

STEM EXTENSION: STRONG CONNECTIONS AIDING STUDENTS WITH DISABILITIES IN STEM

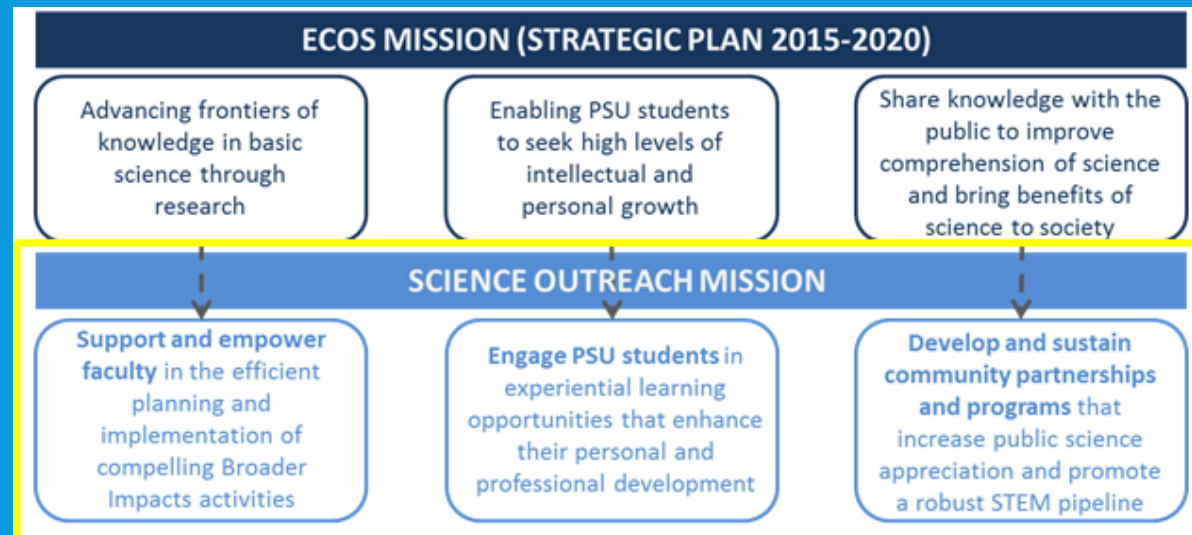
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Office of Science Outreach

Eberly College of Science, Pennsylvania State University

PENN STATE OFFICE OF SCIENCE OUTREACH

- Eberly College of Science at Penn State
- Five-person team
 - Jessica Kim-Schmid – Director
 - Timothy Gould – Education Program Associate



PROGRAMS, EVENTS, AND INITIATIVES

- Programs
 - Science-U
 - Think Outside the Beaker
 - I Am STEM
- Events
 - Exploration-U
 - ENVISION
 - Ask a Scientist
- Initiatives
 - Broader Impacts Resource Center
 - Broader Impacts Workshop



WHY SUPPORT STUDENTS WITH DISABILITIES IN STEM?

- In 2017, **6.3%** of the population ages 18-34 was living with a disability*
- In 2016, **19.5%** of students enrolled in postsecondary institutions had disabilities*
 - Compared to students without disabilities, students with disabilities were less likely to obtain a postsecondary education during the traditional timeframe (15-23 y.o.)
 - 60.3% vs. 53.3%
 - More likely to attend part-time than students without disabilities
 - 51.3% vs 46.8%

