

Work-in-Progress: Social and Cultural Activities Integrated into an REU Site in the U.S. South

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Introduction

Participating in a research experience for undergraduates (REU) site provides opportunities for students to develop their research and technical skills, raise their awareness of graduate studies [1], and understand the social context of research [2]. In support of this mission, our REU site at The University of Alabama (*Sensors, Systems and Signal Processing Supporting Speech Pathology*) is exploring research at the intersection of engineering and communicative disorders. Our site has a focused theme of developing technology to support clinical practice in the field of communication sciences and disorders; which is an applied behavioral science that includes screening, assessment, treatment, and technology/instrumentation related to fluency, speech production, language, cognition, voice, resonance, feeding/swallowing, and auditory habilitation/rehabilitation [3]. In clinical practice, Speech Language Pathologists (SLPs) and Audiologists (AuDs) utilize a range of technologies including audio recording/acoustic analysis, electromyography, and video imaging/analysis. Research projects for our REU include assessment of noise levels in mobile audiology clinics, image analysis to identify features of pediatric dysphagia from videofluoroscopy swallow studies, and assessment of surface electromyography data of oropharyngeal musculature collected during swallowing events. Beyond the research, students participated in professional development sessions and shadowing clinicians at The University of Alabama's Speech and Hearing Center. The shadowing experiences of our program, which was noted by students to help broaden their understanding of speech language pathology, has been previously detailed [4].

Beyond research training, REU sites provide the opportunity for professional development, social activities, and cultural activities to enrich the student experience. These are important features of an REU, which are short, high intensity experiences that typically range from 9-10 weeks. As noted by Straub, social activities in an REU serve to introduce participants to each other and get the group working well together [5]. This is critical as REUs recruit students from across the country and require them to dive in quickly to all aspects of the program.

During the first offering of our REU program in 2019 we aimed to increase the level of social and cultural activities of the cohort in comparison to a previous REU site (NSF Award 1559867, *Innovative Engineering Using Renewable Resources*) that Freeborn helped coordinate at the University of Alabama (UA) from 2016-2018 [6-8]. Previous sites, while noting high levels of satisfaction with the research elements, had very different reports of social experiences between yearly cohorts. For example, the 2018 assessment of the *Innovative Engineering Using Renewable Resources* REU by the external evaluators reported:

"Unlike previous years, several students were disappointed by the social aspect of the REU this year. When asked to rate the social activities provided by the program (n=8), only two were "extremely satisfied," while the remaining six were neutral (n=3), "somewhat dissatisfied" (n=1), or "extremely dissatisfied" (n=2). When asked what they would change about the REU experience, all but one of the respondents indicated they would love to have more opportunities to socialize with other REU students or to have more field trips. The lack of social activities for the REU students was noted by the

faculty as well, with one mentor commenting, “*there were no organized, research-free events for students to relax and interact organically, with such a condensed time period, they definitely needed that.*” "

In light of these earlier experiences, our current REU program aimed to i) increase the number of group activities, ii) increase the satisfaction with group activities, and iii) engage students with the history of Alabama. In this work an overview of the REU activities will be detailed, with a focus on the logistical elements for the social, cultural and professional development efforts. A summary of the student feedback, experiences of the program coordinators, and future plans to refine and improve these elements will be presented.

Activity Planning

The design of our program followed the same general protocol that has been reported by Straub [5]: identify program start/end dates, identify conference that students will attend, identify dates for relevant speakers, and identify dates for social activities. Using this protocol, our 10-week REU implemented the following activities (beyond the research experiences with the program mentors):

- An orientation session on the first day of the program;
- Six professional development workshops, planned for Monday mornings;
- Two field trips planned for Friday's of Week 1 and Week 5;
- A poster session at a local conference of SLPs in Week 9;
- A closing BBQ social with REU students and SLP graduate students post-conference.

