

INTRODUCTION

Established in 1965, Metropolitan State University of Denver (MSU Denver) is a comprehensive baccalaureate and master's degree granting urban university that offers arts, STEM, and professional and business courses to a diverse student population in an atmosphere of mutual respect. MSU Denver serves as a gateway to opportunity by providing students with affordable academic and educational experiences relevant to the Colorado economy. Students are highly valued by employers for the resourcefulness and tenacity they bring to their studies and their work lives. The University is dedicated to offering quality instruction, small class sizes, and a low student-to-teacher ratio – the benefits of which are evident in increasing student retention and graduation rates.

The Summer Science Institute is a MSU Denver program designed for middle and high school students. The program provides access to engaging and research-based STEM experiences. MSU Denver collaborates with schools, school districts, teachers and local organizations to recruit a diverse group of students typically underrepresented in STEM studies and careers to participate in summer science programming at MSU Denver. On behalf of CASE, the MSU Denver Foundation respectfully requests a grant in the amount of \$15,000 to support its middle school Summer Science Institute and high school Summer Science Scholars Program.

ORGANIZATION DESCRIPTION

Since 1965, MSU Denver has strived to be the model urban university for opportunity, diversity, excellence, and transformation through its mission of providing an accessible, enriching education that prepares students for successful careers, post-graduate education, and lifelong learning in a multicultural, global, and technological society. MSU Denver is a top college choice for students from diverse socio-economic backgrounds (almost one-half are first generation college students) as well as for students continuing their education. MSU Denver's student population mirrors the ethnic demographics of the state with over 40 percent identifying as students of color, making the University the leader in diverse enrollment among Colorado's four-year universities. MSU Denver serves approximately 20,000 students and enrolls more undergraduate Coloradans than any other college or university in the state.

STATEMENT OF NEED

The diverse body of students who participate in the Summer Science Institute are exposed to a variety of subjects over the course of each session – including biology, chemistry, water/environment, computer programming and more – helping them develop essential STEM skills. The Summer Science Programs provide an opportunity to experience STEM in a fun, hands-on way that encourages additional exploration of these subjects in their academic and professional careers. Additionally, program participants experience what it is like to spend time on a college campus, showing them that attending college is a possible future path.

According to Colorado Succeeds, a nonprofit, nonpartisan organization that brings business leaders across the state together to ensure all of Colorado's children are educated to their greatest potential, by 2020, 55 percent of the top jobs in Colorado will require skills in STEM. Encouraging future MSU Denver students to explore a career in STEM will improve their chances of finding a career offering a self-sufficiency wage, develop the STEM workforce pipeline and provide Colorado employers with highly trained local employees.

The school districts served by the Summer Science Programs lack access to quality STEM programming. Students in these districts would benefit from additional support, as is evident by the 2018 state (PARCC) math scores. In Adams 14, only 16 percent of eighth graders met or exceeded expectations on the test and in Denver Public Schools (DPS), only a third of eighth graders met or exceeded expectations. The Summer Science Programs provide the instruction and access students need to improve their understanding and interest in STEM-related subjects.

METHODOLOGY

SSI is a 10-day, hands-on, activity-oriented summer science camp for middle school students. Students have a better chance of learning, retaining information and becoming more interested in STEM if they participate and engage in an activity rather than sit in a lecture. Students are taught by MSU Denver faculty and mentored by college students who encourage them to have fun using STEM and consider attending college as a possible future path. The following are examples of projects that allow students to focus on the impact they can have in solving real-world problems:

- Design thinking: students learn creative and innovative problem solving processes; student groups participate in spaghetti and marshmallow tower challenges and classroom design challenges.
- 3D printing: students learn cutting-edge 3D printing skills and use imagination/innovation to create 3D models.
- Engineering: students learn basic principles of electrical and computer engineering and build projects based on their interests such as motion detector, water level alarm, or light controlled by microcontroller.
- Anatomy: students learn what their bodies look like on the inside and examine dissected cats and mink to learn how all the systems work together.
- Forensic Science: students receive extensive hands-on exposure to the techniques used in forensic analysis of biological materials, such as fingerprints, and DNA fingerprints.

After learning fun applications for math, physics engineering, computer programming and more, students will conclude each two-week camp with a trip to Elych Gardens to study the practical applications of physics in a theme park setting.

In the summer of 2019, CASE plans to offer one pilot session as a full day program to better serve working families, offer more in-depth coding instruction and practice, and provide cultural enrichment - adding arts (A) to the STEM experience. Planned activities for the pilot:

- Coding: students will use Java programming to draw simple pictures and animations, play songs, program Lego MindStorm robots, and program Arduino sensors and actuators for real-world applications.
- Art: art will be integrated to inspire creativity and innovation and provide alternative motivation for STEM learning,
- Cultural studies: programming at the Confucius Institute at Community College of Denver allows students to learn about a culture other than their own.

Summer Science Goals and Objectives for 2019

Goal: Encourage diverse students to pursue STEM careers

Objective: Recruit 220+ students.

Objective: Provide project-based pedagogy to students to promote interest in STEM.

Objective: Show real-life implications of STEM.

Goal: Promote learning of STEM concepts and methodologies

Objective: Expose students to STEM fields and methodologies.

Objective: Encourage critical thinking, problem-solving, teamwork and innovation.

Objective: Cultivate growth mindset by providing micro-goals toward consistent, incremental progress.

Goal: Foster idea that attending college is desirable and a viable life path

Objective: Provide students with experience in college classrooms and with college faculty.

Objective: Hire diverse college students as camp counselors and mentors.

MSU Denver measures SSI effectiveness through participation rates, student and parent feedback, and student performance. At the beginning of each session, SSS students take a test to evaluate their initial understanding of the STEM subjects that will be covered, as well as at the end of each session to determine their increase in knowledge of these subjects.

Performance Targets:

- Eighty-five percent of SSI participants will report they are more interested in STEM subjects than they were before attending SSI.
- Five percent increase in algebraic reasoning and explanation scores between pre- and post-test for SSS participants.
- Eighty-five percent of SSS participants will report higher interest in STEM studies and/or careers.

During summer 2018, SSI welcomed 166 middle school students from 45 different schools, with 87 percent receiving full scholarship assistance. In 2018, 21 high school students participated in SSS and all received scholarship assistance.

SUMMARY

The Summer Science Institute transforms the lives of low-income students by promoting STEM learning and serves Colorado by building the foundation for a local, STEM-ready talent pipeline. This summer learning experience offers positive, engaging, and informative experiences to increase students' interest in math and science and provide them with the drive to pursue math and science-related educational activities throughout high school and beyond. MSU Denver requests the opportunity to submit a grant proposal to support this work. Please contact Dr. Hsiu-Ping Liu, Director of the Center for Advanced STEM Education at 303-615-0221 or email hliu1@msudenver.edu if you have any questions or need additional information.