# ISLAND: Inclusion in Science Learning: A New Direction

2024 Conference on Disability and STEM

Tuesday, 27 August 2024

Wednesday, 28 August 2024

University of Tampere, Finland

##

## Sponsored by:

The University of Tampere TACCU

Independence Science

The Office of Information Technology, Princeton University

Princeton Center for Complex Materials

Campus Conversations on Identity, Princeton University

## 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 explore factors that contribute to the underrepresentation of people with disabilities in the STEM pipeline and the STEM ecosystem, and 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 ISLAND 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.

Dr. Cary Supalo,

Founder and Chair, ISLAND conference

## Conference Schedule – Tuesday, 27 August 2024

## 8:30 Eastern European Time Zone (GMT+3)

Zoom open for registrant login and networking

## 9:00

Welcome and Introduction

## 9:05

Curriculum Made Accessible: The Importance of Inclusion.
Ashley Neybert.

Oregon State University, USA.

## 9:35

Alternative Avenues for Accessibility in STEM.

Jennifer Doran\*, Ashley Neybert, and Dr. Andreas Schmittner.

Oregon State University, USA.

## 10:05

Accessible STEM books : how to make it happen.

Sami Määttä1 and Tim Arborealis2.

1Accessibility Library Celia, Finland.

2Swedish Agency of Accessible Media.

## 10:35

Break (15 minutes)

## 10:50

Bridging Similarities Through Shared Experiences.
Ashley Neybert\* and Dr. Martin Storksdieck.

Oregon State University, USA.

## 11:20

Maybe Theirs, But Not Ours - Representation in Algorithms.
Dr. Rebekah Rousi\* and Juho-Pekka Mäkipää.

University of Vaasa, Finland.

## 11:50

Fostering Neurodivergent Persistence in STEM: AIE- STEMPLOS Program Insights from Faculty.

Rebecca Matte

Landmark College, USA.

## 12:20

Lunch (70 minutes)

## 13:30

The Blind Scientist’s Toolkit for Multi-Sensorial Science.
Dr. Mona Minkara.

Northeastern University, USA.

## 14:00

Supporting Neurodivergent Students in STEM: Case Studies and Innovative Strategies for Success.
Dr. Christin Monroe.

Landmark College, USA.

## 14:30

Teaching Fundamentals of Accessibility: Perspectives from Students and Teachers on Course Implementation.

Pauliina Baltzar\*, Tero Avellan, and Dr. Markku Turunen.

Tampere University, Finland.

## 15:00

Break (15 minutes)

## 15:15

Science in Braille: Connecting and Advocating for the Necessity of Blind Scientists.

Dr. Mona Minkara\* and Dr. Sheri Wells-Jensen1.

\*Northeastern University, USA.

1 Bowling Green State University, USA.

## 15:45

Using Audible Light Sensors for Laboratory Physics.

Dr. Peter Walters.

Independence Science, USA.

## 16:15

Sensing the future of laboratory independence for the blind.

Dr. Greg Williams.

Independence Science, USA.

## 16:45

Adjourn Day 1

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Zoom open for registrant login and networking

## 9:00

Welcome and Introduction

## 9:05

The Role of Technology in My Life: Narrating the Evolution of Technology and Its Impact on a Blind Individual from a Developing Country.
Dr. Shrirang Sahasrabudhe.

Educational Testing Service, USA.

## 9:35

Opportunities and Challenges for AI as an Assistant in STEM Accessibility.
Dr. Markku Häkkinen.

Educational Testing Service, USA.

## 10:05

Enabling Graduate Students in STEM to Understand the Fundamentals of Communicating Across the Senses to Facilitate Accessible Communication.
Dr. Hellen Sullivan.

Rider University, USA.

## 10:35

Break (15 minutes)

## 10:50

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

## 12:20

Lunch (70 minutes)

## 13:30

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

## 15:00

Break (15 minutes)

## 15:15

Round Table Discussion 3: Student as Agents in Universal Access to Research Information.

