TB-B2B
STEM TRANSFER
BRIDGE TO BACCALAUREATE

National Science Foundation Louis Stokes Alliance for Minority Participation

Tampa Bay Bridge to Baccalaureate Alliance Undergraduate Research Experience

2019-2020 St. Petersburg College Student Research Projects

This material is based upon work supported by the National Science Foundation under Grant No. 1712738. Any opinions, findings and 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.

SPC St. Petersburg College

Table of Contents

About the Tampa Bay Bridge to the Baccalaureate Undergraduate Research Experience Report

The Tampa Bay Bridge to the Baccalaureate (TB-B2B) Program provides resources and support to St. Petersburg College (SPC) Science, Technology, Engineering, and Mathematics (STEM) students as they work to achieve their 4-year STEM degree. The program is grant funded by the National Science Foundation (NSF) as part of the Louis Stokes Alliance for Minority Participation (LSAMP).

A goal of the NSF LSAMP TB-B2B grant, is for each College in the TB-B2B alliance to provide undergraduate research experiences (UREs) to students during their first and second years of undergraduate studies. Final reports of each URE conducted at SPC during 2019-20 are contained within this document.

SPC TB-B2B students who attended conferences, completed internships and Research Experiences for Undergraduates, visited local employers, received scholarships, and participated in a NASA Kennedy Space Center Tour during 2019-20, are also featured in this document.

Similarly, recent accomplishments of SPC TB-B2B students who completed UREs in 2018-19 are included within. We are pleased to acknowledge these students' continued achievements, and recognize that the long-term benefits of student participation in UREs are far reaching.

<u>Background</u>

Prior to the start of each semester in 2019-20, TB-B2B enrolled students who had not yet completed a research project, were informed that 8-week research opportunities within their STEM major were available during the following semester, and included a paid stipend of $250. Interested students were provided the name of a professor in their field, and were directed to schedule a meeting with the professor to discuss their research interests. SPC's URE Model is provided in Appendix A.

Three St. Petersburg College TB-B2B students participated in 8-week UREs within their field of interest during 2019-20. Students received their stipend after all research project requirements were met at the conclusion of the eight weeks, including the completion of a final report. UREs included research projects in two categories, Microbiology, and Robotics Technology.

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Undergraduate Research Experiences (UREs)

Listed below are the names of three students who completed UREs with guidance from St. Petersburg College professors in two STEM disciplines, and submitted the final reports contained within this document.

Microbiology UREs conducted with Professor Shannon Ulrich, PhD

- Sandra Davis *Antibiotic resistance of bacteria found at water treatment facility*
- Maia Hassan *Correlation between microplastics and bacteria count in water samples*

Robotics Technology URE conducted with Professor Dawn Ellis, MS

- Mikeal Rodriguez *Creating a Robotics Camp in a Box Featuring a Maze-Navigation Robot*

State and National Conferences

Thirteen SPC TB-B2B students participated in seven state and national conferences during 2019-20. Student names, conference attended, dates and location are listed below.

- Larissa Federmann and James Fernandez – Emerging Researchers National Conference, February 2019, Washington DC
- Lionel Plaisance IV - Community College Cyber Summit, July 2019, Shreveport/Bossier City, LA
- Edward Cole and Ramiro Garcia - Minority Access Incorporated, September 2019, National Harbor, MD
- Alexandria Johnson and Alena Waller - Louis Stokes Midwest Regional Center of Excellence, October 2019, Indianapolis, IN
- Sandra Davis - Florida Branch of the American Society for Microbiology Annual Meeting, October 2019, Clearwater Beach, FL
- Cristian Benito and Ramiro Garcia - Society of Hispanic Professional Engineering Convention, November 2019, Phoenix, AZ
- Cristian Benito, Adelle Bradley, Valensca Charles, Sandra Davis, Maia Hassan, and Mikael Rodriguez - Emerging Researchers National Conference, February 2020, Washington DC.

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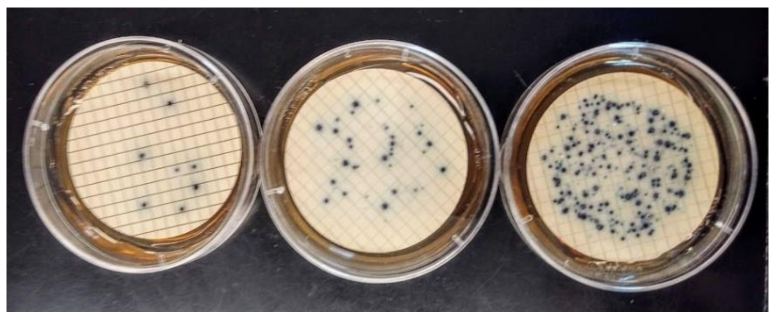
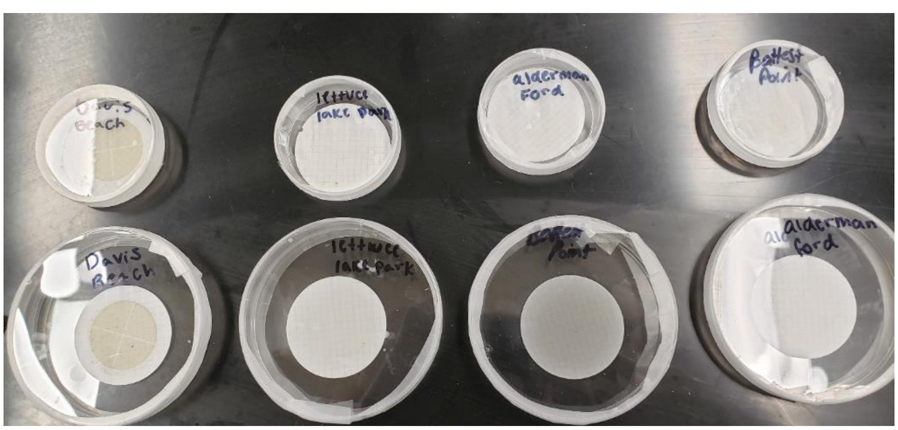
NSF

Microbiology Research Projects



	Isolate No.									
Antibiotic	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Chloramphenicol	24	26	25	24	24	28	23	18	18	25
Ampicillin	0	0	0	0	0	24	0	0	0	0
Gentamycin	9	22	13	9	16	11	15	7	9	8
Streptomycin	0	0	0	0	8	11	8	0	0	11
Vancomycin	22	22	22	23	22	23	22	17	18	22



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Tampa Bay Bridge to Baccalaureate (TB B2B) STEM Program Student Research Final Report

Name: Sandra Davis **Professor:** Shannon Ulrich, PhD
Date: 11/25/2019

Outline of Responsibilities

- Attending a weekly microbiology research meeting Wednesdays from 3:30-4:30 PM
- Performing primary literature research and/or laboratory experiments
- Meeting with Professor Ulrich on a weekly basis for status updates and determination of the following week's goals
- Complete compiled report of the research/activities done each week (e.g. results observed, assumptions, and/or conclusions, learning achieved)

Weekly Reports & Data

Week 1: Spoke with Dr. Ulrich by phone to discuss research project objective to test for Vancomycin-Resistant *Enterococcus* (VRE) in sewage obtained from the water treatment facility. Researched enterococci and VRE for background and preparation of lab work.

Week 2: Toured the lab and equipment. Prepared growth medium for bacteria (mEI and MH agar).

Week 3: Prepared 20 mEI agar and 20 MH agar petri dishes. Diluted raw sewage collected from South Cross Bayou Water Reclamation Facility with phosphate-buffered saline (PBS). Plated diluted samples using the membrane filter technique on the mEI agar.

Week 4: Counted colony growth and used 4 quadrant streak method to grow isolated *Enterococcus* on MH agar (Table 1 and Figure 1).

Table 1. Enterococcus counts on dilution plates.

Strength of Dilution	Number of Colonies
10^{-1} (least diluted)	143
10^{-2}	30
10^{-3} (most diluted)	8

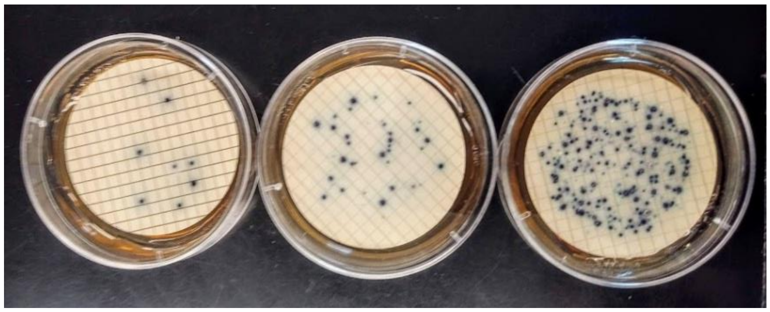

Figure 1. Enterococci growth on mEI agar at 10^{-3} (left), 10^{-2} (middle) and 10^{-1} (right).

Week 5: Ten individual colonies were selected from the mEI plates and aseptic technique was used to isolate bacteria from the plate (Figure 2). Bacteria was also grown in trytic soy broth (TSB) for subsequent assays (Figure 3). All media was incubated at 37°C for 48 hours.

Figure 2. Four quadrant streak method used to isolate enterococci colonies from mEI agar.

Figure 3. Tryptic soy broth tubes containing bacterial colonies from mEI agar.

Week 6: Growth in broth was indicated by cloudiness (turbidity). Ten isolates were tested for antibiotic susceptibility. Bacterial cultures were swabbed onto the entire surface of a MH agar plate. Antibiotic disks placed were placed on the surface of the plate to determine susceptibility of the presumptive enterococci (Figure 4). The 5 different antibiotics used included: ampicillin, Streptomycin, Gentamycin, Chloramphenicol, and Vancomycin.

