

THE IMPACT OF THE ARK-LSAMP PROGRAM ON UNDER-REPRESENTED STUDENTS AT ARKANSAS PARTNER INSTITUTIONS

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Abstract

The NSF-funded Arkansas Louis Stokes Alliance for Minority Participation (ARK-LSAMP) was successful in involving minority students in Science, Technology, Engineering, and Mathematic (STEM) undergraduate programs at partner institutions. This study was conducted in spring 2022. While the ARK-LSAMP program consists of different components, this study focused specifically on the involvement components, such as the Lecture STEM Series/Seminars, Annual Research Conferences, and additional academic and research conferences of the ARK-LSAMP participants while in college (Research Experience for Undergraduates (REU) or internship experience, and other academic or research conferences). This study highlights the impact of the experiences on the participants' course grades, their desire to pursue a STEM-related degree/career, and its impact on providing them with essential information related to pursuing a STEM-related degree and career. The findings indicate a substantial impact of ARK-LSAMP on the participants.

Keywords: STEM, undergraduate students, involvement, engagement, mentor, ARK-LSAMP, underrepresented, minorities, African American, Hispanic

Introduction and Literature Review

Increasing the representation of historically underrepresented students in the areas of Science, Technology, Engineering, and Mathematics (STEM) has been a key focus of our nation's workforce. This increase in the representation of women and individuals from racial and ethnic backgrounds can assist in increasing "diversity, creativity, and innovation in STEM" (Kricorian et al., 2020, p. 2). The literature is clear regarding the low representation and participation of women and individuals of color; including Hispanic and African Americans pursuing STEM-related undergraduate degree programs. According to Ong et al. (2018) and the National Center for Education Statistics (2017), Hispanics, African Americans, and women receive less than 5% of STEM-related undergraduate degrees.

Prior research has drawn attention to several reasons for the low representation of the aforementioned populations in STEM. Among the reasons for low representation are decreased feelings of acceptance, and a lack of a sense of belonging (Ito & McPherson, 2018; Walton & Cohen, 2007; Zaniewski & Reinholz, 2016). Additional research highlights factors such as math and science coursework (Russell, 2017; Cooper et al., 2005); career readiness (Russell, 2017; Cooper et al., 2005), and discriminatory barriers (Russell, 2017; Cooper et al., 2005) as reasons that negatively influence the participation of ethnic and racial minorities and women in STEM.

While these factors may, undoubtedly impact the participation of and have a significant impact on the overall experiences of women and minorities in STEM, drawing attention to ways to increase the representation of this population may prove more beneficial. Prior research has identified several factors that may positively influence the participation of underrepresented students in STEM. These factors include mentorship experiences (Kricorian et al., 2020; Leggon & Pearson, 2006), and positive STEM attitudes (Kricorian, et. al., 2020). Mentorship plays a key role in the interests of women and minority students in STEM. Robnett et al. (2018) assert that mentors have a unique way of influencing students and can, therefore, have a positive impact on students' interests, and attitudes toward STEM areas, and in retaining students in STEM.

Even with this evidence, limited data is available from minority STEM students regarding their perceptions of the impact of their experiences on their outlook toward their persistence in STEM. According to Kricorian et al., (2020), "there remains a need to better understand how experiences may differ in women and students of color who have demonstrated persistence in STEM" (p. 2). "Interactions with research mentors can lead to gains in confidence and a better understanding of educational and career possibilities for African American and Hispanic students in STEM (Thiry & Laursen, 2011).

When exploring ways to increase the participation of students in STEM colleges and universities have incorporated varying strategies and interventions. Fealing et al., 2015, suggest that "a core underlying premise of virtually every major intervention designed to increase the representation of women and racial and ethnic minority group members in STEM careers is that there exists a dominant pathway toward those careers" (p. 1). Undergraduate research opportunities/conferences are essential for college students. "Research experiences provide opportunities to develop a science identity for women of color" (Carlone & Johnson, 2007, p. 2) and increase retention rates for African American and Hispanic students (Jones et al., 2010).

Aligning with this concept is the ARK-LSAMP experience, also known as the Louis Stokes Alliance for Minority Participation. This National Science Foundation (NSF) funded program is designed to "develop strategies to increase the quality and quantity of minority students who complete baccalaureate degrees in science, technology, engineering, and mathematics (STEM), and who continue to graduate studies in these fields" (Clewett, 2006, p. 1).

Purpose of the Study

The purpose of this study was to examine the impact of the ARK-LSAMP experiences on the participants. More specifically, this study examined the impact of the lecture STEM series/seminars; research experience for undergraduates (REU) or internship experience during years in college; annual research conferences, and the impact of Faculty research or pre-professional mentor. This understanding will assist university administrators, faculty, and all individuals who work with students, to better serve students and ensure their overall success in STEM.

