

ISLAND

2012

**3rd Annual Independence Science
Learning a New Direction
Conference on Disability**

**Kurz Purdue Technology Center
Friday, November 16, 2012**

1281 Win Hentschel Blvd.
West Lafayette, IN 47906
Conference Rooms A-B

**Sponsored by:
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Conference Mission

The IsLAND conference on Disability serves to inform and connect educators and future educators to the latest assistive technology, while exploring alternative teaching methods and simple access solutions for learning. Multi-sensory and hands-on approaches are emphasized during this conference in order to generate elevated student interest in classroom material and, thus, improve concept development. Symposium topics also include factors that contribute to Science, Technology, Engineering, and Mathematics (STEM) underrepresentation and strategies for increasing representation among students with disabilities.

Schedule of Presentations

-Friday, November 16-

8:00 A.M.: Continental Breakfast

9:00 A.M.: Introductory Remarks by Cary A. Supalo, Assistant Professor of Chemistry, Illinois State University, Normal, Illinois.

9:15 A.M.: *The potential for raised-line renderings of Blissymbols for labeling in the laboratory.* Presenters: Mick Isaacson^{1,2}, Michelle Michaels² & Lyle Lloyd¹, Purdue University, West Lafayette, Indiana¹, Independence Science, West Lafayette, Indiana².

9:55 A.M.: *Practical, implementable suggestions and considerations for undergraduate chemistry instructors in their task of accommodating blind students.* Presenter: Jordan T. Harshman, Miami University, Oxford, Ohio.

10:35 A.M.: Coffee break.

10:50 A.M.: *Learning Experiences in STEM at Pre-K to 4th Grade Level.* Presenters: Lillian Rankel & Marilyn Winograd, MDW Educational Services

11:30 A.M.: *An Educator's Toolkit: Low Tech Methods for Modifying Science Labs.* Presenter: Alan Roth, Indiana School for the Blind and Visually Impaired, Indianapolis, Indiana.

12:10 P.M.: Lunch

1:10 P.M.: Introductory Remarks by Greg Williams, Independence Science, West Lafayette, Indiana.

1:25 P.M.: *Able Flight: Training People with Disabilities How to Fly to New Heights.* Presenters: Erin Bowen, Jennifer Kirschner, Scott Winter & Bernard Wulle, Purdue University, West Lafayette, Indiana.

2:05 P.M.: *The inTACT Tablet, Eraser, and Printer: an interactive system for producing, editing, digitizing, and reproducing freehand tactile graphics.* Presenters: Josh Coffee, E.A.S.Y. LLC, Burlington, Vermont.

2:45 P.M.: Coffee break

3:00 P.M.: *Audeme Games and STEM Education.* Presenters: Steve Mannheimer, Becky Heck, John Hesch, Ryan Sellick, Venkatesh Bharadwaj, Davide Bolchini & Mathew Palakal, Indiana University and Purdue University at Indianapolis, (IUPUI), Indianapolis, Indiana.

3:40 P.M.: *Enhancing Access of Biomedical Laboratory Research for Persons with Disabilities: More than Widening a Door.* Presenter: Susan M. Mendrysa, Purdue University, West Lafayette, Indiana.

4:20 P.M.: *STEM Access Technology for Persons with Disabilities.* Presenter: Dave Schleppenbach, President and Founder, GH LLC, Lafayette, Indiana.

5:00 P.M.: Conclusion

IsLAND 2012 Abstracts

The potential for raised-line renderings of Blissymbols for labeling in the laboratory

Mick Isaacson^{1,2}, Michelle Michaels² & Lyle Lloyd¹

Purdue University, West Lafayette, Indiana¹, Independence Science, West Lafayette, Indiana²

Braille consists of raised dots that are used by people who are blind for reading and writing. Braille is frequently used for labeling scientific equipment. These labels are supposed to help students with visual impairments increase their independence in scientific settings by helping them to independently locate various items (for example, beakers, graduated cylinders, and test tubes kept in drawers and cabinets throughout the scientific workspace). Using Braille labels may be problematic because Braille literacy has been decreasing over the past few decades. According to the American Printing House for the Blind, the Braille literacy rate among children who are blind is about 10%. Braille labels have limited use for those who do not read Braille. Blissymbolics is a symbol system that uses minimalistic visually rendered symbols. Processing of tactile stimuli is facilitated by minimalism. This paper will present evidence demonstrating that Blissymbols have the capacity to be tactilely discriminated from each other when produced as raised-line renderings. As these symbols have the capacity for being tactilely discriminated, it may be beneficial to consider their potential for use in labeling scientific equipment and in other settings in which non-visual activities may be desired.