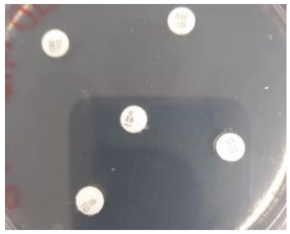

Figure 4. Bacterial culture swabbed onto MH agar and antibiotic discs were placed on the surface of the agar.

Week 7: The diameter of the zone of inhibition was measured around each disc to determine the bacteria's resistance to the specific antibiotic (Figure 5). The values were compared results to the manufacturer's Kirby-Bauer Antibiotic Sensitivity Guideline Chart (Table 2).

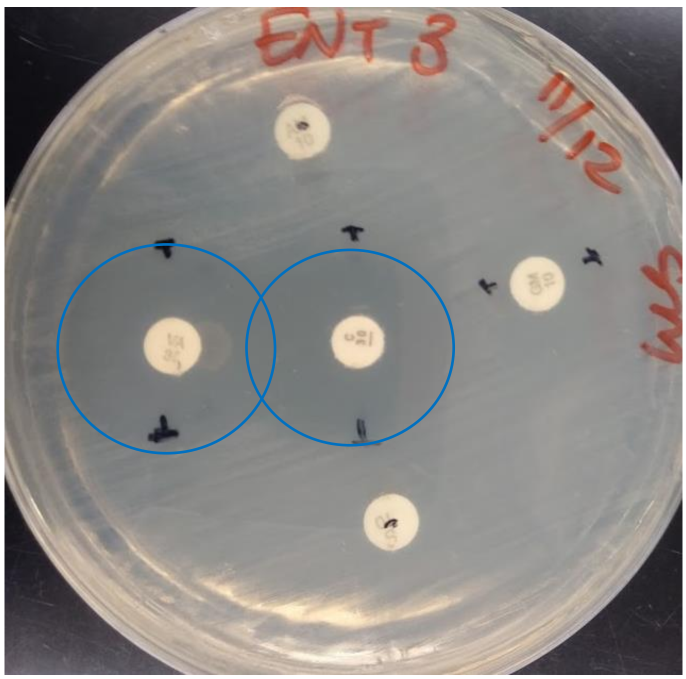

Figure 5. Examples of the zones of inhibition measured for the isolates from mEI agar.

Table 2. Measurements of zone of inhibition in millimeters across 10 different plates. The same 5 antibiotics were tested on each plate. Red highlight indicates a resistance to the indicated antibiotic. Green highlight indicates susceptibility to the indicated antibiotic.

	Isolate No.									
Antibiotic	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Chloramphenicol	24	26	25	24	24	28	23	18	18	25
Ampicillin	0	0	0	0	0	24	0	0	0	0
Gentamycin	9	22	13	9	16	11	15	7	9	8
Streptomycin	0	0	0	0	8	11	8	0	0	11
Vancomycin	22	22	22	23	22	23	22	17	18	22

Conclusions

The data shows the raw sewage sample collected from South Cross Bayou Water Reclamation Facility did not contain Vancomycin Resistant *Enterococcus*. However, all samples showed resistance to the antibiotic streptomycin and all but plate 6 were resistant to ampicillin. Gentamycin had mixed results with 6 resistant isolates. Chloramphenicol and vancomycin showed the strongest inhibitory effects on the enterococci with the largest average zones of inhibition as compared to the Kirby-Bauer antibiotic sensitivity chart.

Techniques Utilized

Microbiological techniques learned:

- Media preparation
- Aseptic techniques
- Aseptic sample collection
- 4 quadrant streak plating
- Purity plating
- Data analysis/excel use

Protocols Utilized

PROTOCOL – mEI Agar Preparation

1. Measured ingredients at a ratio of 72g of powder to 1 L of distilled water.
2. Mixed until dissolved using a magnetic stir bar.
3. Placed mixture in autoclave (121°C for 15 mins).
4. Added solution of nalidixic acid.
5. Added triphenyltetrazolium chloride.
6. Poured 20 plates and let solidify.

Tampa Bay Bridge to Baccalaureate (TB B2B) STEM Program
Student Research Final Report

Name: Maia Hassan **Professor:** Shannon Ulrich, PhD
Date: 2/25/2020

Outline of Responsibilities

- Attending a weekly microbiology research meeting Tuesdays from 3:30-4:30 PM
- Performing primary literature research and/or laboratory experiments
- Meeting with Professor Ulrich on a weekly basis for status updates and determination of the following week's goals
- Complete compiled report of the research/activities done each week (e.g. results observed, assumptions, and/or conclusions, learning achieved)

Weekly Reports & Data

Week 1: 1/12/2020 - 1/14/2020

In week one water was collected and filtered for trial one of the research. One sample of 25 ML was collected from the shoreline of each park, within the span of a few hours on 01/12. The parks were as follows; Alderman ford park, the sample was taken from an offshoot of the Alafia river in plant city Florida. Ballast point park, here the sample was taken from the Tampa bay. Lettuce lake park, the sample was taken directly from the Hillsborough river. The final sample was taken from Ben T Davis beach located in the old Tampa bay, in Clearwater Florida. The parks were very diverse, and all had varying degrees of water salinity and human populations around the sample site.

Two days after collecting the water samples they were filtered via membrane filtration using Aseptic techniques discussed more in detail in the protocol utilized portion of this report. 10 mL were filtered for micro plastics and 10 mL were filtered for bacteria counting. All samples were placed at 4^{o}C until counted.

Week 2: 1/20/2020

Week two consisted of identifying microplastics in the water samples taken during week one. The night before analyzing the samples, research was done to see exactly what microplastics look like in water samples, when viewed under a microscope. Organic matter can look very similar to plastic. Unlike organic matter, microplastics do not contain cellular structure, fibers are equally thick and uniform in color.

When counting microplastics the original plan was to only count four grid squares on the filter, however when zoomed in 100 times with the microscope, there still were not many fibers of microplastic, so a decision was made to count the plastics on the entire filter.

Week 3: 01/31/2020

During week three of the project, the colonies of bacteria found on the samples taken prior, were counted. Filters were placed on mannitol salt agar (MSA) and incubated at 37ºC for 24 hours. Filters used for microplastic enumeration were placed into sterile petri dishes and stored at 4ºC until counted. Samples were plated on January 28th, 2020.

The data varied widely between samples. For consistency purposes two samples were plated from each water source, and one of the two samples was labeled with a star. Due to the number of bacteria colonies, only the top right quarter of the filters were counted. All the colonies were able to be counted apart from Davis beach, which was labeled "TNTC" to numerous to count.

Figure 1 bacteria sample set one

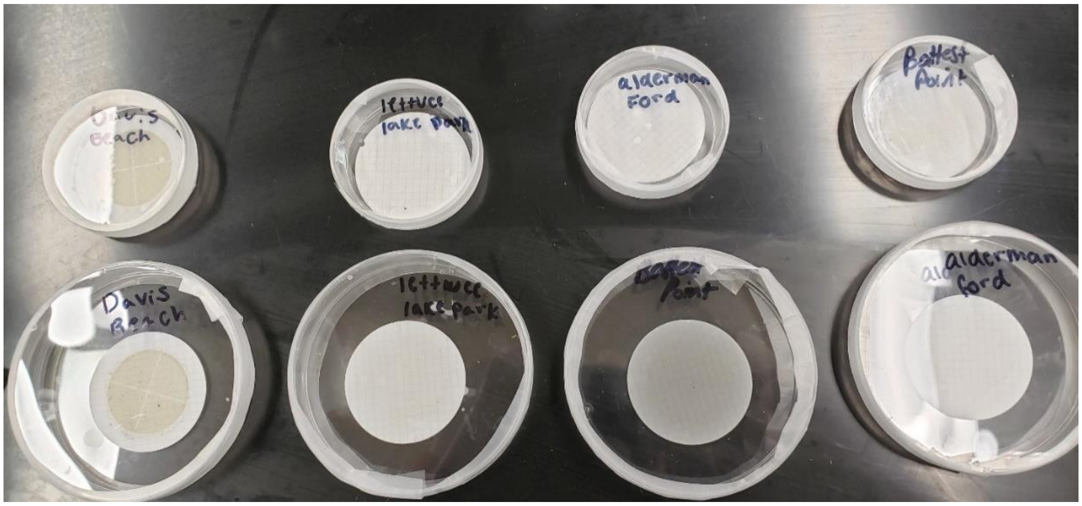

Figure 2 microplastic sample set one

Week 4: 02/02/2020 - 02/04/2020

Week four consisted of water collection and filtering of sample group two. The same protocol was followed as sample set one, with a few changes made. A larger sample was taken from the water sources, one liter instead of 25 mL and the samples were kept in a cooler with ice, instead of kept at room temperature.

This week the water collected was also filtered for microplastics and bacteria, using membrane filtration, the same way as the first sample. 100 mL of water were used to collect microplastics and one mL was used to filter for bacteria. Three samples of bacteria were taken.

Week 5: 2/11/2020

During week five, the bacteria and microplastics in sample set two were counted using the same protocol as sample set one. Heavy rain the day prior to collecting water samples, and a difference in the amount of water filtered meant the results were different then sample set one. It was decided to filter less water for bacteria counting was taken. There were also three samples for bacteria taken, each was labeled 1-3. The hope was changing the amount of water would make it easer to count the plastics, because there were not many on the first samples. Each microplastic filter was labeled with the park name and a number 1-4.

Park name	Microplastics (sample group 1)	Microplastics (sample group 2)	Bacteria (sample group 1)	Bacteria (sample group 2)
Alderman Ford park	none	2	**Sample 1***- 47 **Sample 2-** 45	**Sample 1**- 42 **Sample 2**- 54 **Sample 3**- 52
Ballast point park	5	none	**Sample 1***- 20 **Sample 2**- 56	**Sample 1**-TNTC **Sample 2**- TNTC **Sample 3**- TNTC
Davis beach	8	**7**	**Sample 1***- TNTC **Sample 2-** TNTC	**Sample 1**- 50 **Sample 2**- 55 **Sample 3**- 51
Lettuce lake park	4	None	**Sample 1***-70 **Sample 2** -60	**Sample 1**-9 **Sample 2**-9 **Sample 3**-15

Data table

Week 6: 02/18/2020

This week, no testing was done, but conclusions were drawn, research was organized, and reports were written.

