# ISLAND: Inclusion in Science Learning: A New Direction

2024 Conference on Disability and STEM

Thursday, September 12, 2024

Friday, September 13, 2024

Princeton University

## 

## Sponsored by:

The Office of Information Technology, Princeton University

Princeton Center for Complex Materials, Princeton University

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Independence Science

## ISLAND Conference Mission

The Inclusion in Science Learning: a New Direction Conference on Disability seeks to raise expectations and showcase technical and methodological solutions on what is possible in Science, Technology, Engineering, and Mathematics (STEM) education for people with disabilities. Symposium topics include factors that contribute to the underrepresentation of people with disabilities in the STEM pipeline as well as strategies for their education and retention in this critical area of the world’s economies.

At ISLAND, we believe it is through education that we will reach the hearts and minds of the public on what is possible for people with disabilities, and to remove barriers to access.

ISLAND presentations intend to drive innovation in pedagogy and methodology while informing and connecting a community of scholars and educators to the latest technological interventions and methodological innovations ranging from simple access solutions for inclusive learning to multisensory and hands-on approaches are emphasized.

Since its founding in 2010 the ISLAND conference has served as a forum for conference attendees to meet, network, and collaborate to reshape the future of science access for students with disabilities. Originally organized and operated by scientists with disabilities with a common mission to make the subject they loved more accessible and inclusive, ISLAND has grown to embrace a tapestry of non-disabled partners that have expressed a strong commitment for the full inclusion of persons with disabilities into the STEM professions. All interested individuals and organizations are welcome to participate in ISLAND.

The conference organizers hope that your participation is rewarding and fulfilling. For us, the inclusion of persons with disabilities into the STEM professions is more than a commitment or passion – it is a calling. We are active in promoting the full and authentic inclusion of persons with disabilities within the scientific community through other professional societies and organizations of scientists. I invite you to join our community of research and practice as we continue to strengthen the STEM professions through the inclusion of people with disabilities.

Cary Supalo

Chair, ISLAND conference

# Conference Schedule - Thursday, September 12

## 8:30 AM Eastern Daylight Time (GMT/UTC minus 4 hours)

Zoom open for registrant login and networking

## 9:00 AM

Welcome and Introduction

## 9:05 AM

Empowering Neurodivergent Student Persistence in STEM: AIESTEMPLOS Program Impact and Student Panel Discussion

Dr. Christin Monroe, Landmark College

Anastasio Bonhomme, Landmark College

Gabriel Woolgar, Landmark College

Madison Wan, Landmark College

Jaden Clark, Landmark College

## 9:35 AM

Curriculum Made Accessible: The Importance of Inclusion

Ashley Neybert, Oregon State University

## 10:05 AM

Creating a Sustainability & Recycling Pre-ETS Curriculum for Non-Visual Students

Maeve Goldman, Independence Science

Charis Glatthar, Independence Science

## 10:35 AM

Break

## 10:50 AM

## Interpreting an Ancient Rock-Carving Using NASA-Supported Tactile-Art Representations of the Sun

Tasnim Alshuli, University of Arizona

Cherilynn Morrow, PhD, NASA PUNCH Mission & Lead Author of Petroglyph Inquiry &  
Southwest Research Institute

John M. Keller, PhD, Fiske Planetarium, University of Colorado

Nicole Johnson, PhD, Fiske Planetarium, University of Colorado

Don Kolinski, High Altitude Observatory, Boulder, Colorado

## 11:20 AM

Artificial Intelligence and Captioning: Impacts for STEM Education

Thomas Logan, Equal Entry

## 11:50 AM

Inclusion: Recent Advancements Toward Interoperability of Inclusive, Multimodal Graphics

Jenna L. Gorlewicz, PhD, St. Louis University

Dan Gardner, ViewPlus Technologies

Hari Palani, PhD, ROUX Institute, Northeastern University

Nicholas Giudice, PhD, UNAR Labs

Danielle Guzman-Orth, Measured Methods Consulting

Amy Keith, St. Louis University

## 12:20 PM

Lunch and Keynote Address

Cary Supalo, PhD, MBA

## 1:30 PM

Making a Podcast with Kids: An Inclusive Tool for the Elementary STEM Classroom

Marshall Escamilla, Tumble Science Podcast for Kids

Sarah Lentz, Tumble Science Podcast for Kids

## 2:00 PM

Ionic Bonding Made Simple (in UEB and Nemeth)