Practical, implementable suggestions and considerations for undergraduate chemistry instructors in their task of accommodating blind students

Jordan T. Harshman, Ellen J. Yeziarski & Stacey Lowery Bretz,
Department of Chemistry and Biochemistry Miami University, Oxford,
Ohio

Adequately accommodating blind or low vision (BLV) students in the physical sciences has been a focus of recent research, but much of this work pertains to a laboratory setting rather than a lecture setting. This case study seeks to identify instructional techniques that support and impede the representation of information in the context of a typical gas laws unit in a college chemistry course for science majors. A female blind student participated in five interviews to provide insights on how information and ideas were communicated and interpreted. For instructors, the findings included practical suggestions related to representations of images, pragmatic considerations regarding instruction, and guidelines for the effective use of various technologies. With regard to university administration, findings included suggestions pertaining to multiple constituencies across the institution. In particular, a system for who should be responsible for various steps in the accommodation process was described.

Learning Experiences in STEM at Pre-K to 4th Grade Level

Dr. Lillian Rankel, Science Teacher & Marilyn Winograd, Teacher of the Blind

The presentation will concentrate on the fact that, with planning, 2-9 year olds can learn that STEM (Science, Technology, Engineering and Math) is fun. By giving blind and visually impaired children themed materials for hands-on exploration at their own pace, young children can be exposed to STEM. The curriculum that will be presented encourages a multi-sensory approach to learning, allowing kinesthetic opportunities. Blind and visually impaired children can learn cause and effect through active participation, rather than passive listening. This exposure to STEM at an early age will lead to integration and success in future classes.

Successfully used STEM activities will be displayed and teaching strategies shown. Integration of science, technology, engineering, and math are incorporated into these lessons. Ramps, snowflakes, wind, sound, gravity, friction and sailboats are just a few of the sample lessons. Materials used for these lessons include household items and "dollar" store purchases.

An Educator's Toolkit: Low Tech Methods for Modifying Science Labs

Alan Roth Indiana School for the Blind and Visually Impaired,
Indianapolis, Indiana

Students who are visually impaired and blind often struggle in science classes, when participating in laboratory activities, where the instrumentation and graphs are visual in nature. In this presentation, methods will be demonstrated for low tech, tactile modification, to enable students who are visually impaired and blind to have equal access to their sighted peers. You will walk away with great ideas for differentiating student STEM education.

Able Flight: Training People with Disabilities How to Fly to New Heights

Erin Bowen PhD., Jennifer Kirschner, Scott Winter & Prof. Bernard Wulle, Purdue University, West Lafayette, Indiana

Developing the skills required to fly an aircraft takes intense training with expert flight instructors to meet flight certification requirements. Not everyone can reach those standards, and the challenge is even greater for those with physical disabilities. There are opportunities to modify aircraft allowing physically impaired students to develop the skills to become pilots; however, due to the high cost, few are able to do so. Able Flight seeks to change that by providing scholarship opportunities for people with disabilities to learn to fly and opening up new educational and career opportunities. The partnership between Able Flight and Purdue's Department of Aviation Technology has provided a unique opportunity to develop adaptive equipment and educational and training methods. Over 30 individuals with various disabilities have received scholarships since Able Flight's inception, and all participants have successfully completed the requirements for a sport pilots' license.