Conclusions

From the data it can be concluded that there is a direct correlation between microplastics count and bacteria count in the water samples collected. Between sample set one and two there was a period of heavy rain which changed the expected trend of microplastics and bacteria, even then the data showed the more bacteria in the water, the more likely there will be microplastics in the water.

Techniques Utilized

Microbiological techniques learned:

- Aseptic techniques
- Membrane filtration
- Enumeration of bacterial colonies
- Enumeration of microplastics
- Data analysis/excel use

Protocols Utilized

PROTOCOL – Membrane filtration

1. Wash and disinfect all materials
2. Vortex the samples for 10 seconds
3. Peel paper off filter and place grid side up into apparatus without touching it directly
4. Vacuum filter each sample
5. Remove filter, and place it into a sterile Petri dish

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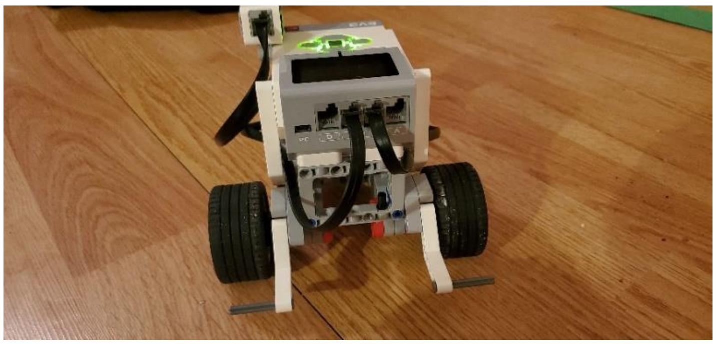
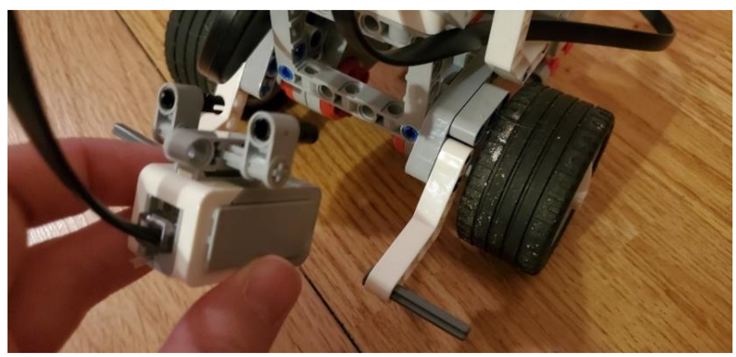
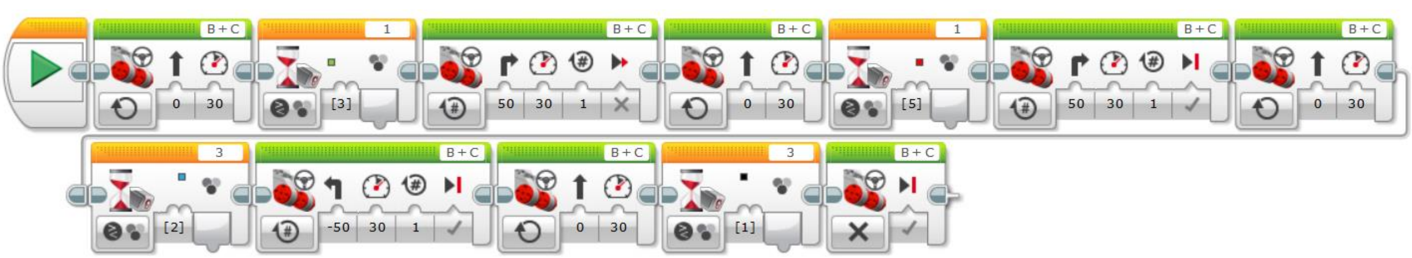
Technology
Research Project







Tampa Bay Bridge to Baccalaureate (TB B2B) STEM Program Student Research Final Report

Name: Mikeal Rodriguez-Clark **Professor:** Dawn Ellis, MS
Date: 5/8/2020

Creating a Robotics Camp in a Box Featuring a Maze-Navigation Robot with LEGO Mindstorms EV3

Abstract

The goal of this project was to develop a robotics camp in a box for middle school students utilizing the LEGO Mindstorms EV3 platform. The initial aim of the project was to develop a mobile weather-station robot which the students could use to collect and analyze atmospheric data, however the sensor required for the project was found to be incompatible with the EV3 programming environment. As such, the project pivoted to a maze-navigating robot utilizing color sensing. The goal was to design a robot which could navigate a maze utilizing only the color sensor. This was made possible by assembling the driving base and adding a downward facing color sensor to the driving robot. With a downward-facing color sensor, the robot can be programmed to change directions when it drives over certain colors. A maze can then be constructed for the robot to navigate by placing flat, adhering color prompts on the ground along the course. In developing this project, strips of colored paper taped to the floor were utilized as color prompts, however other materials such as colored tape or paint can also be used. Issues arose when the sensor picked up trace amounts of its prompting color from the neutral floor material, or failed to read certain shades of its prompting color; care must be taken to test the sensor both with the neutral floor of the maze being constructed and the color prompts being utilized and adjust the colors used in the program appropriately. Another issue that may arise with the sensor is the robot moving too quickly to read the prompts. If smaller prompts are being used, the speed of the robot's motors may have to be adjusted to move slower. If you are using larger prompts, the robot can be programmed to move faster. For the initial test, strips of paper 3 inches long were used as color prompts, which was suitable for speed values up to 50. After adjusting the colors used in the program so that only the color prompts would be read, and finding the appropriate speed for the size of prompt utilized, the robot was able to successfully navigate a maze involving three 90 degree turns with the provided code. This project provides students with a foundation for programming the EV3 platform to navigate via sensors. While the sensors and programming of the EV3 platform are much simpler than those used in autonomous navigation, this project introduces students to concepts utilized in autonomous navigation and the design of autonomous vehicles.

Getting Started

1. Begin by assembling the driving base. This project utilizes the EV3 platform's default driving base with one small addition to house the sensor. Simply follow the instructions included in the physical booklet or in the Building Instructions page of the LEGO MINDSTORMS program (see fig. 1)

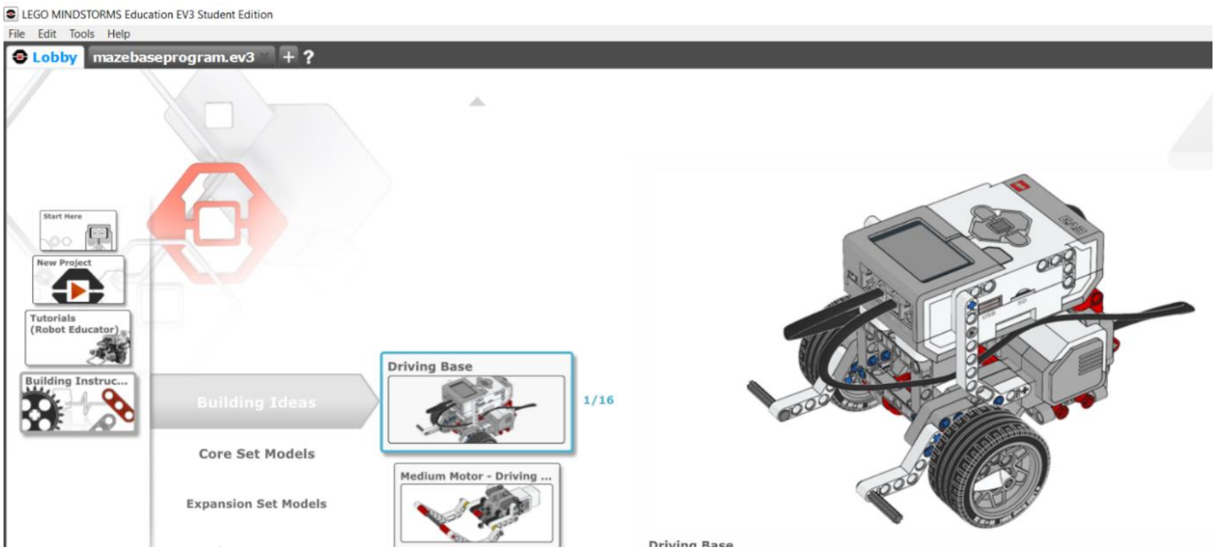


Figure 1.

2. Once we have our driving base assembled (see fig. 2) we must create the sensor attachment. For this we need the color sensor and the pieces shown (see fig. 3)

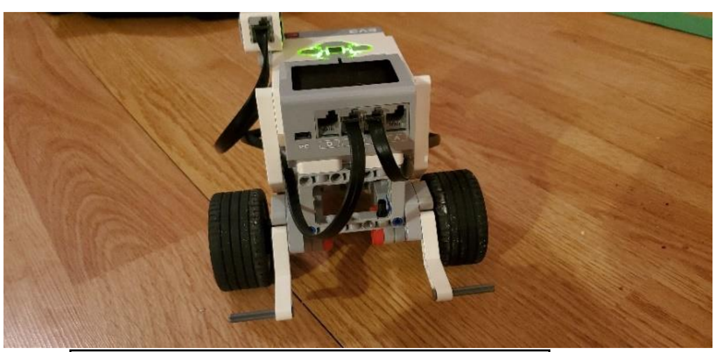


Figure 2.

