

UT System LSAMP: (2019) Undergraduate Student Perceptions of Mentorship and Research Experiences

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Abstract

Previous work demonstrates mentorship and research experiences accelerate socio-academic integration of historically underrepresented minorities into science, technology, engineering and mathematics (STEM) fields of study. Thus, the University of Texas System (UT System) Louis Stokes Alliance for Minority Participation (LSAMP) implemented a multifaceted undergraduate research strategy that aims to increase the number of students from underrepresented groups who earn undergraduate STEM degrees. This study assessed two-year and four-year institution student participants' perceptions of mentorship and research experiences through a mixed methods approach. In 2019, 53 students participated in research projects at partnering LSAMP institutions, Department of Energy laboratories across the US, or research institutes abroad. Students were immersed in mentored, independent or collaborative research for at least eight weeks in the summer. At the program's completion, students presented their research at an undergraduate research conference. Additionally, students participated in focus groups and a survey about their summer experiences. Participants reported satisfaction with the research experience (70%) and reported satisfaction with mentor guidance and direction (98%). Participant suggestions to improve the research experience included increasing communication between UT LSAMP, mentors, and students, and to begin communication between mentors and student participants before the start of the summer research program. In addition, students recommended that mentors enhance the organization and structure of the research activities. The UT System LSAMP leadership team is taking steps to enhance communication, organization, and structure between program leadership, mentors and their students to further strengthen mentor-protégé relationship development. Current efforts include the development of a mentor survey to assess their perspective, and mentor-protégé guide and training, particularly as it relates to the utilization of distance technology to support professional relationship development. Finally, the mentor-protégé pairs are asked to establish communication before the start of the program and submit a brief description of the proposed summer research activities with a tentative timeline for review.

UT System LSAMP: (2019) Undergraduate Student Perceptions of Mentorship and Research Experiences

Research continues to show a disparity in degree attainment and advancement into graduate studies among underrepresented minorities and underrepresented groups (e.g., African-Americans, Hispanics, or Latinos/Latinas, American Indians/Native Americans, Alaskan Natives, Mixed-Race, women, people with disabilities, and members of the LGBTQ communities) in Science, Technology, Engineering and Mathematics (STEM) fields (Estrada et al., 2018; National Center for Education Statistics, 2019). Given this trend, many researchers have identified key program components related to the success of STEM students from underrepresented minorities and groups. For example, research experiences and mentorship have been shown to be positively related to the integration of underrepresented minorities and groups into STEM fields of study (Estrada et al., 2018).

Previous research demonstrates that factors such as research experience and mentorship have accelerated the socio-academic integration of underrepresented minorities and groups into STEM fields of study (Estrada et al., 2018). Overall, studies concluded that research experience has been positively related to career choice, placement, and preparation (Laursen et al., 2010). Recent research shows programs that include research experiences are related to degree completion and academic persistence among students (Estrada et al., 2018; Hernandez et al., 2018; Schultz et al., 2011). In addition to research experience, mentorship has been shown to increase academic achievement, productivity, and academic persistence (Eby et al., 2007). For example, providing students resources, opportunities to network, and encouragement have all been shown to increase academic achievement and persistence (Eby et al., 2007). Lastly, undergraduate research fosters excellence and enhances broadening of participation of sustainable programs (Boy & Wesemann, 2009).

The current study assesses the Louis Stokes Alliance for Minority Participation's (LSAMP) summer research programs. The focus of these programs is to increase associate and bachelor's degree attainment and advancement into graduate studies in STEM fields among underrepresented minorities and groups. Based on research, the University of Texas System (UT System) LSAMP implemented a multi-prong strategy that offers students up to two summers of undergraduate research experiences. Students participated in an eight-week research project approved by UT LSAMP leadership under the supervision of university or community college faculty members. Depending on institution of origin, previous research experience and academic standing, students were recruited to participate in one of five summer research tracks. Students without prior record of participation in LSAMP activities were recruited for the Summer Research Academy (SRA) or the Student Cohort for Undergraduate Research in Marine Biosciences Abroad (SCUBA). Students with at least one prior research experience were recruited for the Summer Research Academy-Abroad (SRA-A), Knowledge and Independence through Externships (KIte), and Department of Energy (DoE) Faculty and Student Team (FaST) programs. Below are brief descriptions of each of the programs. Table 1 summarizes the programs showing yearly track options.

