Since the National Science Foundation’s (1981) report arguing for a strong national focus to address our nation’s scientific and technological needs, science, technology, engineering and math (STEM) education has been widely acknowledged as an area for expansion within P-20 education. The foundation’s report highlighted the continued underrepresentation of women, minorities, and the disabled within the science and engineering professions and suggested the expansion of opportunities to increase STEM participation for all students. Thirty years later, despite these recommendations, Black, Latino/a, and female students continue to lag behind their peers in obtaining advanced degrees in STEM fields (Ross et al., 2012). Research has shown that early exposure to advanced courses in science and math in high school is highly correlated to student enrollment and success in college (National Science Board, 2010) and plays a critical role in developing interest and influencing entrance into college STEM majors (Wang, 2013).

In addition, motivational factors such as attitudes toward math and self-efficacy beliefs have a significant and positive link to entrance into STEM fields (Wang, 2013). Higher education institutions are uniquely positioned to expose elementary and secondary students to STEM fields through exploratory activities, with a goal of increasing students’ interest in STEM careers. Postsecondary institutions also can provide outreach to diverse student populations, potentially increasing participation rates of underrepresented students within STEM fields. Many postsecondary institutions have developed summer camp programs as a mechanism to encourage elementary and secondary students of all backgrounds to consider STEM careers (DeJarnette, 2012). Within the past few years, many universities have been exploring ways to attract underserved populations, especially to increase their interest and participation in STEM fields (Tsui, 2007).

The Committee on Successful Out-of-School STEM Learning (COSOSSL, 2015) provides three criteria for productive out-of-school STEM learning opportunities: (a) they engage youth intellectually, socially and emotionally; (b) they respond to interests, experiences and cultural practices; and (c) they connect STEM learning to learning within school, home and other settings (p. 2-1). Student exposure to STEM career areas may increase motivation, interest, and engagement, possibly propelling them into future studies and careers within STEM-related fields (Davis & Hardin, 2013; Marle et al., 2014; Wang, 2013; Yilmaz, Ren, Custer & Coleman, 2010). Additional studies have indicated a higher level of student interest in STEM camps after exposure and engagement in those camps (Hayden, Ouyang, Seinski, Olszewski, & Bielefeldt, 2011; Marle et al., 2014). The purpose of this brief is to offer students, parents, school leaders, counselors, and teachers insights on opportunities afforded to students who engage in university-sponsored STEM camps. It also provides an assortment of resources for STEM camp opportunities within the state of Illinois.

TYPES OF OFFERINGS AND STUDENT ENGAGEMENT

Programming

Individuals interested in university-sponsored STEM summer camp programming for students should consider the types of offerings and student engagement offered within these programs. With a narrowly defined definition of STEM, offerings typically are anchored in the content areas of science, math, technology, and/or engineering (Yilmaz, Ren, Custer & Coleman, 2010), but can offer more specific units of study within these fields such as robotics and rocketry (Ivey & Quam, 2009), and construction of 3D designs (Bailey & Law, 2014). In addition, the learning model of the STEM camp plays a role in generating student interest (Bryant Davis & Hardin, 2013). Models may range from project-based laboratory experiments (Exstrom & Mosher, 2000) to investigative inquiry problem-based learning (Merle et al., 2014) that helps actively engage students in the learning process. Bryant Davis and Hardin (2013) recommend that camps include hands-on
Diversity

A diverse learning environment is also an important aspect of summer STEM programming. DeStefano, Johnson, and Hall (2006) state that STEM programming should not only have high-quality scientific content but also should incorporate effective pedagogy and emphasize equity and diversity. The researchers convey, “It is quite common to observe STEM programming that considers two domains yet overlooks or struggles to address the third” (Greene et al., p. 54). Recruitment is one way that universities may begin to address equity and diversity goals. Many camps have disseminated flyers to schools to notify school officials of upcoming camp opportunities, with the hope that they will share this information with students and parents. Additional recruitment efforts also can be employed to generate awareness and increase potential for student participation, such as class presentations in selected high schools, close cooperation with counselors and math and science teachers; announcements through local media, including television, radio, and newspapers; descriptive web pages with knowledgeable information about the camp; use of social media, including Twitter and Facebook, and email distribution through the regional education office (Yilmaz, Ren, Custer & Coleman, 2010). Bryant Davis and Hardin (2013) assert that continued, consistent connections with diverse populations during the recruitment phase is helpful in ensuring that parents are aware of the camp opportunities. The authors also stress the importance of recognizing potential family dynamics that may affect attendance at camps. Providing parents information related to financial aid, admissions, housing, meal and parking could assist them in understanding and planning for the full cost of the program (Yilmaz et al., 2010).

Content

With increased attention on student preparedness for college and careers, there has been widespread adoption of the Common Core State Standards to assess student readiness skills, the intentionality of summer STEM Camp programming to assist in supporting student college and career readiness is of paramount importance. Conley (2010, 2014) suggests a four-key model for college and career readiness that can be applied during the selection of a university-sponsored STEM summer camp. Key cognitive strategies, which include being able to hypothesize and strategize about problems or situations and encompass elements of research and analysis, can assist students in developing and implementing cognitive strategies and effective problem-solving process. Key content knowledge, according to Conley (2014), incorporates the foundational content that students must know and understand. Each summer camp has its own unique content focus in which students are immersed. Also, the key learning skills and techniques students obtain in summer camps may help students establish an ownership of learning (i.e., goal setting and motivation) and learning strategies (i.e., study skills and collaboration). Finaly, Costa & Gowan (2013) stress the importance of recognition potential family dynamics that may affect attendance at camps. Providing comprehensive information about the camp; use of social media, including Twitter and Facebook, and email distribution through the regional education office (Yilmaz, Ren, Custer & Coleman, 2010). Bryant Davis and Hardin (2013) assert that continued, consistent connections with diverse populations during the recruitment phase is helpful in ensuring that parents are aware of the camp opportunities. The authors also stress the importance of recognizing potential family dynamics that may affect attendance at camps. Providing parents information related to financial aid, admissions, housing, meal and parking could assist them in understanding and planning for the full cost of the program (Yilmaz et al., 2010).

Student interest. A critical component of selecting a summer STEM camp opportunity is the interest level of the students. Students identifying a specific STEM camp opportunity based on their interest is important. In a study examining student interest, student interest was the most influential factor on student attendance, followed by peer influence, family influence, and financial constraints (Ross, T., Kena, G., Rathburn, A., KewalRamani, A., Zhang, J., Bryant Davis, K. & Hardin, S. (2013). Making STEM fun: How can we increase student interest in STEM fields: A review of the research literature. IEEE Transactions on Education, 57, 313-323. doi:10.1109/TE.2013.2258661)

References


The mission of the PRC is to provide resources and supports to secondary and postsecondary institutions, employers, communities, and other partners as they engage in successful and sustainable pathways for students from secondary to postsecondary, to careers.

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