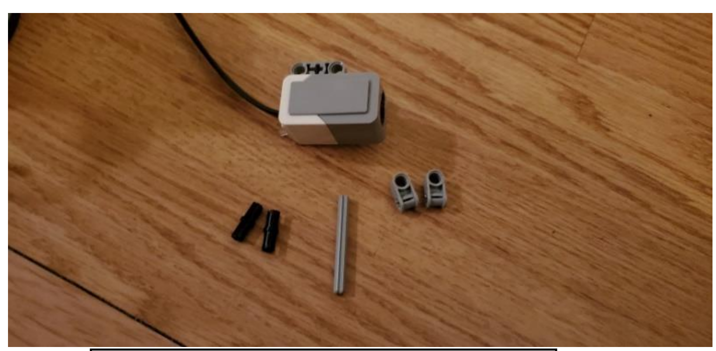


Figure 3.

3. Assemble the attachment by sliding the bar through the central socket on the sensor (see fig. 4)

Figure 4.

4. Fit the pegs into the socket pieces as shown in fig. 5, then attach socket pieces to the ends of the bar as shown in fig. 6.

Figure 5.

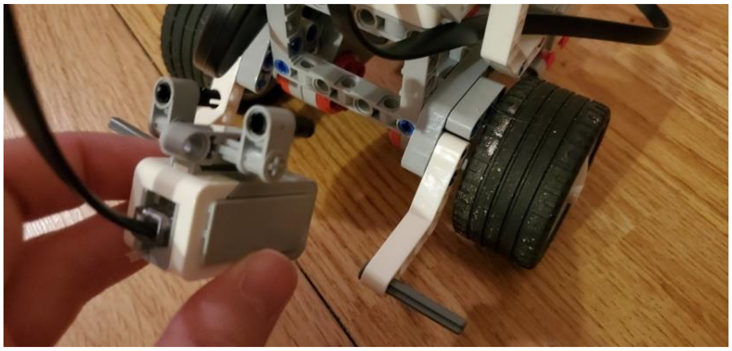


Figure 6.

5. Connect the sensor attachment to the front of the driving base, sensor facing downward, and connect the sensor cable to the EV3 brick (see fig. 7)

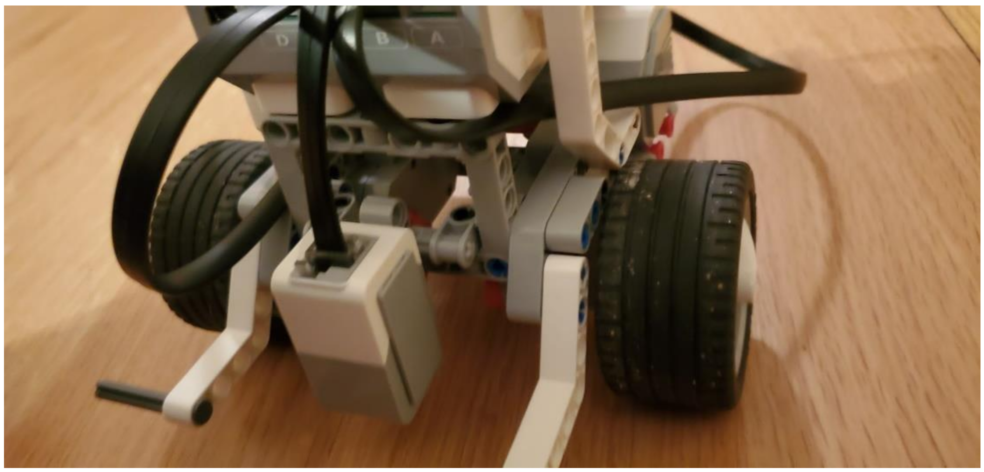


Figure 7.

6. Now that your robot is assembled, it's time to design a maze! In figure 8 is a simple sample maze featuring three color prompts. Keep in mind that you may have to change the prompting color if your color sensor is picking up the same color from your maze floor. Use this sample as a springboard, but get creative! The robot can be programmed to have many more than 3 prompts and is capable of turns up to 360 degrees.

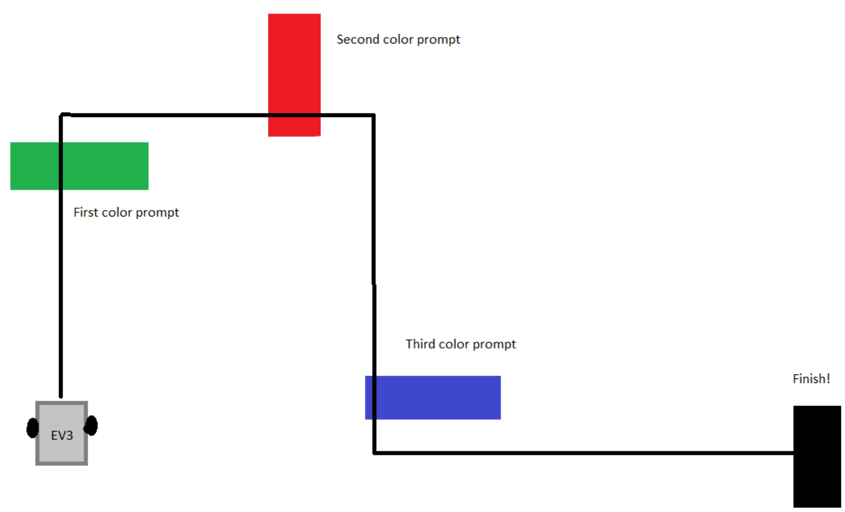


Figure 8.

7. We now have everything we need to begin programming the robot. Connect the EV3 brick to your PC, start a new project in the LEGO MINDSTORMS software and begin coding by dragging, dropping and attaching blocks as shown in figure 9. Use a combination of the green move steering programming blocks and orange wait for color programming blocks to make your robot navigate by color!

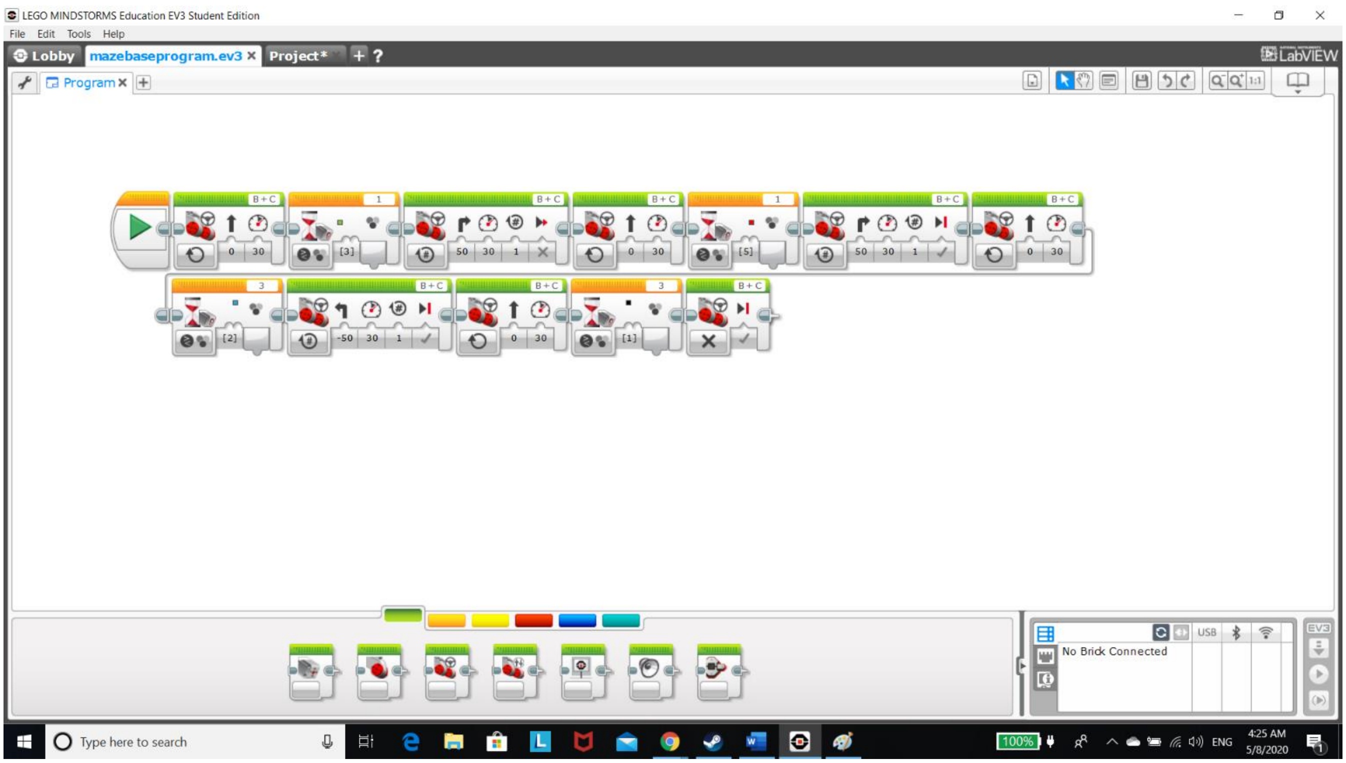
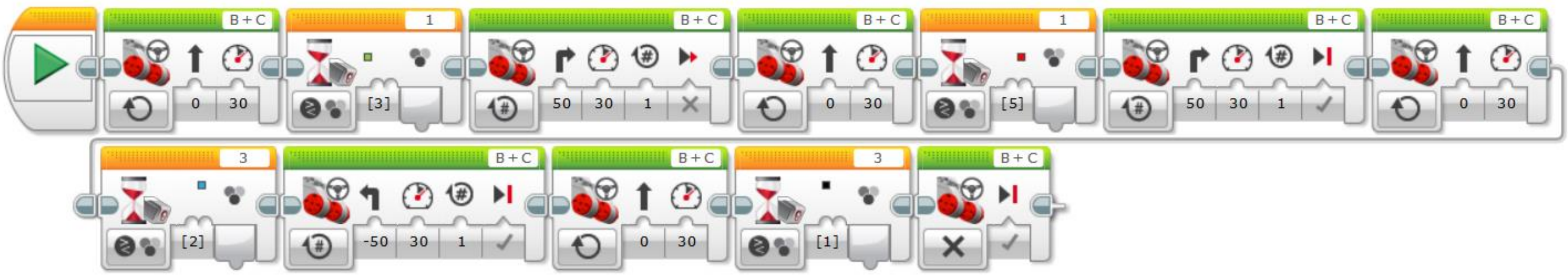


Figure 9.

