

Virtual Summer Research Program with Professional Development and Financial Literacy Training

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1. Introduction

There is minimal or no local internship opportunity in STEM fields in rural areas near a Texas A&M University-Kingsville (TAMUK), a Minority Serving Institution (MSI). Few STEM students get the opportunity to experience an authentic work environment before being thrust into the workforce after graduation. Exposing college students to research projects early in their academic careers has demonstrated strong evidence of improved student-persistence [1]. The National Academy of Sciences, Medicine, and Engineering states that students should develop their own project-based learning opportunities that are part of a team project effort [2].

To help STEM students increase their preparedness and readiness for their future careers, TAMUK offers a three-week summer research internship (SRI) program to TAMUK sophomore and junior students, and to community college students in the region. The SRI program aims to provide academic, professional and career preparation to the SRI participants. In Summer 2020, two three-week SRI programs were offered as 100% virtual programs due to COVID-19 pandemic. It was around late March 2020 when the decision was finally made to offer the SRI program virtually instead of canceling it, the project team was able to advertise the virtual SRI program within TAMUK and nearby community colleges. The project team cancelled the original application deadline (March 31, 2020), and decided to review and accept application on a rolling basis. By the middle of May 2020, 49 qualified applicants were accepted into the SRI program. The first virtual SRI program was held in June 2020 with 25 students, and the second one was in July 2020 with 24 students. All the SRI participants were offered a stipend after successfully completing the program.

After all the selected SRI participants signed their acceptance letters, they were given the SRI research project description and asked to ranked their top 3 preferred research projects through an online survey. Meanwhile, each faculty advisor provided a short list of preferred student academic background. Based on the students' preferences, the project team tried to assign qualified students to their preferred projects (either top 1 or top 2 option).

2. Program Design

In the SRI program, each team consists of 5 to 6 students (SRI interns), one faculty advisor, and one graduate student mentor. In each team, the SRI interns completed their team research internship project with guidance from a faculty advisor and graduate student mentor. Each team was required to submit weekly progress reports, a final poster and presentation, and a final project report. SRI interns were also required to complete personal financial literacy and professional development training aiming to secure an internship or full-time job. Figure 1 shows the overall structure of the SRI program in Summer 2020.

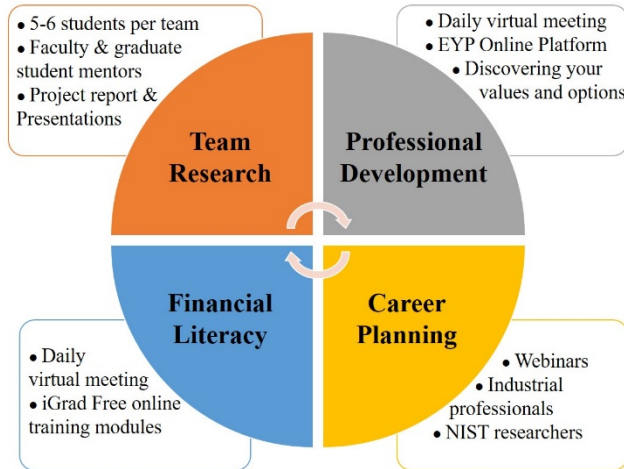


Figure 1: Overall Structure of the Summer Research Internship Program

The research internship projects were designed such that they could be completed virtually by each team. Each team meet with their faculty advisor and graduate student mentor as a group at least once per day for one to two hours. Each SRI intern worked individually or collaboratively every day to complete their assigned research tasks, while the graduate student mentor was available to meet virtually with SRI interns as needed to provide help. Five research projects were conducted in June 2020, and four of them were repeated in July 2020 with different groups of SRI interns. The fifth project was not repeated due to the lack of availability of the faculty advisor. Table 1 presents the list of SRI projects in Summer 2020.

Table 1: List of SRI Research Projects in Summer 2020

Project #	Project Title	Focused Areas
1	Analysis of Electrical Vehicle Charging Stations' Placement in Texas and Their Potential Use of Solar Energy	Renewable Energy, GIS
2	Use Data Science and Machine Learning to Better Understand COVID-19	Data Science, Machine Learning
3	Renewable Energy Generation Estimation Tool	Renewable Energy, Data Science
4	Development of An Air-Powered "Sheet" Actuator based on Engineering Origami Principles	Mechanical Eng., Design, 3D Printing
5	Design and Simulation of a Human Knee Joint	Biomechanics, Design, Simulation

The professional development activities in the SRI program were designed to reinforce the competitive attitude of the SRI participants with the objective of creating an enduring strategy for their professional careers. The exercises used from EYP [3] were designed to cover two major tasks:

- 1) Search into their personal goals and define the resources required to achieve those goals, and
- 2) Create an assertive strategy to define their objectives and the path that brings them closer to meeting their goals.