Rosanne Hoffman, American Printing House for the Blind

## 2:30 PM

Facilitating Math Skills & Curriculum Access with Abacus

Monique Coleman, EdD, VISTAS Education Partners

## 3:00 PM

Break

## 3:15 PM

Accessible Forensic Chemistry Part 2

Annalise Diodato, Independence Science

## 3:45 PM

Wolfram Syndrome

Ellie White, Ellie White Foundation for Rare Genetic Disorders

## 4:15 PM

Alternative Avenues for Accessibility in STEM  
Jennifer Doran, Oregon State University

Ashley Neybert, Oregon State University

Andreas Schmitter, PhD, Oregon State University

## 4:45 PM

Sensing the Future of Laboratory Independence for the Blind

Greg Williams, PhD, Independence Science

## 5:15 PM

Wrap Up

## 5:30 PM

Adjourn / Zoom room closes

## 6:00 – 8:00 PM

Dinner in 701 Café

## Conference Schedule - Friday, September 13

## 8:30 AM Eastern Daylight Time (GMT/UTC minus 4 hours)

Zoom open for registrant login and networking

## 9:00 AM

Welcome from Daren Hubbard, Vice President for Information Technology and Chief Information Officer, Princeton University

## 9:05 AM

The Role of Technology in My Life: Narrating the Evolution of Technology and Its Impact on a Blind Individual from a Developing Country  
Shrirang Sahasrabudhe, PhD, Educational Testing Service

## 9:35 AM

Opportunities and Challenges for AI as an Assistant in STEM Accessibility  
Markku Hakkinen, PhD, Educational Testing Service

## 10:05 AM

Enabling Graduate Students in STEM to Understand the Fundamentals of Communicating Across the Senses to Facilitate Accessible Communication  
Hellen Sullivan, PhD, Rider University

## 10:35 AM

Break

## 10:50 AM

TSVIs’ approach to providing Accommodations for SVIs in Mathematics Education

Tasnim Alshuli, PhD, University of Arizona

## 11:20 AM

Using Audible Light Sensors for Laboratory Physics

Peter Walters, PhD, MS, Independence Science

## 11:50 AM

Lunch

## 1:00 PM

Round Table Discussion 1: How Higher Education is Improving IT Accessibility for Students with Disabilities

Mary Albert, MS, Princeton University

Cary Supalo, PhD, MBA, Independence Science

## 2:15 PM

Break

## 2:30 PM

Round Table Discussion 2: Making Science Education Accessible to Students with Disabilities

Peter Walters, PhD, MS, Independence Science

Greg Williams, PhD, Independence Science

## 3:45 PM

Break

## 4:00 PM

Round Table Discussion 3: Introducing the Topic of Accessibility to Students Without Disabilities so They Will Be Able to Present the Results of Their Work to a Wider Audience

Jasodhara Battacharya, MEd, Independence Science

Peter Walters, PhD, MS, Independence Science

## 5:00 PM

Closing Remarks

## 5:15 PM

Wrap Up

## 5:30 PM

Adjourn / Zoom room closes

## Abstracts – Thursday, Sept 12, 2024

## 9:05 AM: Empowering Neurodivergent Student Persistence in STEM: AIESTEMPLOS Program Impact and Student Panel Discussion

### Presenters

Christin Monroe, PhD, Landmark College

Anastasio Bonhomme, Landmark College

Gabriel Woolgar, Landmark College

Madison Wan, Landmark College

Jaden Clark, Landmark College

### Abstract

The AIE-STEMPLOS (Access to Innovative Education in Science, Technology, Engineering, and Mathematics Providing Learning Opportunities and Scholarship program, supported by NSF, targets neurodivergent students' persistence in STEM. Through tailored support and immersive experiences, the program empowers students academically. AIE-STEMPLOS reshapes students' STEM identities and boosts confidence, aided by the Birkman Method for effective communication and leadership skills. Internship opportunities further enhance practical knowledge and self-awareness. AIE-STEMPLOS fosters a supportive "multigenerational" community, inspiring students to explore opportunities and interests. Through field trips and interactive sessions, students engage in meaningful discussions about their experiences and aspirations. This presentation offers insights from the faculty perspective.

