STOCKTON UNIVERSITY
ANNUAL REPORT FOR
2020 INITIATIVES PROJECT

PROJECT LEADER(S):	Peter Straub, Tara Luke, Norma Boakes, Pam Cohn, Jason Shulman, Melissa Zwick
PROJECT TITLE:	Student Spaceflight Experiments Program Learning Community
DATE:	7/1/2018
CC:	

- *The boxes below expand as needed to accommodate your notes. You may also include/submit appendices or attachments, if needed.*
- *Email a copy of this completed form to Jessica Kay, Data Analyst & Assistant to the Chief Planning Officer at: **jessica.kay@stockton.edu***

Please provide a summary of the project and your experience.

This project provides an authentic research competition to undergraduate students with the goal of generating enthusiasm for students in Science, Technology, Engineering and Mathematics (STEM) disciplines. Students engaged in experimental design and testing with small groups and faculty mentors to advance microgravity research proposals through a two-stage review process to select a winning experiment that will be tested on the International Space Station. Students participate in analyzing the experiment on return to earth and presenting results at the National Student Spaceflight Experiments Program Conference. This project has supported Mission's 11 and 12 of the SSEP and the team is currently engaged in Mission 13.

Mission 12 launch, June 29, 2018 at 5:42 AM carrying Stockton student research to the International Space Station. Photo credit: NASA.

Please attach a copy of your original proposal or list your stated objectives and expected outcomes.

Learning: Primary- Deliver high value-added learning experiences and promote scholarly activity (S1).
Secondary- Strengthen internal processes to support learning (IP1-L).
Secondary- Develop faculty and staff skills to support learning (ER1-L).

Engagement: Secondary- Foster an interactive environment among students, faculty, staff and community (ER3).
Expected outcomes: Increase student enthusiasm for STEM and undergraduate research. Increase community awareness of space science.

Please describe the results of your project and compare them to your original expectations. Elaborate on how well your objectives were met and how they might have changed. Note any particular obstacles that may have prevented your achieving full satisfaction on desired outcomes.

The project has been very successful to date and has additionally been supported by the Stockton STEM Collaborative and the School of Natural Sciences and Mathematics and fundraising. The instructors led 26 students in the GNM 2800 Student Spaceflight Experiments independent study course for Mission 11 in fall 2016. These students produced 11 collaborative student proposals to study physical, biological and chemical systems in microgravity conditions. A review panel of Stockton Professors rated and picked the three semi-finalist proposals. These were forwarded to the national SSEP review panel where one proposal "Spores in Space: The Effects of Microgravity on Endomycorrhizae," was selected for flight to the International Space Station (ISS). Five students worked on the conditions to optimize and prepare the final parameters for flight approval over the spring 2017 semester. During this period, Dr. Melissa Zwick administered assessment instruments to gauge student enthusiasm and participation in the project. She found positive effects on learning enthusiasm for the project. Our local SSEP community had the opportunity to attend the 2017 National Student Spaceflight Experiments Program conference at the Smithsonian Institute's Air and Space Museum in June 2017. Two students presented the flight experiment (pre-launch) data to the SSEP community and in poster format to the general public at the museum. The students did an excellent job.

Our students and faculty team (5 students and 3 faculty) attended the Mission 11 SpaceX Commercial Resupply (CRS)-12 launch at Cape Kennedy Space Center (KSC) Visitors Complex in Cape Canaveral, Florida (which was delayed until August 14th, 2017). As part of the activities, students presented their work in poster form to the public at the KSC Visitors Center, toured the NASA facilities and surrounding Cape Canaveral National Wildlife Refuge and viewed the afternoon launch. The Mission 11 flight returned from the ISS on September 17th, 2017. Upon receipt of the flight experiment, Stockton researchers analyzed the experiment through the Fall 2017 semester. The Mission 11 student team presented their post-flight experimental results at Stockton on the NAMS poster day and at the SSEP National Conference at the Smithsonian- National Air and Space Museum in June of 2018. They found significant differences in the activity of the mycorrhizal fungi pre- and post-flight to the ISS in the Mission 11 flight.

As part of our community engagement, the Stockton SSEP Community Mission 11 mission patch art competition was held at the University level and at the K-12 level and included 210 students. Dr. Norma Boakes oversaw relationships with the K-12 partner schools. One-Hundred and three patch designs from Stockton students (grades 13-16) in both the arts and sciences were received. One-hundred and seven

patch designs were received from three elementary(grades 2-5), two middle (grades 6-8) and one high school (grades 9-12) in four school districts including Atlantic City, Galloway Township, Mays Landing and Toms River, NJ. Participating K-12 schools were the William Davies Middle School, Chelsea Heights School, Absegami High School, J.A. Citta Elementary School, Tom Rivers Intermediate School and West Dover Elementary School. The winning patch designs which flew on Mission 11 to the ISS were from Stockton physics student Nick Coppola and Toms River Intermediate (grade 7) student Achilles Emnace.