The professional development activities are intended to define and provide skills to the SRI participants to achieve their professional goals and objectives according to different circumstances. The SRI participants met with the project manager about one hour every day throughout the entire SRI program. Since the resume serves an essential tool to introduce the background and knowledge of the participants to prospective employers [4], the SRI participants first created, reviewed, and improved their resumes with the help from the project manager. In addition, the SRI participants conducted inner retrospective analyses, and explored their previous experiences that define them as a professional individual, which helped them to define their strengths and reinforce their opportunity areas. It helps the SRI participants to determine the resources that will support their professional careers. For the professional development activities, the participants reacted positively and were motivated, as they found important reasons that define them as professional individuals and reinforce the strategy to achieve the goals for their professional career. Therefore, the SRI participants were ready with accurate strategies to follow and achieve their own goals. The SRI program allows the students to develop their full potential of professional skills including leadership, communication, team collaboration, project management, and entrepreneurship that are currently lacking in the traditional STEM education. Industrial professionals and government officers were invited to offer weekly webinars during the SRI program. The webinars focused on career preparation and planning, time and project management, and career opportunities in STEM fields. Finally, all the SRI participants were required to complete six online personal financial literacy training modules that took about 4 to 6 hours in total, including 1) budgeting, 2) behavioral finance, 3) scholarships, 4) repaying student loans, 5) federal student loans, and 6) using credit cards responsibly.

3. Program Evaluation and Assessment

Quantitative and qualitative data were collected through pre-/post- participation surveys. Out of 49 SRI participants, we received 43 complete responses. Table 2 shows the demographic data of the 43 SRI participants.

Table 2: Demographic Data of 43 Survey Participants

Male/Female	Hispanic/Non-Hispanic	Community College	Sophomore	Junior	Senior
24/19	39/4	11	4	17	11

First of all, more than 90% of the SRI participants rated their overall experience as Very Good or Excellent in the post-survey. More than 90% of the SRI participants considered most SRI program components Valuable (V) or Very Valuable (VV), including

- “Research Experience” (V-25%, VV-70%),
- “Faculty Mentoring” (V-20%, VV-72%),
- “Working with other SRI Participants” (V-30%, VV-63%),
- “Program Orientation Day (first day)” (V-28%, VV-65%),
- “Professional Development Training” (V-22%, VV-70%),
- “Personal Financial Literacy Training” (V-35%, VV-58%),
- “Final Project Presentation” (V-32%, VV-60%), and
- “Final Project Report” (V-40%, VV-51%).

About 80% of SRI participants considered “Graduate Student Mentoring” as Valuable (26%) or Very Valuable (53%). Although that score is a little bit lower than the other components, it is very important to have a graduate student mentor helping the faculty advisor, especially in the virtual environment. The graduate student was able to meet with the SRI participants every day, and was available about averagely 4 hours per day to answer their questions.

Furthermore, SRI participants were asked to rank their confidence levels in 28 different tasks/skills in both pre- and post- surveys, including research and communication skills, professional development skills, and financial literacy knowledge/tasks. By comparing the answers in the pre- and post- surveys, significant increases in the confidence levels were observed in the following tasks/skills:

- 1) Finding an internship or job in STEM fields;
- 2) Marketing their skills during job hunting;
- 3) Creating a budget and financial plan;
- 4) Communication skills including making technical presentations and writing a report
- 5) Formulating a research question and planning a research project; and
- 6) Working collaboratively.

Since it was challenging to include the research project, professional development training, and financial literacy training together in the three-week virtual program, we also asked SRI participants’ feedback about the amount of time assigned for each activity. About 80% of the SRI participants considered all three activities had the right amount of time assigned to them, while about 10% of the SRI participants suggested increasing the amount of time assigned to each activity. The rest 10% of SRI participants were either not sure or thought that the amount of time assigned was too much. Overall, the project management team thought the design and time assigned to each activity was adequate.

4. Discussion

The SRI program was originally designed as in-person program. However, within two months, the project management team was able to modify the program design to pivot to the virtual environment due to COVID-19 pandemic. While the virtual environment presented a challenge to keep students motivated and spirit consistently positive, it also served as a perfect training opportunity for work ethic, responsibility, and accountability.

Through the Summer 2020 virtual SRI program, the project management team learned several important lessons to run a virtual summer research program. It is very important to have a clear and consistent program schedule. Most of our SRI daily activities were scheduled at the same time every day. Clear and frequent communication with the participants is imperative before the program starts, to discuss the program design and emphasize the responsibilities of the participants. Open and smooth communication is also necessary among the project management team, faculty advisors, graduate student mentors, and SRI participants throughout the program. Software and other technology needs should be prepared in advance, especially in a virtual program, to avoid any unnecessary delay in the research progress. Finally, in order to maintain the students’ focus on the assigned tasks, virtual meetings should not be scheduled for longer than two hours.

Although the virtual environment is a big challenge, it also brings some opportunities and benefits. First, it allows us to recruit participants from a much bigger student pool without increasing the program expenses. Second, it allows us to invite more guest speakers through webinar format, who otherwise may not be available for the in-person seminars. Last, it is actually easier to run the virtual program without in-campus lodging and meal arrangements. Summer 2020 was the first time running SRI program. Compared with other similar summer research programs offered as in-person programs before COVID-19 pandemic, the impacts of the virtual SRI program on the student participants were same or even better than previous in-person programs, which was unexpected. The project team will continue running the SRI program virtually in Summer 2021 based on the experience and lessons learned from Summer 2020 SRI program.

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