8. Once finished, hit the download and run button in the lower right corner of the programming screen to run your new program. As you experiment with your color-navigation robot, you may need to adjust the values of your programing blocks. The move steering block allows you to adjust the speed, degree of turn, and motion of your robot. The wait for color block simply tells the robot that it will perform the following action only when it senses the required color. This allows you to steer the robot with color prompts placed on the floor.

Sample Code



This is a code sample that corresponds to the design of figure 8. Essentially, this program tells the robot to drive forward until it detects the color GREEN. When the robot detects GREEN, it will make a 90 degree turn to the right and then continue driving forward until it detects the color RED. When the robot detects RED, it will make another 90 degree angle turn to the right, and continue straight until it detects BLUE. When the robot detects BLUE, it will make a 90 degree angle turn to the left and continue driving straight until it detects the BLACK finish line. Once the robot detects BLACK, it will stop.

TB-B2B Student Participants Internships, Research Experience for Undergraduates, and Scholarships

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Internship Announcement

Ramiro Cabanas Garcia has received an invitation to attend the NASA Community College Aerospace Scholars (NCAS) Onsite Experience at NASA's Kennedy Space Center in Kennedy Space Center, FL on March 23-27, 2020.

Ramiro currently attends St. Petersburg College, and is enrolled in the Tampa Bay Bridge to the Baccalaureate (TB-B2B) Program. His application to participate in NCAS was accepted in fall 2019, but that was just the beginning! Next, Ramiro completed an intense 5-week online course, which ultimately resulted in this prestigious all-expense paid invitation to attend the NASA Community College Aerospace Scholars (NCAS) Onsite Experience for five days.

Unfortunately, the NCAS Onsite Experience was cancelled due to COVID-19.

Ramiro was subsequently invited to attend the NASA Community College Aerospace Scholars (NCAS) Virtual Onsite from Monday, August 24 to Thursday, September 3, 2020. NCAS which will provide Ramiro with a unique competitive online experience. Below is the schedule and meeting times provided for the NCAS Virtual Onsite Experience.

Meeting Name	**Date**	**Time**
Orientation	Monday, August 24, 2020	10:30 a.m.-12:30 p.m. CDT
Subject Matter Expert Talk	Tuesday, August 25, 2020	1-2 p.m. CDT
Resume Workshop	Thursday, August 27, 2020	1-2 p.m. CDT
Careers Presentation	Friday, August 28, 2020	1-2 p.m. CDT
NASA Internships	Monday, August 31, 2020	1-2:30 p.m. CDT
NCAS Alumni/NASA Intern Panel	Tuesday, September 1, 2020	1-2 p.m. CDT
Final Presentations	Wednesday, September 2, 2020	11 a.m.-noon CDT
Closing Ceremonies	Thursday, September 3, 2020	3-4 p.m. CDT

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continued…

Below is Garcia's account of the work he completed.

On September 3rd, 2020, I completed the NASA Community College Aerospace Scholars (NCAS) Virtual Experience. It was a two week long NASA online activity where I worked with a team and NASA employee to present a proposition for a mission to the Moon. The event started on Monday, August 24, with an opening ceremony. Throughout the course of nine days, the NCAS organization provided us with a variety of resources, presentations, and speakers. We also had a Networking and Resume Workshop, a STEM Career Presentation, an Internship Presentation, an Intern Panel, and astronaut Serena M. Aunon-Chancellor was at our closing ceremony.

Throughout the week, I worked with a diverse group of people on a presentation for our Moon Mission Proposition. We called it the Tangaroa Mission, and I was the propulsion engineer, in charge of selecting the rocket, nosecone, and retrorockets.

It was a very fun experience virtually working on a group project with people that were very far away. The communication was challenging, mostly because of bad internet connections, but my team managed to work through it and did not let it slow us down. Our NASA Mentor, Mr. Clyde Sellers was of tremendous help. He was kind, patient, and honest about our work. My teammates were very cooperative and responsible. I have never worked with such a nice flowing team before, it was probably the most enjoyable group project I have ever done yet.