Given the success of the project in engaging students in the creative process of scientific research, the proposal team decided to apply in May 2017 for Mission 12 of the Student Spaceflight Experiments Program and was accepted. Although this 2020 grant was only supposed to cover activities for SSEP Mission 11, the team felt that the experience was of high value and demonstrated the use of a high impact learning strategy. Part of the 2020 project FY18 awarded funds ($3000) were invested in continuing the project into Mission 12 (flight operations) as well as supporting Mission 11 student post-flight analysis of the "Spores in Space" experiment which returned to earth from the ISS in mid-September 2017 for laboratory analysis at Stockton. Additionally, the Stockton STEM Collaborative (also a 2020 project) decided to support Mission 12 (flight operations and travel) as well as the School of Natural Sciences and Mathematics (flight operations and travel).

Mission 12 kicked off in September of 2017 and included 14 students enrolled in GNM 2800 Student Spaceflight Experiments Program Independent Study. Additionally, Dr. Maritza Jaugerui, Associate Professor of Sustainability joined the project. These students produced seven proposals for local scientific review. Three of the Stockton proposals were forwarded to the SSEP national review panel and the winning Stockton proposal was: *The Effects of Microgravity on PGMA Based Self-Assembly and Impacts on Drug Delivery Systems* Flight Experiment, Mission 12 to ISS, Daniel Schneider, Christina Tallone, Chioma Uka with mentor Dr. Pamela Cohn. The Mission 12 flight experiment optimization occurred over spring 2018 semester and culminated with the experiments launch to the ISS on June 29th, 2018 on Space X CRS-15. A Stockton team attended the launch at Kennedy Space Center and presented a poster to the public in the newly opened Shuttle Atlantis exhibit pavilion. The launch occurred pre-dawn at 5:42 AM and was spectacular. The K-12 student winner (ACIT high school) of the Mission Patch art competition joined us with his family at the launch. In addition to the launch, a Stockton team attended the SSEP National Conference at the Smithsonian National Air and Space Museum. Students from both missions gave an oral presentation; Mission 11 students of their post-flight results and students from Mission 12 their pre-flight work. Both groups also gave poster presentation to the public at the museum.

Mission 12 on SpaceX CRS-15 returned on August 8th, 2018 and was returned to Stockton shortly thereafter. The Mission 12 post-flight team is working to analyze the results of the experiment which have been very promising to date. This analysis has included work at Stockton and also additional analysis at Rowan University which has a suite of instruments that proved useful in further characterization of the samples. This work will be presented at the SSEP national conference in June 2019.

As part of our continued community engagement, the Stockton SSEP Community mission 12 mission patch competition received six hundred and fourteen (614) total patch designs in 2018. Five hundred and thirty-five (535) patch designs were in the K-8 division from fourteen elementary and middle schools. Seventy-nine entrants were in the High School and University upper division from four high schools and Stockton University. Participating K-12 schools were: Alder Ave Middle, Atlantic County Institute of Technology, Avalon Elementary, Brigantine North Middle, Cedar Creek High, Dawes Avenue Elementary, Eagleswood Township Elementary, Eugene A. Tighe Middle, Manalapan High, Nellie F. Bennett Elementary, Northfield Community, Pineland Regional Junior High, Point Pleasant Beach High, Port Republic, Roland Rogers Elementary, Southern Regional Middle, Toms River Intermediate North, and William Davies Middle. The winning patch design in the upper division was Robert Lind, grade 9 from the Atlantic County Institute of Technology high school (who also attended the launch of mission 12) and in the lower division was Kirra Fenton, grade 4 from Northfield Community School.

Building on the success of the first two Missions (11 and 12), the Stockton team decided to apply for SSEP Mission 13 and were accepted. The Mission 13 team has sought out additional funding from the NJ Space Grant Consortium and the School of Natural Sciences and Mathematics as well as other fundraising. Mission 13 is scheduled for a June 2019 launch.

Please list any follow-up actions (publications, presentation venues, etc.)

1) A Stockton student team presented a poster "Spores in Space" at the annual NAMS Science Symposium in May 2017.

2) A Stockton team attended the 2017 Student Spaceflight Experiments Program National Conference and two students presented their work in an oral and poster format. The conference venue was the Smithsonian National Air and Space Museum in Washington, D.C., June 28-29th, 2017. The students, Valkyrie Falciani and Danielle Ertz presented "Spores in Space", which detailed their proposal and preliminary data leading to the experiment which will be performed on the International Space Station in August 2017. Pam Cohn, Tara Luke, Norma Boakes and Peter Straub attended as well.

3) Two Stockton teams attended the 2018 Student Spaceflight Experiments Program National Conference and presented their work in an oral and poster format. The conference venue was the Smithsonian National Air and Space Museum in Washington, D.C., June 28-29th, 2018. Mission 11 students: Danielle Ertz, Valkyrie Falciani, Hannah Sandler, Francisca Ekekwe, Ariel Petchel, Chedecia Low, Megan Pierce presented; *The Effects of Microgravity on Endomycorrhizae*, Flight Experiment- Mission 11 to ISS with mentor Dr. Tara Luke. Mission 12 students: Daniel Schneider, Christina Tallone and Chioma Uka presented; *The Effects of Microgravity on PGMA Based Self-Assembly and Impacts on Drug Delivery Systems* pre-Flight Experiment, Mission 12 to ISS, with mentor Dr. Pamela Cohn.

