STEM EXTENSION: STRONG CONNECTIONS AIDING STUDENTS WITH DISABILITIES IN STEM

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- Eberly College of Science at Penn State
- Five-person team
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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
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.
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.
Basic structure of STEM Extension partnerships

Parents, high school teachers, TVIs

BBVS/OVR, Summer Academy

Housing, dining, classroom space

Students

Funding, mentors

Students, RAs

STEM Extension Programming

Office of Science Outreach, STEM Extension

Mentors

Content Expertise

Penn State Conferences and Institutes

Science-U

College of Education

College of Science

MRSEC

Program Evaluation
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
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
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
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

- 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