## 9:35 AM: Curriculum Made Accessible: The Importance of Inclusion

### Presenter

Ashley Neybert, Oregon State University

### Abstract

Every teacher desires the best for their students, but not every teacher has the expertise to make their curricula work for their students especially if their students have disabilities. Working to use Universal Design and improve overall quality of educational experience is something owed to our students by the UNESCO Sustainable Development Goals. Learn suggestions for more inclusive curricula as well as several options for resources to bridge the gap between need for expertise and serving your students the best way you can.

## 10:05 AM: Creating a Sustainability & Recycling Pre-ETS Curriculum for Non-Visual Students

### Presenters

Maeve Goldman, Independence Science

Charis Glatther, Independence Science

### Abstract

From the viewpoint of recycling and sustainability, many indicators use visual approaches to inform people of these options. This creates a barrier for non-visual individuals.

During the process of creating a Pre-ETS Recycling and Sustainability curriculum, we faced many challenges as we put together discussions and activities for non-visual students. Although this project is still a work in progress, we will discuss the challenges we encounter in creating an accessible curriculum as well as the solutions we are developing. We will also review some the critical thinking discussions we will have with students regarding larger scale issues (such as recycling symbols and recycling bins) and ways in which non-visual individuals can be included.

## 10:50 AM: Interpreting an Ancient Rock Carving Using NASA-Supported Tactile-Art Representations of the Sun

### Presenter

Tasnim Alshuli, University of Arizona, Tucson, Arizona

### Authors

Tasnim Alshuli, University of Arizona, Tucson, Arizona

Cherilynn Morrow PhD, NASA PUNCH Mission & Lead author of Petroglyph Inquiry &

Southwest Research Institute, Boulder, Colorado

John M. Keller PhD, Fiske Planetarium, University of Colorado, Boulder, Colorado

Nicole Johnson, PhD3, and Don Kolinski, High Altitude Observatory, Boulder, Colorado

### Abstract

The Outreach team embedded in the NASA PUNCH mission to study the Sun is seeking collaborators (reviewers and field-testers) to help us optimize a standards-aligned, web-based inquiry that is enjoyable for blind, low-vision, and sighted learners. The “Petroglyph Inquiry” guides learners to evaluate the strengths and weaknesses of a hypothetical interpretation of an ancient rock-carving in Chaco Canyon as an Ancestral Puebloan impression of the 1097 total solar eclipse with a solar storm in progress. The Inquiry is authentic without right or wrong answers. It engages learners with a guided, hands-on exploration of seven thermoform tactile-art representations of the Sun’s outermost layer called the solar corona. The tactiles represent the variety of ways the corona has been observed throughout human history, from naked eye to NASA spacecraft. Participants use what they learn from each graphic to develop a case that supports or refutes the “eclipse” hypothesis for the petroglyph.

## 11:20 AM: Artificial Intelligence and Captioning: Impacts for STEM Education

### Presenter

Thomas Logan, Equal Entry

### Abstract

Automated captions are widely available but often inaccurate. This presentation will share real data and lessons learned from a variety of artificial intelligence (AI) platforms to determine which technology provides the most accurate results. This will also highlight the latest tools available from a variety of AI technologies working in this space.

