

**MSGC 2017 Program Award Recipient Abstracts**

Table of Contents

Pre-College Programs . . . . . 2

Public Outreach . . . . . 5

Teacher Training . . . . . 6

Combinations . . . . . 7

## **Girls in Engineering Academy**

### **Abstract**

The Girls in Engineering Academy (GEA) is designed to start students as they enter the sixth grade and advance them through three years of Summer Instructional classes, Academic Year programs, and Industrial Experiences as preparation for entering high school. With the current program, new and returning students will be rising 7<sup>th</sup> graders. The program begins as a four-week summer experience for 30 rising 6<sup>th</sup> graders and 30 returning rising 7<sup>th</sup> graders from the previous program. The courses will be on the campus of Wayne State University in July 2018. The summer classes will present four major areas of study (Mechanical/Electrical Engineering, Computer Science, Mathematics-Geometry/Pre-Algebra and English/Language Arts), at one and one-half hour each, Monday through Thursday with Fridays reserved for engineering field trips and engineering guest speaker's series. The program will stimulate girls' interest in science, mathematics, and technology, through coursework, lab work, field trips, and the final concept, design and building a robotic device for space scientists and conducting rocket launches. The instructors (female engineering students) will serve as role models to help the girls envision themselves as an engineer by providing them with an image of a "scientist" that differs from the stereotype of a man in the lab coat. The Academic Year component will be a series of structured Saturday bi-monthly classes. The focus will be math and science, designed to improve and strengthen the academic skill base of GEA students. Each school year, 30 additional sixth grade students will be admitted into the program cohort. After three years, a total of 90 students will be actively participating in the year-round programs. The major objective of the GEA Program is to foster and promote space science and engineering, but more importantly, to attract more females into the engineering profession.

## **Technology and Outdoor Learning**

### **Abstract**

This proposal will purchase and utilize high-tech scientific equipment in K-12 outdoor science investigation field trip programs and after school classes in order to enhance student engagement and better prepare young people for the jobs of the future that will require a clear understanding and use of a wide variety of technology.

## **Introducing Space Medicine to High School Students in the Upper Peninsula**

### **Abstract**

Sending astronauts to Mars would result in irreversible muscle and bone loss and severe physical deconditioning. Understanding how space affects the human body is paramount for astronaut performance and mission success. Our objective is to implement space medicine activities as part of existing regional, national and international educational outreach events to highlight the integration of Health Sciences and STEM (H-STEM). Through construction of 3-D physical models, calculations/graphing, exercise, demonstrations, and teamwork high school students will learn how astronauts live, move, and work in space. The project will impact over 300 Upper Peninsula students. Inclusion of Michigan Tech students to lead the activities will enhance their understanding of space medicine and provide practice communicating science to the public. Cultivating a strong future workforce through H-STEM education is important for NASA and also the Upper Peninsula because there is a shortage of health care and rehabilitation engineering specialists in our rural communities.

## **Get with the Program**

### **Abstract**

In an effort to introduce more K-12 students to topics in Computer Science, Grand Valley State University's *Women in Computing* group is proposing to conduct two different types of experiences that will reach approximately 140 kids. The first experience will introduce middle school-aged students to writing computer code. These events will be carried out in the student's own computer labs, within their normal school schedule, so that it will be a very convenient and relaxing environment. The second experience will consist of an off-site field trip to Grand Valley's Allendale campus where the students will visit college lecture and laboratory spaces while learning about various topics in Computer Science. Under the direction of Grand Valley's faculty and staff, the purpose of these co-curricular activities is to introduce computer science topics, demystify computer coding, and to expose K-12 students to opportunities in higher education and computing careers.

## **Energizing Our World**

### **Abstract**

As a response to the ever-increasing presence and importance of renewable energy sources, the GVSU Regional Math and Science Center proposes a continuation grant to provide a commuter summer camp experience for pre-college youth, with focus on the underrepresented population in Greater Grand Rapids. The Energizing our World camp will allow students to explore renewable energy, sustainability, and career opportunities. An interdisciplinary team of GVSU faculty will support student learning by exploring such renewable energy sources as solar, wind, and hydro power. By utilizing a project-based learning model, students will be exposed to an authentic problem faced by a local stakeholder, and work in teams to design and present a solution to a team of external judges. As with the project last year, a main goal is to spark an interest in renewable energy and STEM topics in students that may not otherwise have an opportunity to explore such learning.

## **STEM Career Exploration for Detroit High School Students**

### **Abstract**

The national need for STEM-trained employees is growing. African-Americans, Hispanics and American Indians' percentage of degrees in science and engineering is low compared to the general population. The Detroit school system, which is >90% under-represented students, is a good place to start. This project aims to increase the interest of Detroit high school students in STEM college majors and future careers and maintain their interest through their high school years. This proposal seeks funding for engaging Detroit area students in a 6-day STEM Career Exploration that brings them to Michigan's Upper Peninsula and Michigan Tech, including visits to state and federal agencies that employ STEM professionals. Students who participate in the 6-day exploration are encouraged to apply for a one-week STEM summer internship at MTU and/or attend a summer youth STEM program to further their STEM interests the following summers.

## **Application for MSGC Public Outreach Grant: *Roger That!***

### **Abstract:**

*Roger That!* is a two-day public symposium on space exploration named in honor of Roger Chaffee, a native Grand Rapidian who lost his life in the Apollo 1 fire. The symposium, organized by faculty at Grand Valley State University (GVSU) in collaboration with staff at Grand Rapids Public Museum (GRPM), supports NASA's public outreach goals. Keynote speakers are featured, along with presentations by local experts aimed at college students and the general public on scientific and societal considerations of space exploration. The first day also includes a Design Challenge for 5th and 6th graders, K5 field trips, and planetarium shows. The second day features family friendly activities at GRPM. The first *Roger That!* symposium was held in February 2017, and MSGC funding was obtained for the second event to be held in February 2018. MSGC funding is sought again to continue offering this event on an annual basis, further expanding its impact.