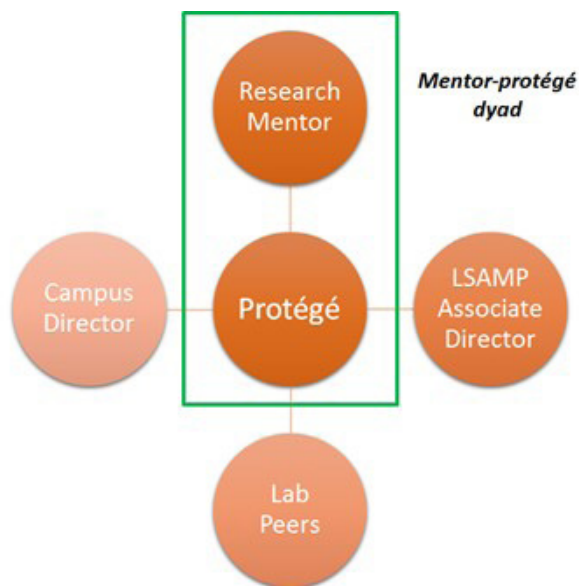
As part of the SRA, students (who receive a stipend to support their participation) spend the summer working 30 hours per week on research projects at various UT Systems LSAMP partnering institutions. LSAMP leadership encourages students to participate in the SRA at a partnering institution and not at the institution where they are currently enrolled. Students selected for SCUBA spend two weeks in the summer at a Caribbean location acquiring data and samples for a marine science project. Students then analyze the data

and samples collected at their home institution. Students selected for the SRA-A complete a summer project at a research institution abroad. Students selected for participation in FaST have prior experience working in the physical sciences or engineering laboratory under the mentorship of a professor. The professor then takes the student with a team to a DoE National Laboratory such as Brookhaven National Laboratory or Ames Research Center. Students selected for KiTE go to a research institution affiliated with another LSAMP alliance (i.e., Colorado-Wyoming LSAMP, Kentucky-West Virginia LSAMP, or Northeast LSAMP).

Mentoring Models

In most instances, the preferred mentoring model among LSAMP summer research programs is the traditional mentor-protégé dyad (National Academies Report, 2019). In this case, the student (or protégé) was assigned to a faculty mentor or doctoral student who supervised the work of the student and provided guidance, training, and encouragement. The protégé met weekly with the mentor to report on progress and receive additional instructions. The second most used model was the small cohort mentoring model in which one or two professors met with a group of proteges working on related projects (National Academies Report, 2019). The team would meet regularly, and in some instances daily, to discuss progress and to plan future activities. Mentors were selected based on their research expertise, mentoring experience, and willingness to participate in the program. The protégé received additional support from the campus director hosting the student and responsible for the student’s professional development, the program associate director who communicated regularly with the student and campus director, and peers who worked alongside the protégé. Figure 1 summarizes the support centered on the protégé.

Figure 1. Programmatic support for the mentor-protégé dyad.



Methods

In 2019, a total of 53 undergraduate students were selected to participate in summer research experiences. Students participated in an intensive research activity for eight weeks mentored by a university faculty member for a minimum of 30 hours per week. In addition, students were required to create and present a poster on their project at the annual UT System LSAMP Conference. At the end of their summer research experience, students were asked to participate in an online survey and focus groups to assess their perceptions of the research experience and mentorship. The evaluation team created the survey and focus group questions. Prior to data collection, permission was obtained from the Institutional Review Board at the University of Texas at El Paso (UTEP). Table 2 includes the number of students who participated in UT LSAMP activities in 2019.

Table 2. Number of students in 2019 activities

Activity	SRA	SRA-A	DoE	SCUBA	KiTE
Student Participants (n = 53)	35	7	5	4	2

The surveys were administered electronically via Survey Monkey during the final two weeks of the SRA and prior to the annual conference. The students were notified and given several reminders to complete the survey. The participants were asked to provide basic demographic information (e.g., gender and ethnicity). Additional identifying demographic included student classification (e.g., freshman, sophomore, junior, or senior), expected graduation year, academic major, and field of research. The next section of survey items included students' level of satisfaction with the summer research experiences, their mentor, their research project, and the instruction and preparation they received prior to attending. In addition, the participants were asked to report their perceptions on the impact the summer research experience had on their research, academic, and professional skills. Each item was assessed using Likert-type scale items (1 = strongly disagree to 5 = strongly agree or 1 = not satisfied to 5 = very satisfied). A "not applicable" and a "prefer not to answer" choice was available for every Likert-type question. Finally, open-ended questions were included to assess the students' motivation to apply and their suggestions and ideas for improving the UT LSAMP summer research experiences.

Focus groups were conducted with several participants from the SRA and all students from the other summer research experiences. Each session was audio taped, transcribed and the transcription used in the data analysis. The focus group questions were intended to understand the reasoning behind students' responses in the survey data. For example, students were asked about their expectations of the summer research experience, the most helpful/least helpful guidance and instruction given, factors related to a successful summer research experience, skills gained from the experience, and student's experience and relationship with their mentor.