* NSF National Center for Science and Engineering Statistics

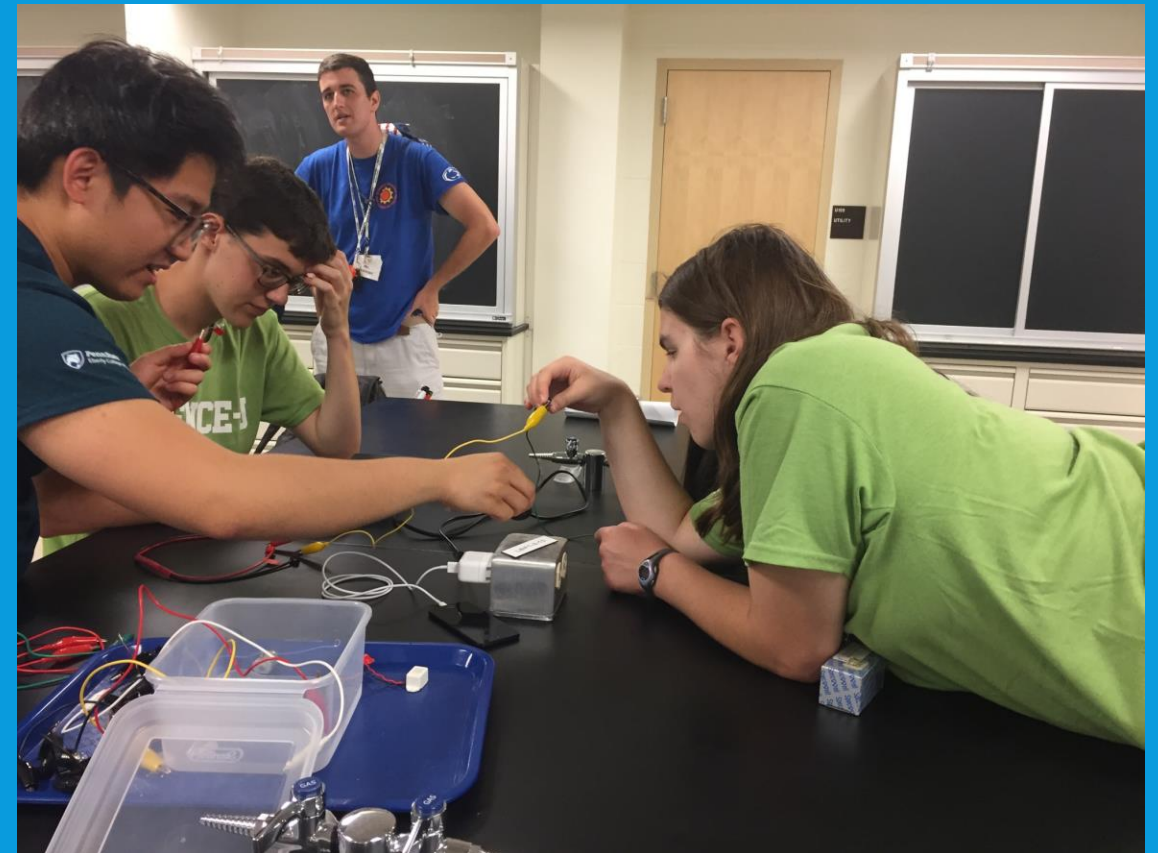
WHY SUPPORT STUDENTS WITH DISABILITIES IN STEM?

- **18.3%** increase in the number of scientists and engineers employed by the federal government between 2008 and 2017
 - Compared to **76%** increase in the number of scientists and engineers with disabilities employed by the federal government
- **45.7%** increase in the number of scientists and engineers employed in business and industry between 2006 and 2017
 - Compared to **153.9%** increase in the number of scientists and engineers with disabilities employed in business and industry

* NSF National Center for Science and Engineering Statistics

WHAT IS STEM EXTENSION?

- STEM-focused extension to Summer Academy, which is:
 - Three-week career- and college-readiness program
 - High school students from across PA
 - Organized by Bureau of Blindness and Visual Services (BBVS) and Office for Vocational Rehabilitation (OVR)
 - Recognized as an emerging best practice nationwide
- Funded primarily by NSF grant via Penn State's Center for Nanoscale Science (a Materials Research Science and Engineering Center)



STEM EXTENSION 2019 STRUCTURE

- Four modules over two days
- Early-college STEM topics
 - Range of experiments and locations
- Evening events
 - Meet & Greet
 - STEM Networking Mixer
 - Research Expo

	Saturday	Sunday
AM	Plant Biology Physics	Plant Biology Chemistry
PM	Forensics Physics	Forensics Chemistry

WHO IS INVOLVED?