4) Social media was used to engage the Stockton community through a takeover of the Stockton Snapchat feed and a Facebook live coverage of the SSEP National conference activities that was undertaken by the SSEP students. Snapchat on YouTube: https://www.youtube.com/watch?v=FnpyCoBPR_c&index=120&list=PLq3J_zhDNwnm7YHGoy8y2Fv3WzR5AY3-W

5) Stockton news releases:

   Mission 11.
   https://intraweb.stockton.edu/eyos/extaffairs/content/docs/pressrel/StocktonSSEPWinner2016PressRelease.pdf
   https://stockton.edu/news/space-mission11-2016-news.html
   https://stockton.edu/news/2017/mission_11.html

   Mission 12
   https://stockton.edu/news/2018/mission-12-launch.html
   https://stockton.edu/news/2018/mission-12-searches-for-solution-to-drug-delivery-2018-news.html

6) Press coverage:
Space spores: Stockton students experiment headed to space station. The Press of Atlantic City (1/30/17) http://www.pressofatlanticcity.com/education/space-spores-stockton-students-experiment-heading-to-space-station/article_1fa3ec35-321e-5e77-8450-6af887c951df.html

Project Launches to Space in Mission 11. Stockton Times, August 17, 2017
https://stockton.edu/relations/documents/stockton-times/StocktonTimesAugust_17_2017.pdf

Space Is The Final Frontier For These Stockton University Students- Ocean City Patch (12/25/16):
https://patch.com/new-jersey/oceancity/space-final-frontier-these-stockton-university-students

Northfield teen's patch to journey into space aboard SpaceX rocket. Evernote

The Student Spaceflight Experiments Program (Mission 11) was featured in summer 2017- Stockton Now: The Official Stockton University E-zine. *Out of this World Experience*.

The Student Spaceflight Experiments Program (Mission 12) was featured in summer 2018- Stockton Now: The Official Stockton University E-zine. *From Outer Space to Under the Sea*

Comcast Newsmakers- Dr. Jason Shulman on Mission 11 of the Stockton SSEP project:
http://comcastnewsmakers.com/2016/12/15/nj161214-8/ (no longer accessible)

7) A website was created for the project: Stockton Student Spaceflight Experiments Project:
https://stocktonspaceflight.org/

8) An Elevate Stockton informational and fundraising campaign for the Student Spaceflight Experiments Program was undertaken to raise additional money for program expenses. The campaign raised $2545 in 2017 and $2170 in 2018 and continues to inform the donors on the progress of the project.
   2017- https://elevate.stockton.edu/project/4629
   2018-https://elevate.stockton.edu/project/10261

9) One follow-up action was that Dr. Straub contacted the New Jersey Space Grant Consortium (NJSGC) and was invited to attend their annual affiliate meeting and student poster presentation event at Rutgers in New Brunswick on April 28, 2017. Stockton is now affiliated with the NJSGC which will provide opportunities for Stockton students to compete for fellowships and internships funded through NASA. The NJSGC is funding part of Mission 13.

10) Dr. Norma Boakes and Dr. Peter Straub were invited to attend a fall 2017 Toms River school board meeting to honor the student and teacher of the winning mission patch K-12 design competition. The student was presented the mounted mission patch which flew to the International Space Station on a commemorative plaque.

Are you recommending the continuation of this project? If so:

- **What are the next action steps you foresee or recommend?**
- **What are the expected budget requirements going forward?**
- **Please identify the program, department, or division to which the continuation proposal should be forwarded.**

[Note: continuation proposals must be approved and incorporated into the appropriate budget process.]
We are recommending continuation of this project into a third year. Funds will be raised for the flight operations, experimental activities and travel associated with the project.

FINANCES: Based on your proposal, please outline below how the award has been spent.		
	Amount	**Notes/Comments**
Beginning Budget Balance as of: 7/1/2016	**$ 7000**	
Salary Expenditures		
• Stipends	$	
• Full-time staff salaries	$	
• Full-time faculty salaries	$	
• TES salaries	$	
• Fringe Benefits	$	
Total Salary and Fringe Expenditures	$	
Non-Salary Expenditures *(supplies, travel, etc.)*		
• Contracted services Mission 12	$ 3000	SSEP (Tides Center) Flight Operations
• Travel	$ 3629.84	Cape Canaveral Launch Mission 11
• Educational supplies	$ 219.89	Mission Patches K-12, chemicals
• Shipping	$ 92.69	Experiment return from Houston
•	$	
•	$	
Total Non-Salary Expenditures	$ 6942.42	
Total Salary + Non-Salary Expenditures	**$ 6942.42**	
Ending Budget Balance as of: 6/30/2017	**$ 57.58**	

If there are remaining expenditures required to complete the project, please itemize them with expected amounts and timing for payment.

IMPORTANT: ***Unused funds will revert to the general 2020 Initiative Fund at the end of the fiscal year if not approved and encumbered for project costs.***

Item	**Expected Amount**	**Expected Timing for Payment**

Total	