Methodology

The participants of the study are undergraduate students in STEM who are in the ARK-LSAMP program. The ARK-LSAMP is developed to test the efficacy of select pre-college readiness experiences and ARK-LSAMP program interventions on undergraduate STEM students' retention, graduation, and entry into STEM graduate education and careers. An online survey was developed using Qualtrics. The research was approved by the IRB at the study institution and the data was collected in the spring 2022 semester. An email invitation, including the purpose of the study and information about the study, was sent to all students in ARK-LSAMP.

Thirty-three (33) students participated across the four partner institutions, including the University of Arkansas at Fayetteville (36%), the University of Arkansas at Pine Bluff (32%), the Arkansas State University (28%), and the University of Arkansas at Little Rock (4%). Most of the students (76%) who completed the LSAMP Questionnaire were of Black or African American origin. Less than half (24%) of the participants self-identified as Hispanic or Latina (o). A majority of participants (62%) self-identified as female, followed by 34% who self-

identified as male. A small percentage (3.5%) of the respondents selected not to disclose their gender. All of the participants provided informed consent where data anonymity and confidentiality were strictly maintained.

Findings

Table 1 represents the demographic profile of the participants. 33 students participated across the four partner institutions, including the University of Arkansas at Fayetteville (36%), the University of Arkansas at Pine Bluff (32%), the Arkansas State University (28%), and the University of Arkansas at Little Rock (4%). Most of the students (76%) who completed the LSAMP Questionnaire were of Black or African American origin. Less than half (24%) of the participants self-identified as Hispanic or Latina (o). A majority of participants (62%) self-identified as female, followed by 34% who self-identified as male. A small percentage (3.5%) of the respondents selected not to disclose their gender. All of the participants provided informed consent where data anonymity and confidentiality were strictly maintained.

Table 1

Demographics of the LSAMP Participants (n = 33)

Variable	Attribute	Percentage (percentage)
Gender	Male	34
	Female	62
Ethnicity	Other	3.5
	Black/African American	76
	Hispanic/Latino/Latina	24

Table 2 represents the majors of the LSAMP participants. All 33 of the LSAMP participants were enrolled in STEM-related undergraduate programs.

Table 2

Undergraduate Majors of the LSAMP Participants

Majority of the respondents	
Biology/Pre-Medicine	Information and Computer Technology
Biology	Electrical Engineering
Forensic Chemistry	Computer Science and Data Science
Mechanical Engineer	Computer Science
Computer Science and Computer Engineering	Computer Engineering
Chemistry	Zoology
Industrial Technology Management with Applied Engineering	Civil Engineering

Table 3 represents the impact of the LSAMP Lecture STEM Series/Seminars on the participants' course grades, their desire to pursue a STEM-related degree/career, and its impact on providing them with essential information related to pursuing a STEM-related degree and career. Among the respondents who attended the LSAMP Lecture STEM Series/Seminars, 57% reported that their participation had a moderate impact on their course grades, while 25% reported a slight and 18% reported a substantial impact.

Table 3 also showed that among the respondents who attended the ARK-LSAMP Lecture STEM Series/Seminars, 54% reported that their participation had a moderate impact on their desire to pursue a STEM-related degree/career, while 32% reported a substantial impact, and 14% reported a slight impact. Among the respondents who attended the ARK-LSAMP Lecture STEM Series/Seminars, 50% reported that their participation had a substantial impact on providing them with informative information related to pursuing a STEM-related degree and career, while 36% reported a moderate impact and 14% reported slight impact.

Table 3

Impact of the ARK-LSAMP Lecture STEM Series/Seminars (n = 33)

Variable	Slight	Moderate	Substantial
Course grades	25%	57%	18%
Desire to pursue a STEM-related Degree/career	14%	54%	32%
Providing them with Informative information Related to pursuing a STEM-related degree and career	14%	36%	50%

Table 4 represents the impact of participation in a Research Experience for Undergraduates (REU) or internship experience during your years in college on the participants' course grades, their desire to pursue a STEM-related degree/career, and its impact on providing them with essential information related to pursuing a STEM-related degree and career. Among the respondents who participated in a Research Experience for Undergraduates (REU) or internship experience during their years in college, 28% reported that their participation had a substantial impact on their course grades, while 36% reported a moderate impact and 36% reported a slight impact.