- Staff
 - Four faculty/staff instructors
 - 8 science mentors
 - 5 MRSEC graduate student volunteers,
3 Science-U summer camp staff members
- Summer Academy Resident Assistants
- Support staff from Office of Science Outreach and BBVS



HISTORY OF STEM EXTENSION

- 2016 – Half-day event
 - Forensic science focus
 - All Summer Academy students
- 2017 – Week-long extension at the end of Summer Academy
 - 12 students, self-identified, STEM interest
 - Chemistry and physics focus
- 2018 – Three-day weekend program
 - Between Summer Academy weeks one and two
 - All Summer Academy students
 - Four modules

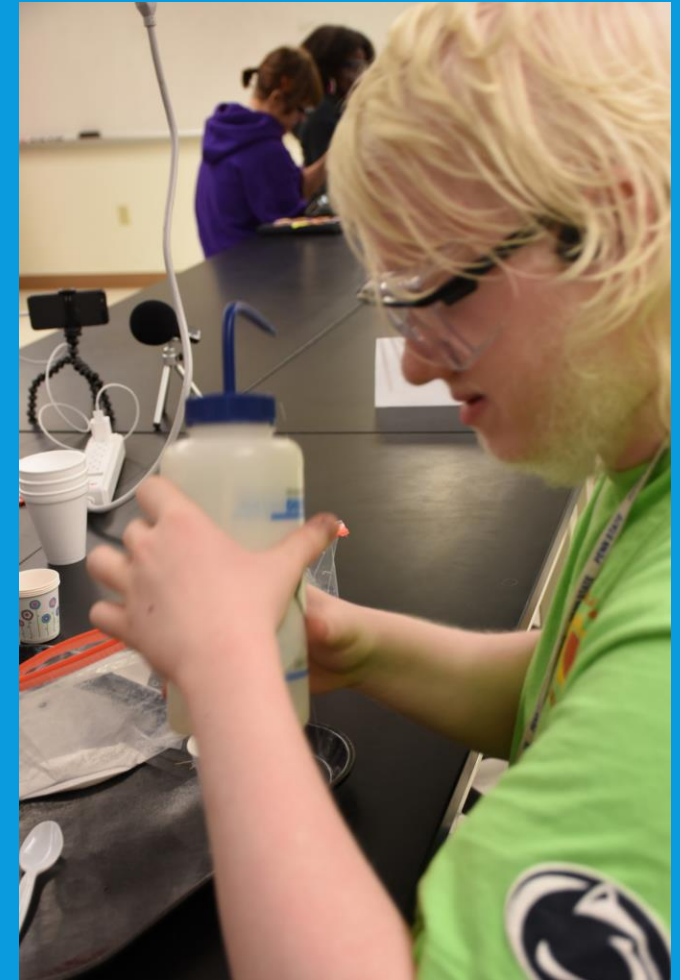


HISTORY OF STEM EXTENSION



STEM EXTENSION GOALS

- Three sets of goals for different target audiences
- For student participants:
 - To work toward obtaining skills needed to be a **full and active participant** in the science laboratory setting
 - To learn how to **confidently advocate** for full participation in high school and college classes
 - To become **aware of STEM majors and careers** that are open to individuals who are blind or visually impaired
 - To learn how to utilize the Sci-Voice Talking LabQuest 2 adaptive technology
 - To **understand the common challenges** associated with and academic skills needed to pursue a STEM college degree (for all students)