## 11:50 AM: Inclusion: Recent Advancements Toward Interoperability of Inclusive, Multimodal Graphics

### Presenters

Jenna L. Gorlewicz, PhD, Saint Louis University

Dan Gardner, ViewPlus Technologies

Hari Palani, PhD, ROUX Institute, Northeastern University

Nicholas Giudice, PhD, UNAR Labs

Danielle Guzman-Orth, PhD, Measured Methods Consulting

Amy Keith, Saint Louis University

### Abstract

Inclusio is pioneering a global shift towards inclusive content creation and consumption by transcending barriers and fostering collaboration across diverse stakeholders. We are building a community-driven, web-based software platform that includes: accessible authoring and generation of content supported by AI, multiple input and output mediums for consuming content, and a marketplace for finding inclusive content. In this presentation, we share our latest advancements in interoperability across embossed tactile graphics, multimodal touchscreen display of graphics, and a combination of the two on the IVEO platform. We have also developed an emerging, open, interoperable metadata format (called the JIM Specification) created to ease the discovery, acquisition, evaluation, and creation of accessible graphical information. This format will provide a means to include raw data in a complex image or data visualization, to detail the parameters of assistive technology behaviors such as audio-tactile, haptics, sonification, and braille, to include localization and internationalization, and to tie each piece of the metadata to its graphical representation elements. We will share insights on the interoperable content from individuals with blindness and low vision. As an NSF-funded convergent partnership, Inclusio is supported by collaborations that stretch across the accessibility ecosystem and are driven by the blind and low vision community.

## 1:30 PM: Making a Podcast with Kids: An Inclusive Tool for the Elementary STEM Classroom

### Presenter

Marshall Escamilla, Tumble Science Podcast for Kids

### Abstract

There are a wide range of children that teachers struggle to include in STEM learning for a variety of reasons: perhaps they are dyslexic, have reading or language deficits, or are blind and low vision. There are a dearth of tools to help teachers include these students in STEM learning. Podcast creation can be a solution to this problem. We are presenting a podcast creator tool that is accessible and very easy to use, along with an attendant podcast creation curriculum that is being developed as part of an NSF-supported grant.

## 2:00 PM: Ionic Bonding Made Simple (in UEB and Nemeth)

### Presenter

Rosanne Hoffman, American Printing House for the Blind

### Abstract

APH presents the Tactile Ionic Bonding Kit, a low-tech interactive model system that helps students with vision impairments understand one way atoms can bond to each other. Individual elements, such as sodium, are represented by rectangular manipulatives/subunits made of flexible foam sheets. In addition to large print, UEB or Nemeth braille depict the element’s name, atomic symbol, and atomic number on the surface of each subunit. The subunits are designed like jigsaw puzzle pieces; those with tabs represent atoms with one to three electrons in their outer shell which are available for transfer to atoms that require electrons to satisfy the octet rule. The latter atoms are represented by subunits with one to three notches. As an example, the tab extending from the sodium subunit fits into the notch of the chlorine subunit, thus demonstrating electron transfer resulting in ionically bonded sodium chloride. The Tactile Ionic Bonding Kit prepares the beginning chemistry student for more complex atomic models depicting multiple electron shells, such as Azer’s Interactive Periodic Table Study Set, also available from APH.

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## 2:30 PM: Facilitating Math Skills & Curriculum Access with Abacus

### Presenter

Monique Coleman, EdD, VISTAS Education Partners

### Abstract

This presentation will focus on the cranmer abacus as a tool for building math skills and facilitating access to the core curriculum for blind and low vision learners, including those who have additional disabilities. The primary goal of the presentation will be for attendees to have a greater awareness of the relevance of the Cranmer abacus in present-day Math education for blind and low vision learners, and the state of instruction and advocacy around use of the abacus.

The presenter will draw upon personal experiences as a TVI, data from the NJ Regional Abacus Bee and the National Abacus Bee competitions, and qualitative from students, parents, and educators to address this important topic in the area of math education of blind and low vision students, specifically those in elementary and middle school. Topics will include: (a) the relevance of the abacus in the age of digital knowledge and education; (b) creating support system for abacus integration in the students educational program; (c) effective approaches to the integration of technology in abacus instruction; (d) barriers to abacus access and strategies for removing those barriers; and (e) promoting abacus awareness and skills through friendly competition: reflections and stats on the APH Abacus Bee.