Among the respondents who participated in a Research Experience for Undergraduates (REU) or internship experience during their years in college, 43% reported that their participation had a substantial impact on their desire to pursue a STEM-related degree/career, while 28.5 % reported a slight or moderate impact. Among the respondents who participated in a Research Experience for Undergraduates (REU) or internship experience during their years in college, 43% reported that their participation had a substantial impact on providing them

with informative information related to pursuing a STEM-related degree and career, while 28.5% reported moderate or slight impact.

Table 4

Impact of Research Experience for Undergraduates (REU) or Internship Experience During Your Years in College (n = 33)

Variable	Slight	Moderate	Substantial
Course grades	36%	36%	28%
Desire to pursue a STEM-related Degree/career	28.5%	28.5%	43%
Providing them with Informative information Related to pursuing a STEM-related degree and career	28.5%	28.5%	43%

Table 5 represents the impact of participation in ARK-LSAMP Annual Research on the participants' course grades and their desire to pursue a STEM-related degree/career. It also includes its impact on providing them with essential information related to pursuing a STEM-related degree and career.

Table 5

Impact of Participation in ARK-LSAMP Annual Research Conference (n = 33)

Variable	Slight	Moderate	Substantial
Course grades	44%	44%	11%
Desire to pursue an STEM-related Degree/career	11%	56%	33%
Providing them with Informative information Related to pursuing a STEM-related degree and career	11%	50%	39%

Table 6 represents the impact of faculty research or pre-professional mentoring on the participants' course grades. It also includes its impact on providing them with essential information related to pursuing a STEM-related degree and career.

Table 6

Impact of Faculty Research or Pre-Professional Mentor (n = 33)

Variable	Slight	Moderate	Substantial
Course grades	25%	37.5%	37.5%
Desire to pursue a STEM-related degree/career	12.5%	37.5%	50%
Providing them with Informative information Related to pursuing a STEM-related degree and career	13%	31%	56%

Discussion and Conclusion

Increasing the representation of students of color has been a focus of academic institutions for quite some time (Pierszalowski et. al., 2021). Institutions have incorporated and developed several strategies and initiatives geared toward this effort. The responses from the survey revealed three significant impacts: *faculty research or pre-professional mentor, Research Experience for Undergraduates (REU) internship experience during their years in college and participation in different academic and research conferences.*

Regarding faculty research or pre-professional mentor, this study revealed that over half (56%) of the respondents with a faculty research or pre-professional mentor reported that their participation with their mentor had a substantial impact on providing them with essential information related to pursuing a STEM-related degree and career. The literature is clear regarding the role of mentors in the success of not only students of color but also students of color in STEM disciplines (Starobin et al., 2016; Smith et. al., 2022; Smith, 2016; Jackson et al., 2013). Research indicates that mentors are positioned to provide students with direction, an academic career path, motivation, and encouragement (Smith, 2016; Schwartz, 2012). Additionally, mentors are also positioned to educate students on the different STEM career options (Griffin et al., 2020). Mentors are also able to provide advisement on different research experiences for students.

Regarding participation in a Research Experience for Undergraduates (REU) or internship experience during their years in college, results from this study indicate that almost half (43%) of the participants reported that their participation in an (REU) or internship experience during their years in college had a substantial impact on their desire to pursue a STEM-related degree/career. Students pursue STEM-related degrees for several reasons, including financial outlook, interest in the discipline, and limited options, to name a few

(Jackson-Smith, 2015). Research opportunities are an ideal way for students to not only learn more about STEM but to also engage in the discipline and actively participate in STEM activities related to a specific STEM area. In research experiences, students engage in hands-on experiments and can interact with other students and faculty while in the experience, which can be informative for students as they make informed decisions regarding their career paths (Jones, 2019; Jiang et al., 2020; Crawford et al., 2018).

Participation in any academic and research conferences, is essential for all students, especially students who are on a STEM-related career path. The findings of this study indicated that half (50%) of the respondents who participated in different academic and research conferences reported that their participation had a significant impact on their course grades. Additionally, more than half (62.5%) of respondents who participated in different academic and research conferences reported that their participation had a significant impact on providing them with essential information related to pursuing a STEM-related degree and career. “Research experiences provide opportunities to develop a science identity for women of color” and are essential in increasing the retention rates for African American and Hispanic students (Jones et al., 2010; Pierszalowski et al., 2021).

Recommendations

This study offers three (3) main recommendations for universities to assist students of color as they progress on STEM career paths. The recommendations align with the findings of this study and prior literature and research. The recommendations are as follows: 1) encourage students to connect with a mentor and/or provide opportunities for mentorship; 2) encourage students to participate in a Research Experience for Undergraduates (REU) or internship experience during their years in college; and 3) encourage students to participate in any other academic or research conferences, during your years in college.

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