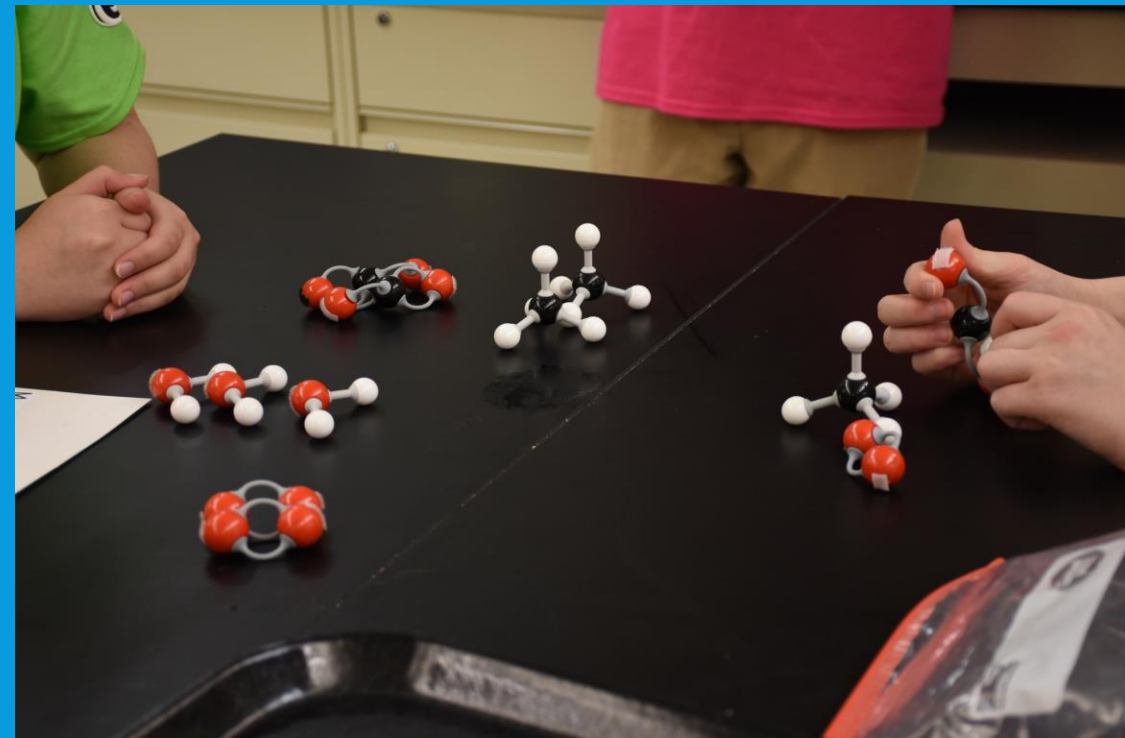
STEM EXTENSION GOALS



- For instructors:
 - To obtain the skills and awareness of specific adaptive tools and techniques needed to fully support and provide adaptations for students who are B/VI in the science classroom and laboratory
 - To understand the capabilities, unique strengths, and challenges that students who are B/VI bring to scientific discourse
 - To know how to confidently advocate for students who are B/VI
 - To pro-actively prepare Penn State introductory-level Chemistry and Physics courses to fully support students who are B/VI