Our program provided clinical shadowing experiences directly linked to the program theme and our program provided social activities focused on introducing students to the culture and history of Alabama. For cultural activities, full-day field trips were taken to the U.S. Space & Rocket Center in Huntsville, AL and The Legacy Museum / The National Memorial for Peace and Justice in Montgomery, AL. These trips engaged students in very different aspects of Alabama's history. One showcasing achievements of the U.S. space and rocket program and the other confronting the racial injustice pervasive in American history with deep roots in the American South and



Figure 1: 2019 REU cohort during the group activities at (a) U.S. Space & Rocket Center, (b) The National Memorial for Peace and Justice, and (c) the Cooper-Lecture Series.

Alabama. While many of the students were familiar with these histories, the museums and their compelling visuals and data-rich exhibits provided a far deeper insight into these topics and facilitated further conversation between the REU cohort.

U.S. Space & Rocket Center

The first field trip of our REU was to the U.S. Space & Rocket Center in Huntsville, AL, with the 2019 REU cohort on this trip shown in Fig. 1a. While not connected to our REU site theme, this trip aimed to provide a common experience and shared activity to begin bringing the individual students into a cohesive group (i.e., 3 hours of round-trip travel in a 15-passenger travel van and 3-4 hours of space focused exhibitions and activities) prior to students launching their faculty mentored research. The Space & Rocket center features exhibits related to the space race, NASA placing a man on the moon, the international space station, and technological innovations of the space programs. This center provides details of the contributions from Alabama including rocket and propulsion development, international space station modules, and payload operations of the ISS being monitored 24/7 by the Marshall Space Flight Center in Huntsville. This site was selected because all of the REU participants have engineering or computer science backgrounds and were expected to share some level of enthusiasm for space flight. It was hoped this would serve as a common shared experience to bond the group and also facilitate familiarity with the site coordinators who attended with them.

Practicing Inclusive Engagement Workshop

To help prepare students for conversations about the racial injustice in American history (expected as a part of the next planned field trip), the REU cohort participated in a Practicing Inclusive Engagement (P.I.E) workshop facilitated by UA Crossroads. UA's Crossroads is a department within the Division of Community affairs that provides resources and opportunities for civic learning and democratic engagement through dialogue programs and engaged learning. The P.I.E. workshop aimed to build skills for intercultural engagement, which we expected would support the development of a more inclusive REU cohort and provide the tools to discuss topics of race and injustice in America. The 2-hour workshop engaged the cohort (10 students, 1 graduate research assistant, and 2 faculty) in interactive experiences focused on concepts of identity, practicing inclusive language, and creative ways to ask questions that invite and engage diverse perspectives. Both REU coordinators participated in the workshop to model for our REU participants that we highly valued these skills and were actively engaged in improving them ourselves. This workshop required participants to share their lived experiences, show vulnerability, and trust each other; behaviors and activities that are not often practiced or encouraged during regular STEM coursework and research.



Figure 2: a) Nkyinkyim installation by Kwame Akoto-Bamfo, b) commemoration of victims of lynching, and c) REU students during their visit to the National Memorial for Peace and Justice.

The Legacy Museum / The National Memorial for Peace and Justice

While the history of racial injustice in America was not the focus of our REU site, we felt our location in Alabama and the history of racial injustice in the state served as an opportunity to engage students in these topics. A field trip to the Legacy Museum and the National Memorial for Peace and Justice in Montgomery, AL was planned for this engagement. The National Memorial for Peace and Justice commemorates the Black victims of lynching in the United States. It is intended to acknowledge the history of racial terrorism in America and advocate for social justice. Similarly, the Legacy Museum displays and interprets the history of slavery and racism in America. While many of the students in our REU cohort were familiar with these histories, the museums and their compelling visuals and data-rich exhibits provided a far deeper insight into these topics. Students were given the space to engage with the museum and memorial site at their own pace and depth. Conversations on these topics and what students learned were encouraged and did develop organically during the visit, but there was not an active facilitation of conversations between the group. The REU group at this site are detailed in Figs. 1b. Further, Figure 2 details part of the Nkyinkyim installation at the memorial by sculptor Kwame Akoto-Bamfo and the victims of lynching in Tuscaloosa County commemorated at the site; visuals that students engaged with during their visit to this site.