## 3:15 PM: Accessible Forensic Chemistry Part 2

### Presenter

Annalise Diodato, Independence Science

Maeve Goldman, Independence Science

### Abstract

Working with my intern Maeve Goldman, I quickly learned of her interest in Forensic science. I allowed Maeve to take charge on making accessible Forensic curriculum. As we wrap up this curriculum, I plan on merging it with forensic curriculum we have used with students to have an incredible activity! By the end of the summer, we hope to have had the opportunity to work with students with this updated curriculum. This will allow blind students to have a hands-on forensic experience like never before imagined.

## 3:45 PM: Wolfram Syndrome

### Presenter

Ellie White, Ellie White Foundation for Rare Genetic Disorders

### Abstract

Wolfram syndrome is a rare genetic disorder which causes type one diabetes, blindness, hearing loss, loss of coordination, and multiple other complications, culminating with brainstem atrophy, leading to premature death due to respiratory dysfunction. This terminal disorder currently has a life expectancy of 35. Managing the complexity of the symptoms is particularly challenging with the addition of vision loss. I have Wolfram syndrome and I have started a foundation to help find a cure as well as assist patients with the management of this insidious disorder.

## 4:15 PM: Alternative Avenues for Accessibility in STEM

### Presenter

Jennifer Doran, Oregon State University

Ashley Neybert, Independence Science and Oregon State University

Andreas Schmittner, PhD, Oregon State University

### Abstract

The Blind population is underrepresented in STEM fields across globe. The lack of accessible materials is one reason for this underrepresentation. Here, we will discuss workable leadership, self-advocacy, and effective communications strategies that Blind students can use to find other avenues to gain accessible materials when their university fails to supply materials in a timely matter. One of the most helpful methods to overcome this obstacle is working directly with scientists to ensure an accessible format is available upon request. Another helpful strategy is to work with individual colleges within a university to provide in-house materials for Blind students in STEM, as often disability offices at these universities lack the professional know-how and scientific understanding needed to convert STEM-related materials to an accessible format.

## 4:45 PM: Sensing the Future of Laboratory Independence for the Blind

### Presenter

Greg Williams, PhD, Independence Science

### Abstract

There is a lot of excitement in the blind community because several multi-line braille displays capable of displaying data and graphical content are on the verge of being commercially available. Although many of us have dreamed about possible applications for multi-line displays for years, there is still much exploration and research to be done on how these can and should be implemented. Independence Science received a grant from the National Science Foundation to develop a prototype to explore whether and how multi-line braille displays could be used with laboratory sensors to collect and display data in a table and as a graph in real-time. This talk will discuss what we learned while developing our prototype which used an Android app to collect data from Vernier Science Education GoDirect sensors and display it on the Cadence Tablet from Tactile Engineering. We will discuss the findings from our user study and possible future plans.

# Conference Schedule – Friday, September 13

## 9:05 AM: The Role of Technology in My Life: Narrating the Evolution of Technology and Its Impact on a Blind Individual from a Developing Country

### Presenter

Shrirang Sahasrabudhe, PhD, Educational Testing Service

### Abstract

The advent of digital technology has revolutionized how we interact with the world around us. For people with disabilities, advancements in assistive technology have had a profound impact, transforming daily life and opening up new opportunities. This paper explores the academic and professional journey of a blind individual from India, set against the backdrop of the evolving landscape of assistive technology.

## 9:35 AM: Opportunities and Challenges for AI as an Assistant in STEM Accessibility

### Presenter

Markku Hakkinen, PhD, Educational Testing Service

### Abstract

AI technologies offer many possibilities in advancing the field of accessibility, but also pose challenges and risks. One area where AI can have near term or immediate value is in STEM accessibility, and one specific area is making scientific data more accessible and inclusive. By transforming complex data into multi-modal formats, AI enables individuals with disabilities to engage more effectively with scientific content. This includes converting visual data into audio descriptions, simplifying text through natural language processing, and offering interactive, adaptive visualizations that cater to diverse needs. In choosing to apply AI, we have to recognize its limitations and seek applications and strategies for use that are effective and accurate. Treating AI as an assistant, or apprentice is crucial as it should not be seen as a perfect or ideal expert guide. It will learn in the process of working with the student or professional. While the potential is significant, it is crucial to acknowledge that AI technology still requires significant training and refinement. Ongoing research and development is essential to ensure these tools are effective and reliable in promoting true accessibility in STEM fields.