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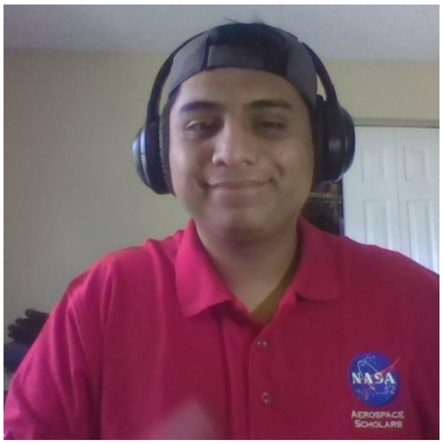
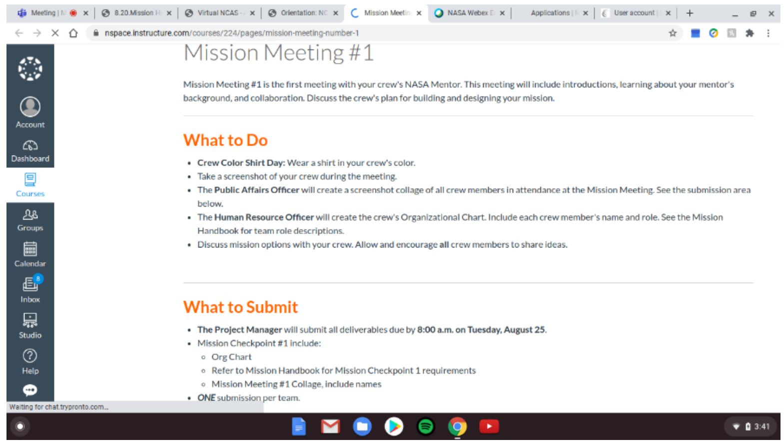
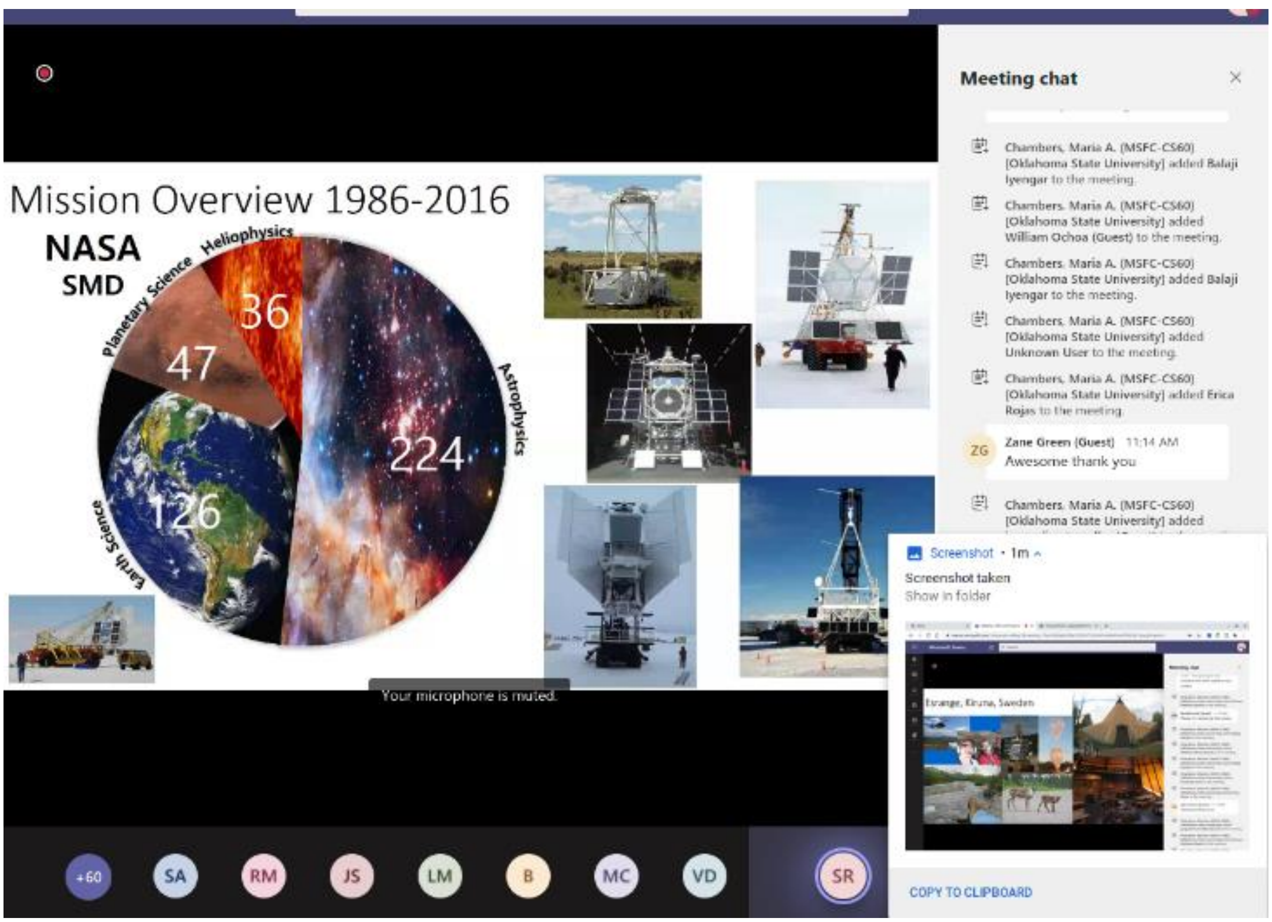
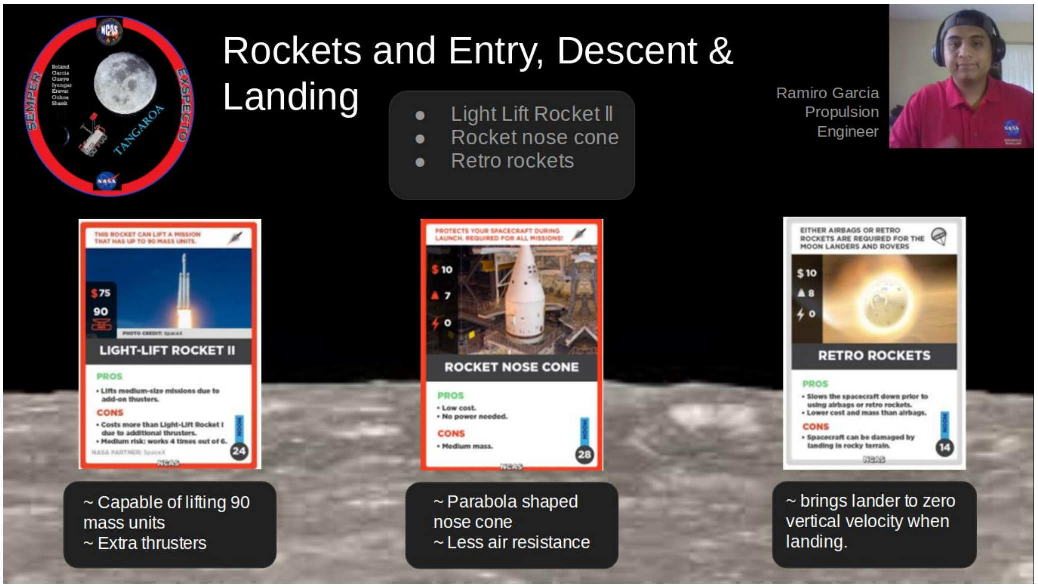
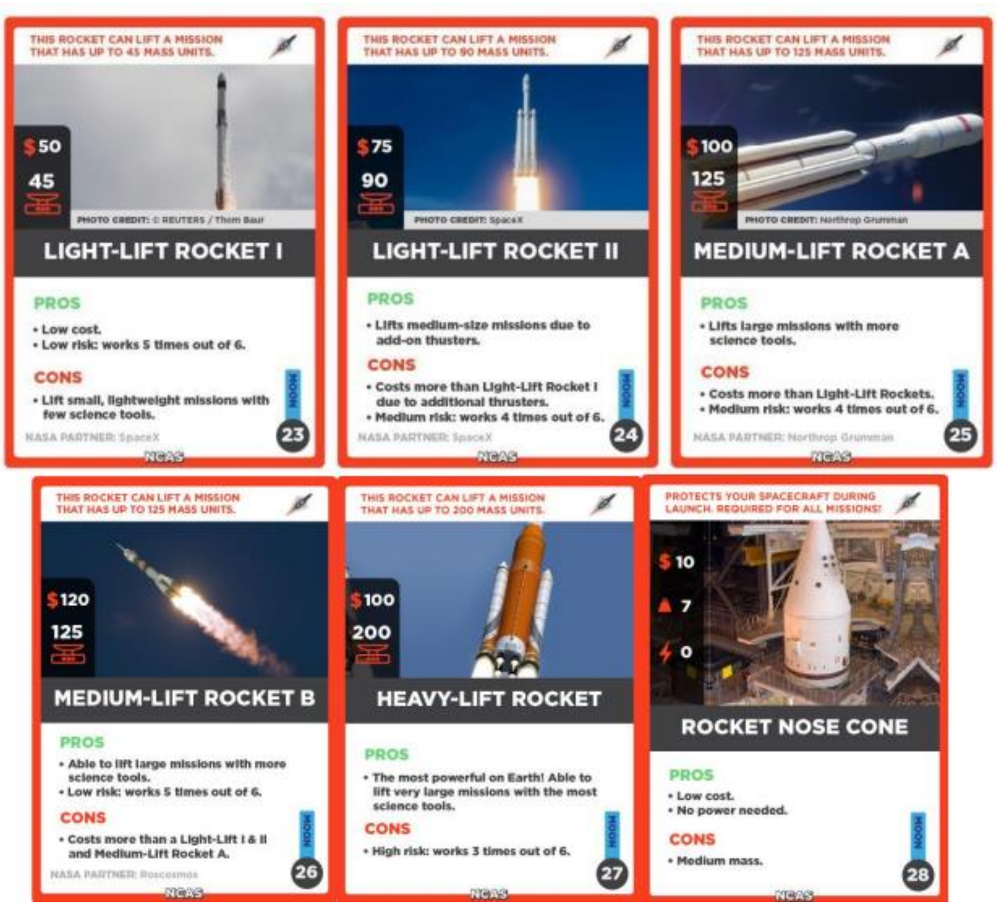



Mission Meeting #1
Mission Meeting #1 is the first meeting with your crew's NASA Mentor. This meeting will include introductions, learning about your mentor's background, and collaboration. Discuss the crew's plan for building and designing your mission.
What to Do
Crew Color Shirt Day: Wear a shirt in your crew's color.
Take a screenshot of your crew during the meeting.
The Public Affairs Officer will create a screenshot collage of all crew members in attendance at the Mission Meeting. See the submission area below.
The Human Resource Officer will create the crew's Organizational Chart. Include each crew member's name and role. See the Mission Handbook for team role descriptions.
Discuss mission options with your crew. Allow and encourage all crew members to share ideas.
What to Submit
The Project Manager will submit all deliverables due by 8:00 a.m. on Tuesday, August 25.
Mission Checkpoint #1 include:
Org Chart
Refer to Mission Handbook for Mission Checkpoint 1 requirements
Mission Meeting #1 Collage, include names
ONE submission per team.


Mission Overview 1986-2016
NASA
SMD
Heliophysics
Planetary Science
Earth Science
Astrophysics
36
47
126
224
Your microphone is muted.
Meeting chat
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added Balaji Iyengar to the meeting.
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added William Ochoa (Guest) to the meeting.
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added Balaji Iyengar to the meeting.
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added Unknown User to the meeting.
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added Erica Rojas to the meeting.
ZG
Zane Green (Guest) 11:14 AM
Awesome thank you
Chambers, Maria A. (MSFC-CS60) [Oklahoma State University] added
Screenshot • 1m
Screenshot taken
Show in folder
COPY TO CLIPBOARD
+60
SA
RM
JS
LM
B
MC
VD
SR



Rockets and Entry, Descent & Landing
Light Lift Rocket ll
Rocket nose cone
Retro rockets
Ramiro Garcia
Propulsion
Engineer
LIGHT-LIFT ROCKET II
ROCKET NOSE CONE
RETRO ROCKETS
~ Capable of lifting 90 mass units
~ Extra thrusters
~ Parabola shaped nose cone
~ Less air resistance
~ brings lander to zero vertical velocity when landing.



THIS ROCKET CAN LIFT A MISSION THAT HAS UP TO 45 MASS UNITS.
$50
45
PHOTO CREDIT: © REUTERS / Thom Baur
LIGHT-LIFT ROCKET I
PROS
• Low cost.
• Low risk: works 5 times out of 6.
CONS
• Lift small, lightweight missions with few science tools.
NASA PARTNER: SpaceX
23
THIS ROCKET CAN LIFT A MISSION THAT HAS UP TO 90 MASS UNITS.
$75
90
PHOTO CREDIT: SpaceX
LIGHT-LIFT ROCKET II
PROS
• Lifts medium-size missions due to add-on thusters.
CONS
• Costs more than Light-Lift Rocket I due to additional thrusters.
• Medium risk: works 4 times out of 6.
NASA PARTNER: SpaceX
24
THIS ROCKET CAN LIFT A MISSION THAT HAS UP TO 125 MASS UNITS.
$100
125
PHOTO CREDIT: Northrop Grumman
MEDIUM-LIFT ROCKET A
PROS
• Lifts large missions with more science tools.
CONS
• Costs more than Light-Lift Rockets.
• Medium risk: works 4 times out of 6.
NASA PARTNER: Northrop Grumman
25
THIS ROCKET CAN LIFT A MISSION THAT HAS UP TO 125 MASS UNITS.
$120
125
MEDIUM-LIFT ROCKET B
PROS
• Able to lift large missions with more science tools.
• Low risk: works 5 times out of 6.
CONS
• Costs more than a Light-Lift I & II and Medium-Lift Rocket A.
NASA PARTNER: Roscosmos
26
THIS ROCKET CAN LIFT A MISSION THAT HAS UP TO 200 MASS UNITS.
$100
200
HEAVY-LIFT ROCKET
PROS
• The most powerful on Earth! Able to lift very large missions with the most science tools.
CONS
• High risk: works 3 times out of 6.
27
PROTECTS YOUR SPACECRAFT DURING LAUNCH. REQUIRED FOR ALL MISSIONS!
$10
7
0
ROCKET NOSE CONE
PROS
• Low cost.
• No power needed.
CONS
• Medium mass.
28

Internship Announcement

Hambric Edwards
6/30/2020
CGS2940

During my time as an intern at CEI enterprises I engaged in plentiful activities. As interns our first few weeks were mostly spent on setting up our local environment to host the application natively, for me this included downloading Laravel, importing the local project and configuring the application to work with my already existing AMP (Apache, MySql, Php) stack, lastly updating my DB with the last live update of the website.