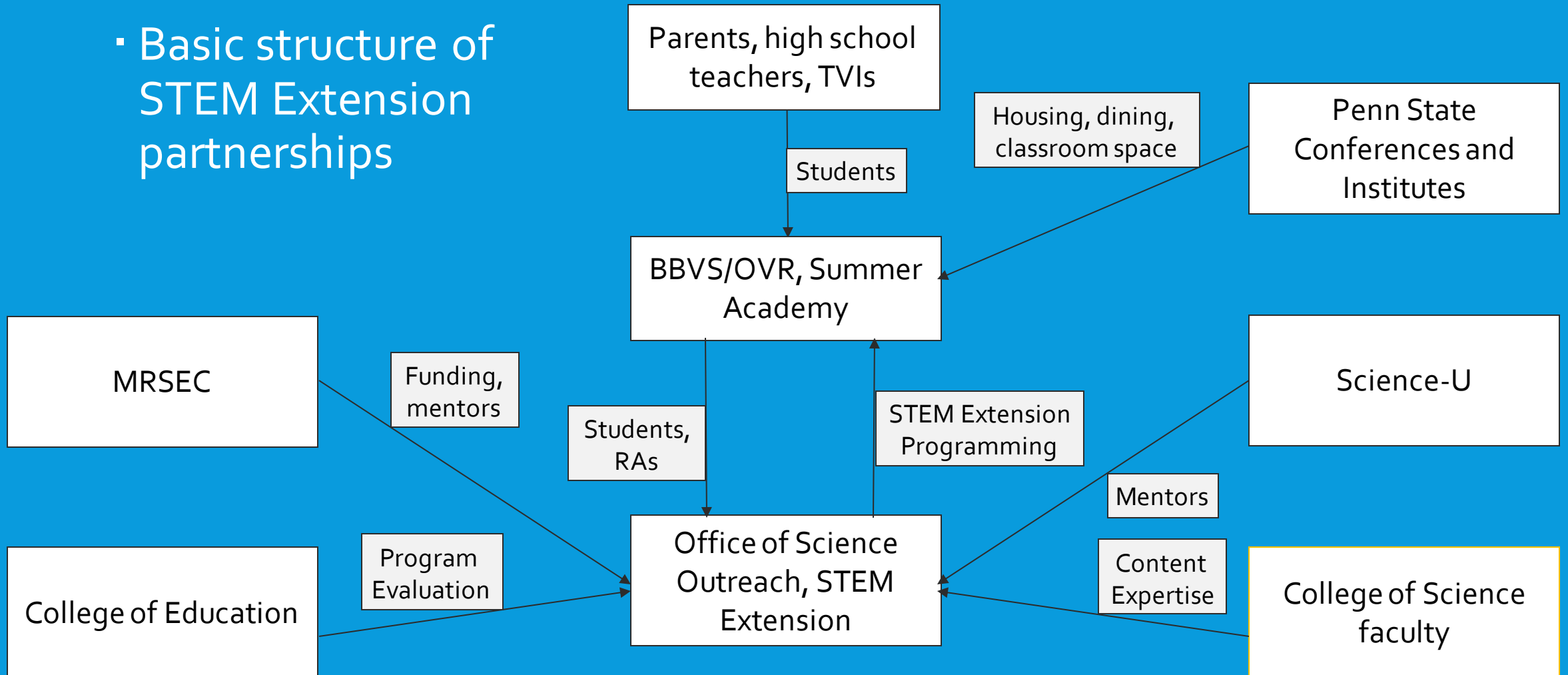
STEM EXTENSION GOALS

- For science mentors:
 - To obtain the skills and awareness of specific adaptive tools and techniques needed to fully support and provide adaptations for students who are B/VI in the science classroom and laboratory
 - To understand the capabilities, unique strengths, and challenges that students who are B/VI bring to scientific discourse
 - To know how to confidently advocate for students who are B/VI



PARTNERSHIP CONCEPTUAL DIAGRAM

- Basic structure of STEM Extension partnerships

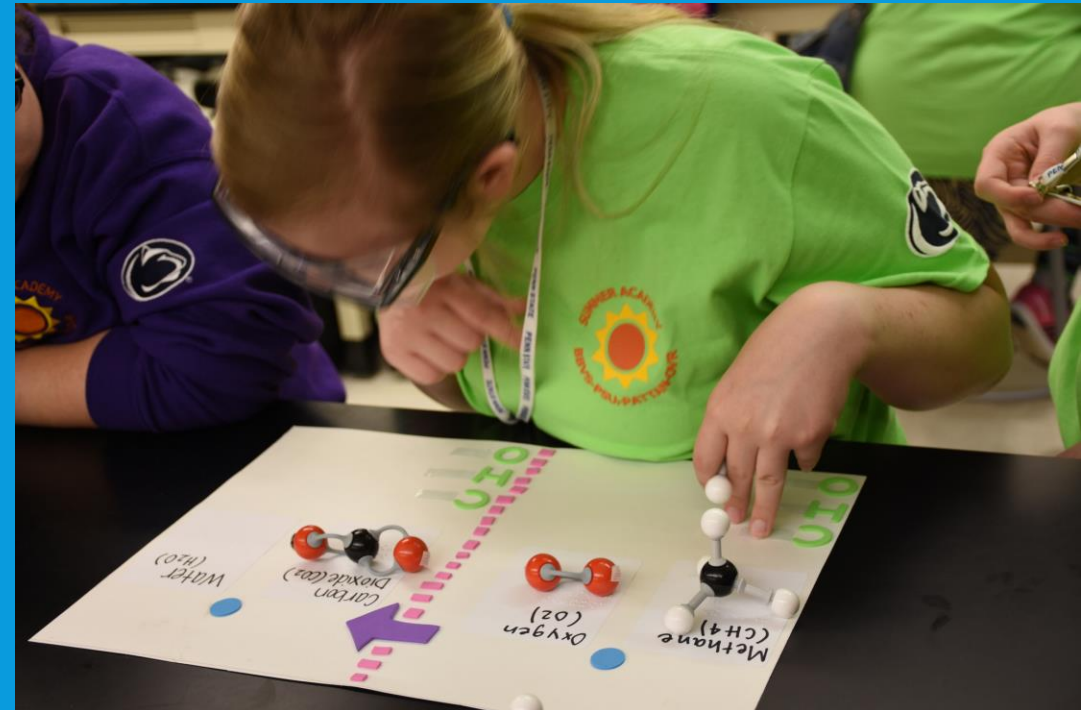


WHAT TYPES OF PARTNERS ARE NEEDED?