## 10:05 AM: Enabling Graduate Students in STEM to Understand the Fundamentals of Communicating Across the Senses to Facilitate Accessible Communication

### Presenter

Helen Sullivan, PhD, Rider University

### Abstract

In many graduate programs internationally, students in the sciences are unlikely to receive exposure to academic courses focused on accessibility and inclusive design.  While efforts such that of Teach Access in the US are showing promise in introducing accessibility to students and faculty, internationally there remains work to do The University of Jyvaskyla Summer School, now in its 33nd year, provides a two week program of courses open to graduate students from around the world in subjects including mathematics, physics, biology, computer science, and cognitive science. Since 2017 the Summer School has offered an introductory course in accessible and inclusive design as part of the cognitive science program and in 2022 offered an initial course in Accessible Data Visualizations.  Students attending the course come from diverse research areas and are required to attend the introductory course before proceeding to data visualization.  In 2023, the data visualization course was adapted into a three day hackathon format as an experiment with a small number of students. In 2024, we elected to continue with the three day format with an increase in the number of students (approximately double). This presentation will describe the summer school program in accessible and inclusive design and focus on the hackathon, the student participants and their project work.   Given the intensive, three day format, and the varied backgrounds of the students, we continue to incorporatd generative AI as a “coding” apprentice to accelerate prototyping by some students.  AI-supported hackathon-based learning opportunities are discussed as a means to develop skills in emerging scientists to support accessible dissemination of their research.

## 10:50 AM: TSVIs’ approach to providing Accommodations for SVIs in Mathematics Education

### Presenter

Tasnim Alshuli, University of Arizona

### Abstract

This presentation will provide an overview of different approaches that teachers of students with visual impairments (TSVIs) in mathematics education employ when it comes to accommodating students with visual impairments (SVIs) in mathematics education. This presentation will include findings and implications from interviews targeted to TSVIs. Results demonstrated the complexity in their approaches to accommodations and the complexity of TSVI's role and practices when supporting SVIs in mathematics education.

## 11:20 AM: Using Audible Light Sensors for Laboratory Physics

### Presenter

Peter Walters PhD, MS, Independence Science

### Abstract

Optics and interferometry are two subjects in physics that can pose difficulties for blind and low vision students due to the vision-centered nature of most of the experiments. However, audible light sensors can be used alongside simple modifications to allow blind and low vision students to fully participate in optics and interferometry experiments in a classroom or laboratory setting. A general treatment of strategies will be discussed and several examples of modifications will be given.

# ISLAND 2024 Acknowledgments

The chair and organizers of the 15th annual ISLAND conference thank you for your participation. We hope you found the presentations and discussions informative, interesting, insightful, and useful for your teaching and research.

The ISLAND conference is a forum for effecting change in STEM education and building community. We believe that the more people learn how to promote inclusion and equity in STEM, the more STEM education and related industries and professions will embrace the participation of people with disabilities.

We look forward to your continued participation in the ISLAND community. We invite all interested presenters to submit a peer reviewed paper for the ISLAND proceedings issue of the [Journal of Science Education for Students with Disabilities](https://scholarworks.rit.edu/jsesd/) (JSESD). Details about deadline submissions and publication guidelines, as well as previous ISLAND conference proceedings, are available on the [JSESD website](https://repository.rit.edu/jsesd/).

Thank you to our sponsors for helping to make this year’s conference a success: Princeton University’s Office of Information Technology, Campus Conversation on Identities, the Princeton Center for Complex Materials, and Independence Science. We also thank our ambassadors and volunteers for their support throughout the conference. Finally, we wish to thank our presenters, whose contributions to the field of accessibility in STEM make ISLAND possible.

We look forward to welcoming you next year to ISLAND 2025.

Cary Supalo, Chair, with Mary Albert, Jas Bhattacharya, and Peter Walters