The evaluation team aggregated the data across the various summer research experiences (e.g., SRA, SRA-A, SCUBA, FasT, and KItE) and descriptive statistics have been generated for the survey items. This allowed the evaluation team to preserve the anonymity of the participants. For the focus group data, the evaluation team's interpretation was based on observation, review of the audio tapes, and analysis of the content contained in the transcripts from all the sessions.

Results

Of the total sample from the survey, 45% reported being female ($n = 24$). Participants reported their ethnicity/race as the following: 50% Hispanic/Latino, 21% White Non-Hispanic, 11% Asian, 10% African American or Black, and 8% multiracial. No students reported having a disability. Participants came from universities and community colleges throughout Texas. For example, participants reported their home institution as UT El Paso (32%), Tarrant Community College (13%), UT Rio Grande Valley (13%), UT Tyler (11%), UT Austin (8%), El Paso Community College (5%), UT Permian Basin (6%), Tyler Junior College (6%), UT Dallas (4%), and Midland College (2%). For this cohort, nearly one in three students was a community college student.

The participants reported academic majors from a wide spectrum of STEM disciplines: Engineering (28%), Life/Biological/Agricultural Sciences (28%), Chemistry/Biochemistry (13%), Physics/Astronomy/Astrophysics (13%), Geosciences (6%), Mathematics/Statistics/Actuarial Science (6%), Computer Science (2%), Environmental Science/Atmospheric Science/Ocean Sciences/Ecology (2%) and Other (2%). As in previous cohorts, Engineering and Life Sciences accounted for most majors.

Most projects were limited to eight weeks. Across all summer research experiences, only 40% of students reported being able to complete their research project. Of those who did not complete the summer research project, 40% reported they would continue to work on the project during the school year, 32% reported they would not, and 5% reported they did not know. Nonetheless, all the students prepared a scientific poster to present at the annual LSAMP Student Research Conference.

Assessment

Overall, 94% of participants reported being "satisfied" and 70% of participants reported being "very satisfied" with the summer research experiences. Among the participants, 89% were happy with their research project and 85% reported the summer experience exceeded their expectations. In addition, 89% of participants agreed the instructions and guidance they received before going into their summer research experience was helpful. Most participants reported their faculty mentor provided excellent guidance and direction (96%).

While most of the participants were satisfied with the summer research experience and their mentorship throughout the program, the evaluation team conducted focus groups and asked for suggestions to improve the summer research experience. Participants suggested increasing communication between LSAMP, faculty members, and students before the start of the project. This communication would allow participants and faculty members to have a clear understanding of the project and the role the faculty member and student had throughout the summer. Finally, participants suggested more organization or structure throughout the research experience. For example, students suggested the use of a firm schedule, list of tasks needed to be complete, or scheduled weekly meetings with LSAMP and faculty members.

Discussion

Underrepresented minorities and groups in STEM fields continue to show a disparity in degree attainment and advancement into graduate studies (Estrada et al., 2018; National Science Board, 2015). Thus, researchers have identified key program components related to the success of STEM students from underrepresented minorities and groups. The current study evaluated undergraduate student perceptions of mentorship and research experiences from the UT LSAMP program.

Overall, participants reported satisfaction with the research experiences and with mentor guidance and direction. Although, students provided suggestions to improve the research experiences such as: increasing communication between UT LSAMP, mentors, and stu-

dents before the start of the summer research program. Students also recommended mentors enhance the organization and structure of the research activities.

The results of this study will be used by UT System LSAMP leadership to enhance communication, organization, and structure between program leadership, mentors and their students to further strengthen mentor- protégé relationship development. Future research efforts include the development of a mentor survey to assess their perspective, and mentor-protégé guidance and training. Insight into the mentors' perspective can provide UT System LSAMP leadership suggestions on how to better provide support for the mentors and provide key components of the mentor-protégé guide and training. The mentor-protégé guide and training will include resources to enhance the utilization of distance technology to support professional relationship development. Additionally, the mentor-protégé pairs will be asked to communicate before the start of the program and submit a brief description of the proposed summer research activities with a tentative timeline for review. This will give the UT System LSAMP leadership, faculty mentors, and students a clear role for each member, and an outline of the proposed research project.

Conclusion

The study incorporated research experience and mentorship, key components to increase the integration of minorities and minority groups into STEM fields and graduate programs, into a summer research experience. Students participated in a quantitative and qualitative evaluation of the program. Overall, students reported being satisfied with the research experience and mentorship. Although, students reported wanting to have increased communication between LSAMP leadership, students, and faculty mentors before the start of the program. They also mentioned mentors should increase the organization and structure of their research activities. This study will help develop the tools and resources for students and faculty members to better provide support throughout their summer research experiences.

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