- Knowledge/experience with target audience
- Knowledge/experience with volunteers/staff
 - Faculty/students
- Institutional/logistical knowledge
- Content knowledge
- Knowledge/connections with funders
- Marketing/media/visibility/advocacy knowledge
- Evaluation

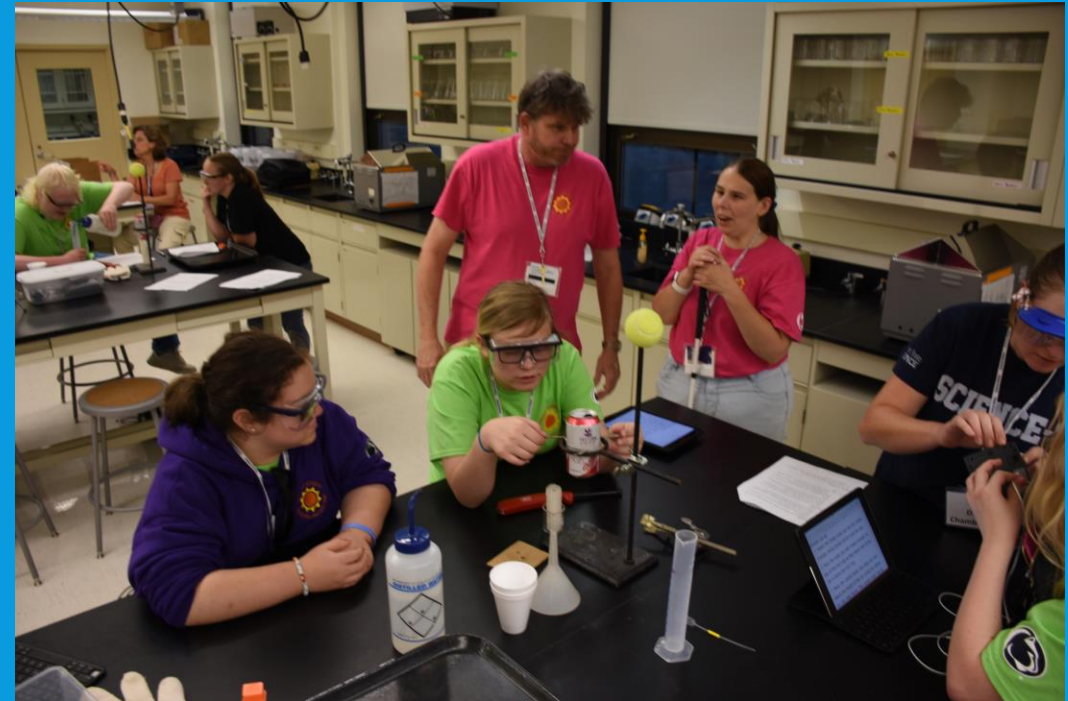
TARGET AUDIENCE

- Established recruitment pipelines and points-of-contact
- Familiar with needs of target audience
 - Can train and guide other partners
- STEM Extension
 - BBVS, PaTTAN, parents, high school teachers, TVIs, Was
 - Familiarity with both general audience and individuals



VOLUNTEERS/STAFF

- Experience recruiting/training staff and volunteers
- Established pipelines
- Individuals already available
- STEM Extension
 - MRSEC, Science-U, Office of Science Outreach



