positive stories about local STEM courses, clubs and camps as well as non-revenue sports that are available to Black students

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