After successfully setting up the live environment and hosting the application through Laravel's production server I as well as the other interns where having a great deal of trouble with bugs in the application. After a meeting we were given some code to add to our local projects in hopes of rectifying the situation, which it did end up helping a great deal. Afterward each intern was assigned a different project to work on mine being a shopping cart application. My learning objective was to build some useful code to add to GitHub portfolio and this seemed like a very fitting assignment.

For the rest of my time as intern I researched the code base and possible solutions to my task of creating a shopping cart service that persists through session storage. I had many informative sessions with my supervisor while going over the code base and discussing possible implementations for the shopping cart, I learned a great deal about Laravel and session storage through my research. Although I did not implement a working shopping for the website for me the internship was still a great experience, and the expectations I mentioned in my learning objectives were more than met.

Announcement – March 4, 2020
CMaT Research Experience for Undergraduates
University of Georgia

Cristian Benito Elias was selected to participate in the Cellular Manufacturing Technologies (CMaT) Research Experience for Undergraduates (REU) program during summer 2020 at the University of Georgia. This is a 10-week full-time summer research program that provides students the opportunity to work in a lab conducting research under the guidance of a graduate student or postdoctoral mentor, with a faculty member overseeing the project.

Although the University of Georgia suspended the onsite REU program due to COVID-19, Elias subsequently accepted an invitation to complete a virtual CMaT REU program during summer 2020. Below is Elias' account of the work he completed.

Throughout the REU I worked with a mentor, Daniel Shaw who is a graduate student at the University of Georgia (UGA). He was part of Dr. Cheryl Gomillion's Lab. Dr. Gomillion's lab focuses on the development of complex and multi-functional tissue-engineered systems. Basically, I examined a part of the body, say a broken bone, and studied the interactions of cells, molecules, tissues and so on that allow it to heal, using engineered biomaterial to aid or enhance the process.

More information can be found on the UGA website at:
https://gomillionlab.engr.uga.edu/index.php/research/areas-of-focus/

The REU project that I worked on with Daniel was called "**Bioreactor Optimization for Mesenchymal Stromal Cell (MSC) Expansion & Culture**". A bioreactor is a vessel where we grow and mature stem cells to become specific cells such as bone, fat, tissue, or neural cells.

MSCs are stem cells that are found in the bone marrow of adults. They can be harvested from a patient or can be bought from certain companies that have the cells (similar to HeLa cells used in the medical field). There are low amounts found in the bone marrow, so this is where bioreactors can be used. Under the right conditions, you can differentiate the cells and then extract them and redo the cycle until you have the amount necessary for your application. But the "right conditions" are subject to the type of cell you want. Since the project was mainly about creating more MSCs, we focused on the optimal conditions for them to grow. Also, since there are many different types of bioreactors, choosing one also depends on the cells you want, along with how many you need.

continued…

Dr. Gomillion's lab previously employed a graduate student who worked on designing and creating a bioreactor, and we were tasked with optimizing the design via mathematical computations. Since this was a virtual REU, there was limited data so we had to make a simple model and make lots of assumptions. The bioreactor was one where there was a continual flow of media (fluid where the cells grow in) like a loop. The cells adhered to a flat circular "dish" placed on the bottom.

As the media flowed in from the top, the cells would experience some stress as the fluid would flow over them while providing essential nutrients and removing waste that was later filtered out. This stress is essential since the amount of stress, or shear stress the cells experienced can also determine the type of cells they become.

For this project, we looked at providing optimal shear stress of 1 pa to the MSCs for best outcomes.

To achieve the desired shear stress, we modeled the media as being water at 37 degrees Celsius and going through a 90-degree miter bend as it encountered the surface of the "dish". From there we found the necessary fluid velocity needed for the cells to experience the desired shear stress. We also found the velocity needed to overcome the 90-deg. bend to have sufficient shear stress. From there we had to develop a channel so the fluid would have sufficient velocity from the inlet at the top of the bioreactor. We also had to find the needed fluid velocity and the associated flow rate at the inlet of the channel. The project is fully documented within the final poster presentation.

[Final Poster Presentation]()

As a small aside, the REU lasted for 6 weeks. The first week was more of an introduction and focused on getting to know my mentor and PI. The next 2 to 5 weeks were spent working on the project, and the last week was devoted to getting an oral and poster presentation finished.

I dedicated about 1.5 weeks to reading papers on the use of bioreactors, stem cells, MSCs, the secretome, etc., reading about 20 to 25 papers. During another week I learned about fluid mechanics and worked problems, and the remaining weeks were focused on the project.

CMaT also offered professional development sessions as well, along with sessions tailored for graduate school students, such as applying to the NSF Graduate Research Fellowship and what to expect. In my opinion, UGA and CMaT conducted a great REU program.

Scholarship Announcement

In March, the Tampa Bay Bridge to Baccalaureate (TB-B2B) program submitted a proposal to the SPC Foundation in an effort to provide financial support in the form of scholarships to B2B STEM students who were within the last few credits of completing their degrees. Often times with STEM degree programs, students exceed the 60-credit total while earning their Associates, due to state-mandated prerequisites that are necessary for transfer to the 4-year college or university of their choice.

Under-represented minority (URM) students who are enrolled in STEM career fields experience more challenges than other student populations. Financial support is one of the obstacles these students encounter while completing their education.

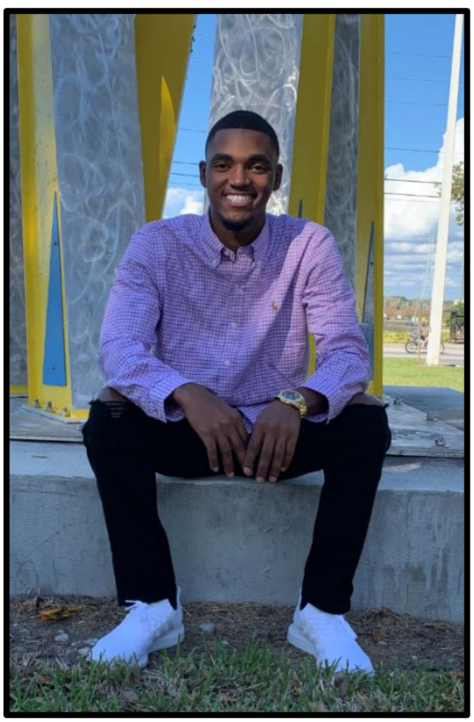
The SPC foundation approved the proposal, which allowed the TB-B2B program to award a "Homestretch" summer scholarship to 5 students, in the amount of $1,120 to each student selected. Students who were nearing completion of their degrees were selected to ensure that they had the necessary financial assistance to finish strong.

Four of the five students who received the Homestretch scholarship share their thoughts below.

Adelle Bradley

"First and foremost I would like to say thank you so very much for this opportunity to learn and challenge my final percentage within my degree. I appreciate everything that the B2B program has done for me while working towards my degree!"

Adelle has been working diligently towards completing her AS degree in Computer Networking and getting closer to graduating. She is also an SPC employee, working as a Technical Support Specialist.



KeAndre Chisom

"I would like to thank the foundation, NSF and B2B for this Scholarship. This scholarship has not only helped me during this hard time with COVID-19 but it has also given me a chance to indulge further into my academics. College is not easily accessible for some and I am very thankful that I have been able to not only attend college, but to work towards a degree and graduate!

I am currently working towards my Master's Degree and any bit of financial support is great. I feel that the B2B program has helped me so much through past semesters and I believe that without this program, I wouldn't have gotten this far or have any of the networking skills that I have learned from the B2B program. The advisors are great and the foundation is even better.

Again, thank you for this opportunity!"

Ke'Andre earned his Associates in Arts in Architecture Engineering, and is completing courses in the Associates in Science for Building Design and Construction Management, so that he can transfer to USF.

Hambric Edwards

"I would like to thank you for the honor of being a recipient of the Bridge to Baccalaureate Scholarship. In light of current world events a helping hand with tuition is a great relief during a difficult time. I plan to make the most of this opportunity."

Hambric graduated, and is pursuing a BAS degree in Technology Development & Management, at SPC.

Tara Wasson-Olden

"Thank you so much for the generous Tampa Bay Bridge to Baccalaureate scholarship. I was very happy and appreciative to learn that I was selected as the recipient of for this B2B scholarship. I can't wait to continue improving the lives and longevity of people with my STEM degree. Thank you B2B and NSF!"

Tara is currently pursuing an AS degree in Biotechnology Lab Technology.

TB-B2B Student Participants Conferences and Field Trips

TB-B2B

STEM TRANSFER

BRIDGE TO BACCALAUREATE

Emerging Researchers National Conference, February 2019, Washington DC

St. Petersburg TB-B2B students, James Fernandez and Larissa Federmann (front), and other TB-B2B Alliance members enjoyed dinner in town, after attending the Emerging Researchers National Conference.

Larissa graduated and transferred to the University of South Florida, where she is pursuing a BS degree in Biology.

SPC TB-B2B student, Ramiro Garcia met Dr. A. James Hicks, Director LSAMP 20th Minority Access Incorporated, September 2019, National Harbor, MD.

SPC TB-B2B students, Edward Cole and Ramiro Garcia attended the Minority Access Incorporated Conference, September 2019, National Harbor, MD.

St. Petersburg College TB-B2B student, Sandra Davis participated in the Florida Branch of the American Society for Microbiology Annual Meeting, October 2019, Clearwater Beach, Florida.

Sandra graduated and is currently pursuing a BAS in Sustainability Management, at SPC.

TB-B2B

STEM TRANSFER
BRIDGE TO BACCALAUREATE

SPC B2B students, Cristian Benito and Ramiro Garcia attended the Society of Hispanic Professional Engineering Convention, November 2019, Phoenix, AZ.

Cristian graduated from SPC in spring 2020, and is pursuing a BS degree in Biomedical Engineering at USF.