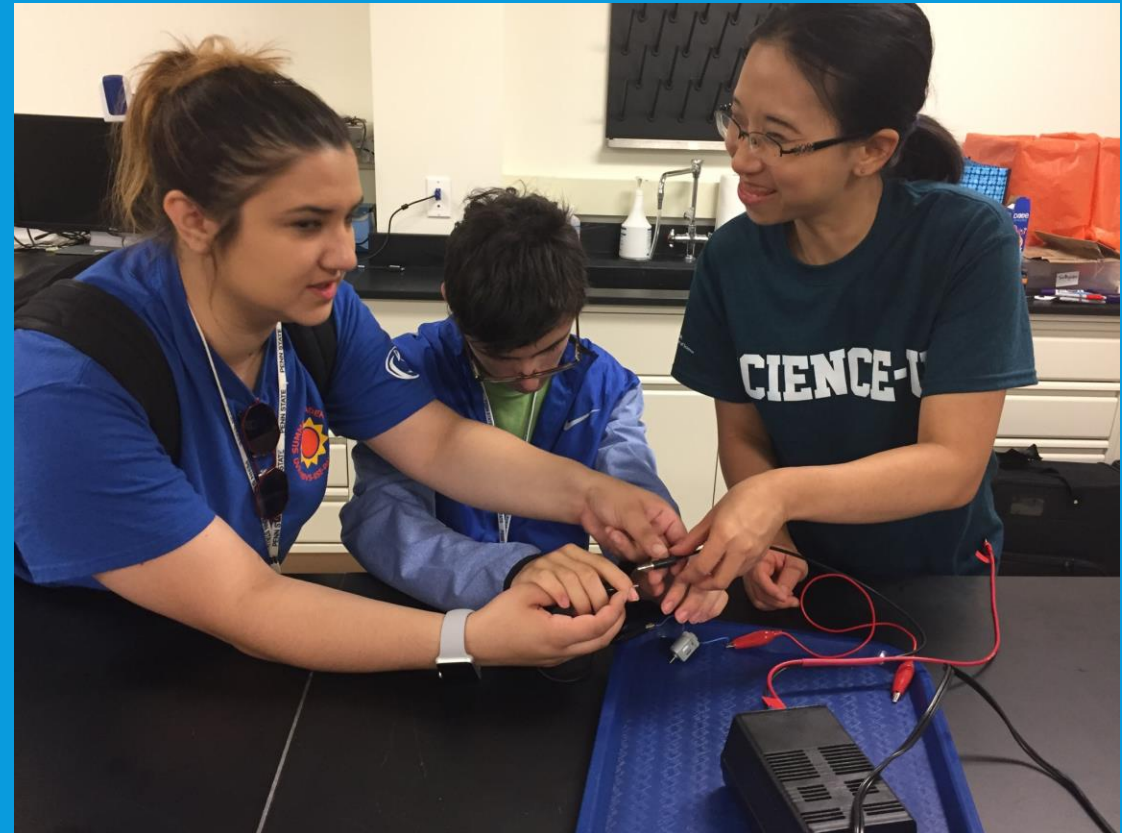
INSTITUTIONAL/LOGISTICAL KNOWLEDGE



- Program coordination/management experience
 - Responsible for managing logistics
- Experience with partnering organizations, venue, etc.
 - Serve as interface
- STEM Extension
 - Conferences and Institutes, Office of Science Outreach

CONTENT KNOWLEDGE

- Able to conduct and/or lead program
- May not have experience with audience or venue
- Skilled in translating their content for varying audiences
 - Able to work with guidelines from other partners
- STEM Extension
 - Faculty instructors, science mentors



CONNECTIONS WITH FUNDING SOURCES

- Grant applicants/awardees
- Familiarity with funding processes and guidelines
- Familiarity with existing pipelines and points-of-contact
- STEM Extension
 - MRSEC, BBVS, faculty instructors



MARKETING, MEDIA, ADVOCACY EXPERIENCE



- Share vision of project/program
- Generate public/private interest, excitement, and buy-in
- Can be especially important if reliant on government funding
- Helps attract broader audience, potential new partners
- STEM Extension
 - BBVS

EVALUATION

- Crucial for both internal and external evaluations
- Allows incorporation of student feedback
- Potentially required if working with a funding agency
- Evaluation needs may vary depending on your program and partners
- STEM Extension
 - College of Education graduate students



WHAT MAKES OUR PARTNERSHIPS STRONG

- **Involved partners who were deeply invested, kept coming back to the table**
- **Everyone was at the table from the beginning to make important decisions**
 - Selected specific target demographic
 - Discussed goals and evaluation from the outset
- **Collective ownership of ideas and associated outcomes**
 - Continuing to move ideas forward, evolve goals as situations change!
- **Commitment to truly understanding students being served**
 - Rigorous training on skills, mindsets, vocabulary
- **Genuine buy-in, passion, and excitement**
 - Give credit where credit is due! (Public accolades whenever possible)
 - Important for both continued funding and continued involvement

WHERE ARE THE BROADER IMPACTS?