The Cooper Lecture Series

The final professional development and social activity during our REU was the students' presentations of their summer research at a poster session integrated into the Cooper Lecture Series in Communicative Disorders. The Copper Lecture Series is a conference/workshop hosted annually by the Department of Communicative Disorders at UA to support the continuing education of SLPs in the state of Alabama. In 2019, this event focused on the theme "Getting to the Heart of the Conversation" and addressed the most-up-to-date, evidence-based means of achieving communication so that SLPs can facilitate conversant, functional, and employable communicators. The REU participants were able to attend the workshops and presented posters of their research results during the conference breaks (samples of the REU students and their posters are given in Fig. 3). This provided the opportunity for the students to practice communicating beyond their discipline and learn further about SLPs in Alabama. A panel of judges composed of engineering faculty, communicative disorders faculty, and SLPs rated each poster and presentation. The top-rated poster/presentation was then nominated (and accepted)

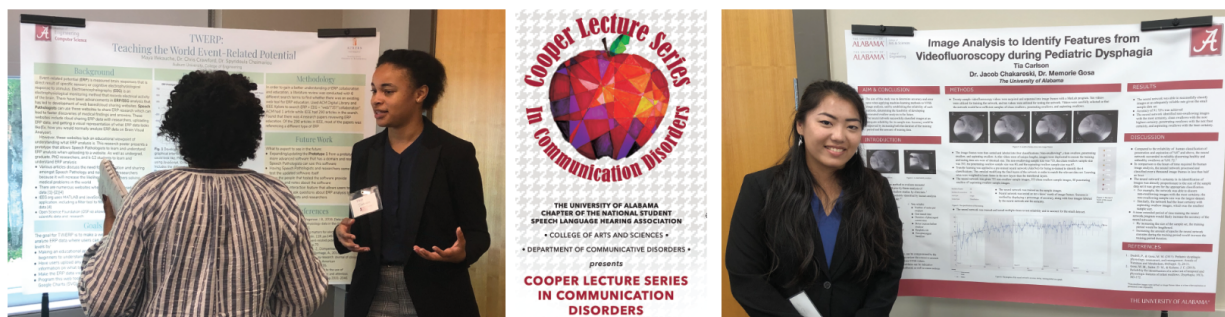


Figure 3: Students presenting their posters at the 2019 Cooper Lecture Series in Communicative Disorders.

for presentation at the Council of Undergraduate Research (CUR) sponsored Research Experiences for Undergraduates Symposium. This event in Alexandria, VA provides an opportunity for students to present their research results to other REU students and faculty from around the country. The CUR conference provided further incentive for students to polish and refine their posters/presentations. Following the day of workshops/presentations, a BBQ event was facilitated (food, yard games) to spur on friendly competition between REU and SLP graduate students to close-out the summer REU. This provided both groups an informal opportunity to debrief about the summer experiences.

Student Feedback Regarding REU Elements

On the last day of the program, REU students were invited to participate in an online survey assessing their opinions about participating in the REU. This survey was developed and administered by the program's external evaluators. The evaluators collected, analyzed, and summarized the results for the program coordinators. The specific questions and the distribution of responses focused on student satisfaction with the social activities and group dynamics in the program are detailed in Table 1. Generally, students were highly satisfied with mean ratings <2 for these specific questions (lower scores represent greater satisfaction).

Table 1: How satisfied are you with the following aspects of your REU experience? (n=8)						
	Extremely satisfied	Somewhat satisfied	Neutral	Somewhat dissatisfied	Extremely dissatisfied	Mean
REU Site program overall	5	3	0	0	0	1.38
Opportunities for social activities	4	3	1	0	0	1.63
Group dynamics in the lab/project environment	6	0	1	0	1	1.75
Organized group activities/field trips	3	3	2	0	0	1.88

Further questions regarding the amount of interactions and students expectations of continued interactions with their peers in the REU program are detailed in Table 2. Again, students reported that they had high levels of social interactions with their peers in the program (and expected to continue those interactions after the program ended). However, they reported lower interaction with other REU students at UA in different programs.