SPC St. Petersburg College

TB-B2B
STEM TRANSFER
BRIDGE TO BACCALAUREATE

St. Petersburg College TB-B2B students, Alexandria Johnson and Alena Waller attended the Louis Stokes Midwest Regional Center of Excellence, October 2019, Indianapolis, IN.

Alexandria graduated and transferred to the University of South Florida, where she is pursuing a BS degree in Mathematics.

SPC St. Petersburg College

TB-B2B
STEM TRANSFER
BRIDGE TO BACCALAUREATE

NSF

St. Petersburg College TB-B2B students, Cristian Benito, Adelle Bradley, Valensca Charles, Sandra Davis, Maia Hassan, and Mikael Rodriguez attended the Emerging Researchers National Conference, February 2020, Washington DC.

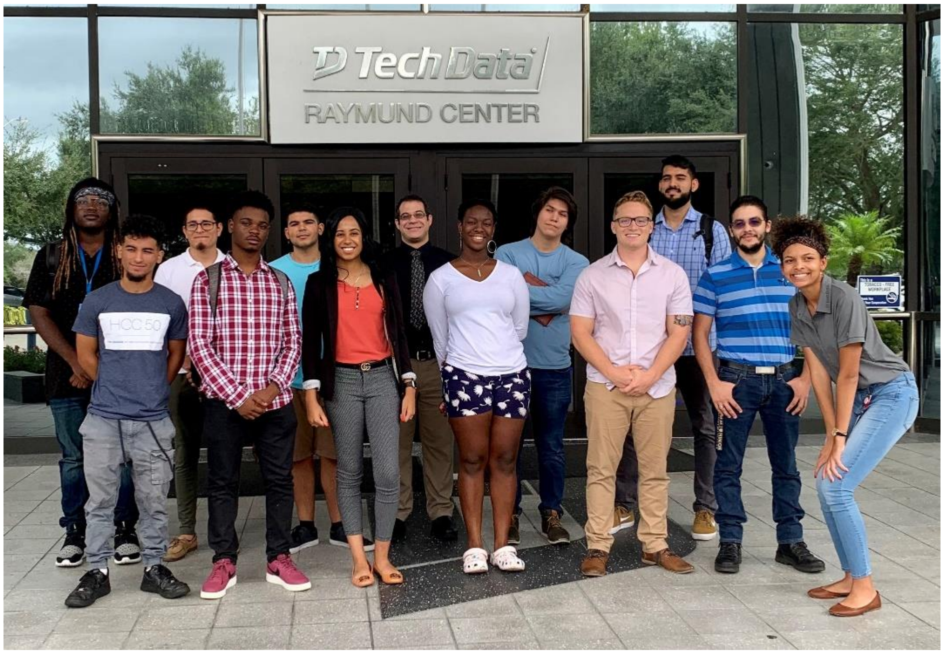
The SPC group joined TB-B2B students from other colleges in the TB-B2B Alliance.

SPC St. Petersburg College

TB-B2B

STEM TRANSFER
BRIDGE TO BACCALAUREATE

NSF



St. Petersburg College TB-B2B students together with TB-B2B students from HCC and SCF, visited Tech Data, one of the world's largest technology distributors, during July 2019. The Tech Data information sessions included insight on internships, scholarships and employment opportunities.

SPC TB-B2B students together with TB-B2B students from HCC and SCF participated in a NASA Kennedy Space Center Tour during October 2019. NASA scientists and engineers provided career insights and life stories; and discussed NASA scholarships. and internships.

SPC St. Petersburg College

Recent Accomplishments of 2018-19 URE Participants

TB-B2B
STEM TRANSFER
BRIDGE TO BACCALAUREATE

NSF

St. Petersburg College TB-B2B student, Lionel Plaisance presented at the National Community College Cybersecurity Summit (3CS).

Lionel graduated, and is pursuing a BAS degree in Technology Development & Management, at SPC.

Lionel continued his URE research related to *Hosting a Cybersecurity capture the flag event (CTF) at SPC*, and accepted an invitation to present at the National Community College Cybersecurity Summit (3CS) in Louisiana in summer 2018.

SPC St. Petersburg College

TB-B2B

STEM TRANSFER
BRIDGE TO BACCALAUREATE

NSF

St. Petersburg College TB-B2B student, Alexandria Johnson is a math major and had initially considered a career as an actuary. After completing a URE, she attended a B2B-sponsored event at Moffitt Cancer Center where she met Dr. Renee Brady, an Integrated Mathematical Oncology researcher. Alex was intrigued by the use of mathematics in medicine and decided to research internship opportunities.

Alexandria graduated and transferred to the University of South Florida, where she is pursuing a BS degree in Mathematics.

In summer 2018, Alexandria completed an internship at Moffitt Cancer Center and worked on a project related to Intermittent Androgen Deprivation Therapy for Prostate Cancer. This research seeks to predict how a patient will respond to therapy by computing thousands of mathematic iterations. The power to predict responses to various treatment techniques such as drug scheduling in chemotherapy, immunotherapy and radiotherapy may result in improvements that minimize patients' side effects and complications.

Alexandria said she really enjoyed her internship, particularly on Fridays when all the Moffitt researchers would meet to collaborate on their projects. "I really enjoyed hearing from the Patient Advocates. It is their job to represent the patient's individual needs and feelings." Alex said. "It helped me keep my perspective – it is easy to get caught up in the Mathematics equations, but there is a human side to consider."

SPC St. Petersburg College

Contact Information

Please address any questions or comments regarding this report to:

Magaly Tymms, MA
Co-Principal Investigator NSF LSAMP TB-B2B Grant
Institutional Effectiveness Director
St. Petersburg College, P.O. Box 13489, St. Petersburg, FL 33733
(727) 341-3195
Tymms.magaly@spcollege.edu

Appendix A

St. Petersburg College

SPC Academic Effectiveness

National Science Foundation Louis Stokes Alliance for Minority Participation (LSAMP) Tampa Bay Bridge to Baccalaureate Alliance (TB-B2B)

Undergraduate Research Experience (URE) Model

Purpose: A goal of the National Science Foundation Louis Stokes Alliance for Minority Participation (LSAMP) Tampa Bay Bridge to Baccalaureate Alliance (TB-B2B) grant, is for each College in the TB-B2B alliance to provide undergraduate research experiences (UREs) to students during their first and second years of undergraduate studies.

Background: In 2018, St. Petersburg College (SPC) developed and implemented a model for providing undergraduate students at SPC with UREs. The model was shared with other institutions within the TB-B2B alliance.

Undergraduate Research Experience Model:
The model includes a 'Student Research Commitment and Agreement' form which was developed to ensure consistency, accountability, student learning outcomes, and impartiality across all STEM Degree Majors (See Appendix A).

The learning activities (highlighted bullets) in the 'Student Research Commitment and Agreement' are revised by faculty based on the respective research project agreed upon by faculty and student during their first meeting. Submitting a compiled report (last bullet) of the research/activities completed each week, including results observed, assumptions, and/or conclusions, learning achieved, etc., is a required component of every research project. A research report submitted by a B2B student in 2018 is presented in Appendix B.

Communications:
Several weeks before a semester begins, Tier 1 B2B students who have not yet completed a research project, are informed that 8-week research opportunities within their STEM major will be available during the following semester, and will include a paid stipend of $250.

Faculty members who teach within the various STEM programs and have expressed a desire to conduct student research projects are contacted throughout the year, to ensure that sufficient faculty are available to conduct student research each semester.

Students who respond stating they are interested and available to complete a research project, are provided the name of a faculty in their field, and are directed to schedule a meeting with the faculty to discuss their research interests as well as the faculty member's research interests. During a student's first or second meeting with the faculty, the research project and learning activities are agreed upon, the learning activities are included in the agreement form, and the form is signed by both faculty and student.

March 2019 Undergraduate Research Experience Model developed by Magaly Tymms 1

TB-B2B
STEM TRANSFER
BRIDGE TO BACCALAUREATE

St. Petersburg College
SPC Academic Effectiveness

Student Research Dissemination:
Each of the student research reports submitted at the conclusion of the respective research project will be included in an Annual B2B Student Research brochure, and shared with students, faculty, and the Alliance partners.

Throughout the year, students who have completed a research project will be encouraged to present their findings at local and national conferences. Students will receive guidance to develop poster presentations, and funding provided for travel and accommodations as available.

St. Petersburg College

SPC Academic Effectiveness

Contact Information

Please address any questions or comments regarding this evaluation to:

Magaly Tymms, M.A.
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St. Petersburg College
SPC Academic Effectiveness

Appendix A

STEM TRANSFER
BRIDGE TO BACCALAUREATE

Congratulations! You have been offered a Student Research opportunity in the TB B2B STEM program.

Timeline: 8-week Session (March 25 – May 3)

Upon completing the learning activities listed below, you will receive a $250 stipend.

- Attending a weekly microbiology research meeting Tuesdays from 4:00-5:00PM
- Performing primary literature research and/or laboratory experiments
- Meeting with Professor Ulrich either by phone or in person on a weekly basis for status updates and determination of the following week's goals
- Completing compiled report of the research/activities done each week (e.g. results observed, assumptions, and/or conclusions, learning achieved)

Note that the stipend may be subject to taxes, and student financial aid may be affected.

Do you wish to "**Accept**" or "**Decline**" this opportunity?

- [x] Accept
- [ ] Decline

I fully understand that to receive the $250 stipend, I must complete the activities listed above during the 8-week period of March 25 – May 3. If I am unable to be present for any mandatory activity, I will alert Professor as soon as I am aware.

Please sign below attesting to your understanding and agreement of these requirements.

--- ---

Student Professor

St. Petersburg College is committed to equal access/equal opportunity in its programs, activities, and employment. For additional information visit www.spcollege.edu/eaeo/. St. Petersburg College is an Equal Opportunity Employer.