## **Reaching Students with Science at a Strategic Moment: The Appeal of Earth Science Research on Lake Michigan Dunes**

### **Abstract**

The First-Year Research in Earth Sciences (FYRES) project represents an innovative model for STEM public outreach that targets students at two strategic intervals in the education pipeline: the first months of undergraduate education and while students are exploring their commitment to a STEM discipline. Outreach is strengthened by elements that give everyone a heightened stake in learning: a striking natural environment and experiences that generate enthusiasm in participants as well as broader audiences. FYRES participants benefit from enhanced scientific literacy and interest. Some will go on to become scientifically-literate citizens who pursue vocations in business, humanities, education, etc., whereas others discover or confirm a deeper interest in the Earth sciences and other STEM disciplines. MSGC funding for the FYRES project in 2018-2019 will contribute to the continued development of a successful program, directly impact 30 students, reach out to many members of the public, and promote NASA strategic interests.

## **Teacher Training: The Next Generation Science Standards in Theory and Practice**

### **Abstract**

This proposed Teacher Training grant will fund a professional development course for in-service K-12 science teachers. The goals of the course are to introduce teachers to the Next Generation Science Standards and its theoretical and empirical foundations, develop teacher ability to evaluate the extent to which existing curricular materials are aligned with the standards, and create teacher leaders who will help their colleagues as schools transition to the NGSS. Professional development opportunities such as this course are necessary for all K-12 science teachers, both so that they may maintain accountability to state education requirements, and so that they continue to be knowledgeable about and skilled in implementing best pedagogical practices. Teachers who have participated in such professional development are most likely to foster interest and motivation to pursue STEM fields among their students.

## **New Worlds**

### **Abstract**

NASA's seeks to foster partnerships with tomorrow's educators today. We propose to develop a new interdisciplinary course with lesson modules for pre-service teachers designed to meet state K-12 science education and teacher certification requirements using NASA resources integrated into each lesson module. The course lessons will address scientific knowledge of life, physical, and planetary systems and processes emphasizing the application of new knowledge to the search for exoplanets beyond our solar system. Extensive use will be made of data from NASA's latest missions, including Kepler/K2, the James Webb Space Telescope (JWST), and TESS scheduled to operate in the project year. By integrating resources from the latest NASA missions into each lesson module, education students will become familiar with NASA's role in science education. Lessons will be designed to meet the science education needs of pre-service teachers preparing them "to inspire the next generation of explorers" in partnership with NASA.

## **Earth System Science STEM Camps, Outreach and Teacher Training (K-12 Students and Teachers, and the Community)**

### **Abstract**

A continuing comprehensive, hands-on, student-centered, activity-based outreach and education program is proposed here to deliver substantive Earth system sciences training to three separate populations – K-12 students (through summer programming and school-year STEM field trips) focusing on underrepresented and underserved students, K-12 STEM teachers (best practices in teaching STEM, Next Generation Science Standards), and the broader community. The shorter workshops, STEM field day trips, and longer STEM camps in the summer are to be continuing activities that were initiated with MSGC funding that we hope will continue as matching is continuing at higher funding levels and the funds are leveraged to obtain corporate support. These efforts are STEM-centered, hands-on experiences where attendees learn fundamental knowledge and then apply this to active learning exercises. Promoting STEM to this generation and those younger is critical to enhance knowledge, education, and eventually economic growth with a sustainable mindset.

## **Galaxy Girls**

### **Abstract**

The summer Galaxy Girls program is a week-long residential program facilitated in partnership with the University of Michigan–Ann Arbor (UM-AA), for 20 rising 11<sup>th</sup> and 12<sup>th</sup> grade girls. Summer Galaxy Academy began in 2013 and continues to be successful and highly anticipated.

In this program, female participants are provided the opportunity to explore, research, and study various fields of engineering; strengthen their academic skills in math and science subjects; apply knowledge to challenges aimed at deepening understanding in the field of aerospace engineering, and develop soft skills inherent to working in the field of engineering.

## **Engineering the Future Academy**

### **Abstract**

Hope College's Engineering the Future Academy provides local area students the opportunity to explore engineering design in a hands-on, problem solving context and professional development for in-service and pre-service teachers. Designed as a learning experience for students and a research and mentorship opportunity for undergraduate STEM and STEM education majors, this year's efforts will center around two one-week 30 hour on-campus design challenges. This year's challenges will be developed collaboratively with the STEM teachers at Holland Public Schools with the emphasis building units of instruction that are transferable to the classroom in the upcoming school year. Supplies and equipment purchased for the camp activities will be transferred to the schools at the end of the summer. Fees are covered and transportation and meals provided for at-risk students to facilitate their participation. Holland Public School's STEM program continues to grow, hiring new STEM teachers and moving into the elementary grades.

## **Air Quality Monitoring in the Middle and High School Grades**

### **Abstract**

Portable air quality monitors have shown to be an effective tool for inquiry-based learning in the middle and high school grades. Students are guided through creating their own research questions and testing protocols to collect relevant data. Program development has focused on exploring the most educationally effective construction and software for the monitors along with piloting curricular lessons and applications for the monitors for several math and science disciplines. Before the project is packaged for effective, larger-scale dissemination, this year will focus on working with teachers to prepare lessons tied to K-12 learning standards and implementing solutions for more robust science and technical components on the monitors. The project is managed by the Center for Exploratory Learning (ExploreHope) at Hope College, in partnership with the Holland-Hope College Sustainability Institute (Sustainability Institute), and local community members.