The inTACT Tablet, Eraser, and Printer: an interactive system for producing, editing, digitizing, and reproducing freehand tactile graphics

Mike Rosen, Josh Coffee & Mike Coleman E.A.S.Y. LLC, Burlington, Vermont

inTACT is a three-component product system being developed by E.A.S.Y. LLC for production, editing, digitizing, and reproduction of freehand tactile graphics. It is based on standard methods for scribing raised lines on thin plastic sheets. The Tablet captures a user's strokes digitally while drawing, uploading them to a computer where input is converted to a graphics file formatted for driving the Printer. Using Tablet-generated or pre-existing graphics files, the Printer mechanically produces raised-line graphics on the same freehand-drawing plastic sheets. The hand-held Eraser thermally flattens raised lines by ironing them, allowing users to edit originals with repeated erasing/drawing. The system will greatly increase opportunities for effective interactive tactile graphical communication of all kinds (e.g., sketches, diagrams, designs, charts, graphs, schematics, flowcharts, and hand-written math) for blind and low-vision individuals, especially in STEM fields. This system allows for more than tactile sensing of pre-produced, permanent graphics; it enables users to interact with modifiable tactile graphics in ways never before possible. For example, a student can print axes from a digital file, then hand-draw and modify a graph on that same tactile medium while storing and sharing it digitally. E.A.S.Y also aims to produce interactive tactile graphics-based workbooks with such exercises.

Audeme Games and STEM Education

Steve Mannheimer, Becky Heck, John Hesch, Ryan Sellick, Venkatesh Bharadwaj, Davide Bolchini and Mathew Palakal, Indiana University and Purdue University at Indianapolis, (IUPUI), Indianapolis, Indiana

Science students in schools for the blind generally are obliged to use state-mandated textbooks full of illustrations, photographs and informational graphics that present concepts (e.g. water cycle, cell biology, solar system, etc.) that are not easily explained in words. Non-speech sounds, including sound effects and music, can present a different type of “audified” information to aurally “illustrate” such science concepts, often by referencing ideas that are metaphorically or semantically related to the target concept. For example, the idea of “mountain” is suggested by a yodel; “sunlight/sunrise” suggested by a rooster’s cockle-doodle. Combinations of such aural signifiers called “audemes” can form rebus-like semantic riddles that engage students both intellectually and emotionally, particularly when student teams compete to solve the riddles. In a year of in-class work with high-school students at the Indiana School for the Blind and Visually Impaired, audeme games were shown to be effective supplements to science pedagogy. Test scores for text units taught with audeme games were significantly higher than scores for units without audemes. For low-achieving students, scores sometimes improved as much as 30 percentage points. After a year of such games, scores of subjective student attitudes about science also showed significant improvement.

Enhancing Access of Biomedical Laboratory Research for Persons with Disabilities: More than Widening a Door

Susan M. Mendrysa

Basic Medical Sciences, College of Veterinary Medicine, Purdue University, West Lafayette, Indiana

Efforts to promote the inclusion of persons with disabilities in biomedical science have lagged behind other efforts focused on underrepresented groups. Persons with disabilities make up 10 percent of the overall workforce but less than 2 percent of employed scientists 35 years of age or younger. The mission of the Institute for Accessible Science (IAS), established at Purdue University in 2010 through funding by an NIH Director's Pathfinder Award, is to broaden the participation of persons with disabilities in science, technology, engineering, and mathematics (STEM) careers. In this presentation we will discuss three IAS activities designed to target and break down attitudinal and physical barriers that persons with disabilities face in biomedical science. First, we will present the results from a survey of a large cohort of research faculty about their perceptions of the barriers that may limit the entry of persons with disabilities into biomedical science careers. Second, we will discuss lessons learned from the IAS Summer Undergraduate Research Fellowship Program. Third, we will present an overview of accessible laboratory scientific instruments currently being developed by IAS.

STEM Access Technology for Persons with Disabilities

Dave Schleppenbach

President and Founder, GH LLC, Lafayette, Indiana.

GH LLC is currently engaged in several interlinked projects with the shared objective of improving accessible mathematics education. The overarching goal is to create a complete, accessible online mathematics course, including enhanced input and output tools. The individual projects are directed toward software design, usability testing, and a study of the underlying framework of secondary-school math education.