Table 2: Interactions with other REU students (n=8)						
	A Lot	Some	Very Little	None		Mean
How much social interaction did you have with other REU students in the speech program?	6	2	0	0		1.25
How much social interaction did you have with other REU students who were outside the speech program?	2	0	4	2		2.75
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
I anticipate that I will have continued interactions with other REU students after the completion of the program.	5	2	1	0	0	1.50

In the feedback survey students were asked to rank a series of 11 specific factors that may have contributed to their positive feelings about the program. Including the 11 factors plus “other,” students could rank the experiences from 1 (contributed the most to positive feelings) to 12 (contributed the least to positive feelings). From the mean ranks assigned, the “Learning new skills” factor was the most influential for positive feelings about the program. Next, the mean ranks showed that “Spending time with your peers” was the 2nd most influential factor contributing to positive feelings. This highlights the value that students place on the interactions with their peers towards a positive REU experience and why REU coordinators need to scaffold experiences to promote social activities within their programs. This also aligns with earlier reports by Straub about the importance of social programs in an REU [5].

In addition to the end of program online survey, a focus group with the participants (facilitated by the external evaluators) was conducted to solicit further details on the students’ experiences. A summary of discussions from the evaluators focused on the social, cultural, and conference activities are provided below:

- "Overall, the students were satisfied with the program and with the development of their research skills. They enjoyed learning about the research process and the opportunities for interface between engineering and speech pathology."
- "Although much of the content of presentations at the speech pathology conference they attended was beyond their understanding, the students appreciated the opportunity to present their research in the poster session of the conference and were gratified to find that the speech pathologists found the students’ research to be interesting and potentially quite useful."
- "[Students] also enjoyed the field trips and many social activities organized for them and by them, and they felt they had made friends with the other students and some graduate students. Students felt that the field trips and other social activities were fun. They enjoyed the trip to NASA’s [U.S. Space and Rocket Center], but felt they learned more on the field trip to the National Memorial for Peace and Justice in Montgomery."
- "The students described many spontaneous activities that the organized on their own, and they appreciated the fact that the graduate assistant made efforts to

organize social activities for them. They admitted that sometimes they were “too lazy” to go to some of these organized events. All of the students agreed that they had made life-long connections with each other, and most agreed that they had connected with their mentors and the graduate students in their labs.”

Lessons Learned and Future Plans

From our experiences in this REU site (and previous REU sites), we agree with Straub that successful REU social experiences do not happen by accident and require significant planning and scaffolding to execute [5]. However, this effort does contribute to a positive REU experience for the participants and is a great complement to the research activities these students engage in. By planning and organizing social activities, field trips, and professional development activities we were able to facilitate a positive REU experience for the student participants. Most significantly, the positive feedback regarding the learning at the National Memorial for Peace and Justice supports that cultural activities focused on challenging and uncomfortable histories can be thoughtfully integrated into STEM research programs. The preparation of students for these trips through activities to teach and practice inclusive communication is highly recommended for REU coordinators interested in adopting similar elements. These workshops are a benefit to not only the REU participants, but the coordinating faculty, and graduate students affiliated with the program.

In future iterations of our REU site, we aim to expand on the cultural activities related to racial injustice in American history and its legacy. There are multiple sites and activities available to engage students in these topics and facilitate further conversations. Locally in Tuscaloosa there are the civil rights history trail [9] and the Hallowed Ground Project [10,11] from Dr. Hillary Green. In Birmingham, there is the Birmingham Civil Rights Institute [12], which promotes understanding of the significance of civil rights developments in Birmingham. While our 2019 iteration focused on facilitating cultural trips, there is an opportunity to facilitate group discussions on these topics and their connection to STEM education in future iterations of this REU. Topics such as how the history of racial oppression contributes to the under-representation of racial groups in STEM and what STEM students and faculty can do in support of STEM diversity and inclusion efforts are important and can easily be built into debriefing sessions following the aforementioned field trips.

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. 1852161. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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