## 16:45

Debrief and Closing Remarks

# Abstracts – Tuesday, 27 August 2024

## 9:05: Curriculum Made Accessible: The Importance of Inclusion

### Presenter

Ashley Neybert
Oregon State University, USA

### 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.

## 9:35: Alternative Avenues for Accessibility in STEM

### Presenter

Jennifer Doran\*, Ashley Neybert, and Dr. Andreas Schmittner
Oregon State University, USA

### Abstract

The Blind population is underrepresented in STEM fields across the 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 manner. 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.

## 10:05: Accessible STEM Books : How to Make it Happen

### Presenter

Sammi Määttä1 and Tim Arborealis2
1Accessibility Library Celia, Finland.

2Swedish Agency of Accessible Media, Sweden

### Abstract

What challenges do visually impaired students face when reading STEM textbooks? For a long time, mathematical equations have been inaccessible. New tools such as MathML and MathCAT are creating possibilities. At Celia and MTM we produce books for the visually impaired and people with other reading disabilities. We will discuss how we work on making STEM textbooks accessible and share our tips for publishers and users.

## 10:50: Bridging Similarities Through Shared Experiences

### Presenter

Ashley Neybert and Dr. Martin Storsdieck
Oregon State University, USA

### Abstract

An ongoing issue for students with disabilities is hearing that an instructor has never taught a student with their particular disability before. This often falls onto the student to tell the instructor how to best teach them which is a burden not held by other students. Often though the lived experiences that two people have might be more similar than what they would appear at a surface level. Two of these experiences are myself, a blind PhD graduate student in Education, and my PhD advisor Martin Storksdieck, a German immigrant to the United States. An analysis of similarities of several lived experiences and how bridging the gap when working with students with disabilities might be an easier bridge to build than previously imagined.

## 11:20: Maybe Theirs, But Not Ours - Representation in Algorithms

### Presenter

Dr. Rebekah Rousi\* and Juho-Pekka Mäkipää
University of Vaasa, Finland

### Abstract

In the area of AI ethics, increasingly more discussions are focusing on bias. Bias generates through a concentration of ideas or information that focus on certain parts of a whole, yet not necessarily the entire whole. In our current algorithmic era of artificial intelligence and particularly large language models, attention has been placed on bias resulting from lack of comprehensive representation of knowledge by both people developing the technology, and those who use it. In other words, the digital divide is alive and well for numerous reasons - linguistic, economic, geographical, accessibility-related. Yet, how to increase inclusion to deepen diversity within the algorithms is a point for discussion and contention. The same barriers that are present within the algorithms and the technology design, are the same social barriers that are present in human-to-human communication. This presentation is aimed at highlighting issues of discomfort and disability from the perspective of developers. Here, 'disability' refers to a lack of ability by those who develop technology to engage and collaborate with people who hold diverse experiential views and abilities. The presentation will not offer any quick fix solutions but aims to address the problem via its raw nerve - interpersonal social discomfort.

## 11:50: Fostering Neurodivergent Persistence in STEM: AIE- STEMPLOS Program Insights from Faculty

### Presenter

Rebecca Matte
Landmark College, USA

### 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.

## 13:30: The Blind Scientist’s Toolkit for Multi-Sensorial Science

### Presenter

Dr. Mona Minkara
Northeastern University, USA

### Abstract

In this presentation, I will discuss the importance of multi-sensorial science and the tools I have used as a blind scientist to conduct my research. "The Blind Scientist Tools" is an extensive online resource documenting the various multisensory tools and techniques I have used and engineered throughout my journey from high school to becoming a professor of bioengineering and a research scientist. The toolkit is a versatile resource for educators and students, containing a variety of tools ranging from hardware to software. It is organized into sections that address specific needs such as tools for research and classroom settings and is categorized by different academic and professional development stages, including high school, undergraduate, graduate, postdoctoral, and professional phases. This presentation aims to showcase tools for multi-sensorial science and emphasize the necessity of including blind and partially sighted individuals in the scientific community.

## 14:00: Supporting Neurodivergent Students in STEM: Case Studies and Innovative Strategies for Success

### Presenter

Dr. Christin Monroe
Landmark College, USA

### Abstract

Neurodivergent students possess unique abilities that often lie at the extremes of the bell curve. While these students offer distinct problem-solving skills that can greatly benefit STEM fields, they frequently face challenges within an educational system not traditionally designed for diverse learning styles. This presentation examines case studies of neurodivergent students, highlighting the barriers they encounter and the innovative strategies implemented to support their success.