- High school students and parents
- TVIs, school districts, other vocational specialists
- Faculty and students
 - Graduate
 - Undergraduate
- Institutions
 - PSU
 - BBVS & OVR
 - PaTTAN



HIGH SCHOOL STUDENTS AND PARENTS



- Increased some students' interest
- Attracted a new audience
- Unique opportunity
- According to BBVS:
 - In many cases, helps improve student confidence
- Parents are often unaware that STEM is an option
- Can help alter their perception of their child's abilities

TVIS, SCHOOL DISTRICTS, VOCATIONAL SPECIALISTS

- Exposure to novel adaptations and techniques
 - Demonstration that this field can be taught
 - Introduction to some basics
 - Ease with which adaptations can be made
- Opportunity to interact with university faculty
- Confident and well-versed students



FACULTY INSTRUCTORS



- Exposure to and experience with a unique audience
 - May encounter same audience later
 - Build ability to work with, accommodate, and advocate for this audience
- Development of techniques applicable in normal classes
- Opportunity to reflect upon and modify teaching practices
- Activities and involvement that can be incorporated into grant applications

GRADUATE AND UNDERGRADUATE STUDENTS

- Exposure to an audience and perspective with which they often have little experience
 - Build ability to work with and advocate for these individuals in the future
- Opportunity to practice translating science
- Opportunity to practice teaching



PENN STATE

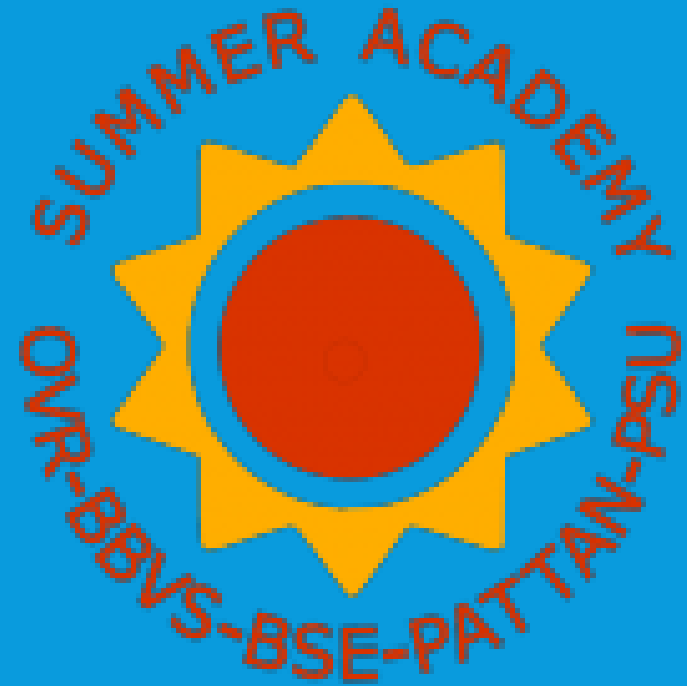
PENNS^TATE[®]



- Strengthening of relationship with partners
- Institutional knowledge
 - Increased ability to accommodate these individuals in the future
- Involvement of faculty and students in meaningful Broader Impacts activities
- Exposure of Penn State facilities and programs to a diverse target audience
- Playing a major role in a “feel good” program

BBVS & OVR

- Ability to advertise and offer diverse, robust program
 - Allows for recruitment of strong, college-bound students
- BBVS is able to focus on interfacing with students
- Able to show progression of students through the program
- Able to grant-funded STEM Extension as a model when working with other institutions



PATTAN



Pennsylvania Training and Technical Assistance Network

- Official training/professional development opportunity for TVIs
- Opportunity for professionals to interact with university faculty
- Associated conference presentations allow for dissemination of knowledge to a wider audience

APPLICATIONS TO OTHER PROGRAMS

#1 - STEM Camp for Students on the Autism Spectrum

#2 - STEM Saturday for Students who are Deaf/Hard of Hearing

- Discuss goals of the program with partners in advance
- Work with partners to recruit students
- Provide staff with training on understanding and working with each group of students