One case discusses a student struggling with executive function challenges, who benefited from flexible deadlines and alternative assignment formats. Another case explores the rationale behind the use of video assignments in a flipped classroom and how these can serve as an accessible alternative. A third case examines a student grappling with confidence issues and sense of belonging, emphasizing the importance of curriculum modifications that foster metacognitive skills and appropriate self advocacy. The fourth case presents the use of AI-driven prompts to help students initiate assignments, providing insight into their thought processes. Finally, the teaching of molecular visualization is discussed, with a focus on scaffolding assessments and offering alternative learning tools, such as tactile models, to ensure all learning objectives are effectively accessed.

These case studies underscore the need for accessibility modifications and inclusive teaching practices that not only accommodate but also empower neurodivergent students, but all students, in their pursuit of STEM education.

## 14:30: Teaching Fundamentals of Accessibility: Perspectives from Students and Teachers on Course Implementation

### Presenter

Pauliina Baltzar\*, Tero Avellan, and Dr. Markku Turunen
Tampere University, Finland

### Abstract

What challenges do visually impaired students face when reading STEM textbooks? For a long time, mathematical equations have been inaccessible. New tools such as MathML and MathCAT are creating possibilities. At Celia and MTM we produce books for the visually impaired and people with other reading disabilities. We will discuss how we work on making STEM textbooks accessible and share our tips for publishers and users.

## 15:15: Science in Braille: Connecting and Advocating for the Necessity of Blind Scientists

### Presenter

Dr. Mona Minkara\*, Northeastern University, USA

Dr. Sheri Wells-Jensen, Bowling Green State University, USA

### Abstract

In this presentation, I will discuss the importance of multi-sensorial science and the tools I have used as a blind scientist to conduct my research. "The Blind Scientist Tools" is an extensive online resource documenting the various multisensory tools and techniques I have used and engineered throughout my journey from high school to becoming a professor of bioengineering and a research scientist. The toolkit is a versatile resource for educators and students, containing a variety of tools ranging from hardware to software. It is organized into sections that address specific needs such as tools for research and classroom settings, and is categorized by different academic and professional development stages, including high school, undergraduate, graduate, postdoctoral, and professional phases. This presentation aims to showcase tools for multi-sensorial science and emphasize the necessity of including blind and partially sighted individuals in the scientific community.

## 15:45: Using Audible Light Sensors for Laboratory Physics

### Presenter

Dr. Peter Walters
Independence Science, USA

### 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.

## 16:15: Sensing the Future of Laboratory Independence for the Blind

### Presenter

Dr. Greg Williams
Independence Science, USA

### 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.

# Abstracts – Wednesday, 28 August 2024

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

### Presenter

Dr. Shrirang Sahasrabudhe
Educational Testing Service, USA

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

### Presenter

Dr. Markku Häkkinen
Educational Testing Service, USA

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

### Presenter

Dr. Helen Sullivan
Rider University, USA

### 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 33rd 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 incorporate 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: Round Table Discussion 1

### Topic

How Higher Education is Improving IT Accessibility for Students with Disabilities.

## 13:30: Round Table Discussion 2

### Topic

Making Science Education Accessible to Students with Disabilities.

## 15:15: Round Table Discussion 3

### Topic

Student as Agents in Universal Access to Research Information.

# 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 encounter and learn how to effectively promote inclusion and equity in STEM, the more STEM education and related industries and professions will embrace, not fear, the participation of people with disabilities.

We look forward to your continued interest and participation in the ISLAND community in the months and years ahead. 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). This open access journal is a valuable resource for science educators and researchers alike. 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: The University of Tampere TACCU, Princeton University’s Office of Information Technology, Princeton University’s Campus Conversation on Identities, the Princeton Center for Complex Materials, and Independence Science. We offer special thanks to Mark Häkkinen and Helen Sullivan for all their work on the ground in Tampere. 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 to the 16th annual ISLAND conference in 2025. Please check the ISLAND conference website in spring 2025 for details.

Dr. Cary Supalo, Founder and Chair,

with Mary Albert, Dr. Peter Walters, and Jasodhara Bhattacharya









