

**ACCESSIBLE TECHNOLOGY WEBINAR SERIES**

Southwest Center      Pacific ADA Center      Great Lakes Center

**Accessibility & Inclusion in K-12 Computer Science Education**

Session Begins 1:00 pm CST  
Periodic Audio Testing Occurring

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### Useful Keyboard Shortcuts

- Full list - *Keyboard Shortcuts* from the *Help* menu on the Menu Bar.
- Chat: Move cursor to the Message text box  
Windows: Ctrl+M  
Mac: Command-M
- Speaker level Up:  
Windows: Ctrl+Alt+Up Arrow  
Mac: Command-Option-Up Arrow
- Speaker level Down:  
Windows: Ctrl+Alt+Down Arrow  
Mac: Command-Option-Down Arrow

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### More keyboard shortcuts

- Open Closed-Captioning window  
Windows: Ctrl+F8  
Mac: Command-F8
- Close Closed-Captioning window  
Windows: Alt+F4 or Ctrl+W  
Mac: Command-W

3

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Listening to the Webinar

- The audio for today's webinar is being broadcast through your computer. Please make sure your speakers are turned on or your headphones are plugged in.
- You can control the audio broadcast via the Audio & Video panel. You can adjust the sound by "sliding" the sound bar left or right.
- If you are having sound quality problems check your audio controls by going through the Audio Wizard which is accessed by selecting the microphone icon on the Audio & Video panel.



4

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Listening to the Webinar, *continued*

If you do not have sound capabilities on your computer or prefer to listen by phone, dial:

**712-432-6297**  
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**558341#**  
 This is **not** a Toll Free number

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Listening to the Webinar, *continued*

MOBILE Devices supported include iPhone, iPad, Android Devices, Kindle Fire HD)\*\*

Individuals can download the free Blackboard Collaborate App from the Apple Store, Google Play or Amazon



\*\*Closed Captioning is not visible via the Mobile App and there is limited access to the white board for individual's using voice over technology

6

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### Captioning

- Real-time captioning is provided during this webinar.
- The caption screen can be accessed by choosing the  icon in the Audio & Video panel.



- Once selected you will have the option to resize the captioning window, change the font size and save the transcript.

7

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### Submitting Questions

- You may type and submit questions in the Chat Area Text Box or press Control-M and enter text in the Chat Area
- If you are connected via a mobile device you may submit questions in the chat area within the App

*Please note:* This webinar is being recorded and can be accessed on the website at <http://www.ada-accessibletech.org> within 24 hours after the conclusion of the session.



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### Customize Your View

- Resize the Whiteboard where the Presentation slides are shown to make it smaller or larger by choosing from the drop down menu located above and to the left of the whiteboard. The default is "fit page"
- Resize/Reposition the Chat, Participant and Audio & Video panels by "detaching" and using your mouse to reposition or "stretch/shrink". Each panel may be detached using the icon in the upper right corner of each panel.

9

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**Setting Preferences**

- Depending on your system settings you may receive visual and audible notifications when individuals enter/leave the webinar room or when other actions are taken by participants. This can be distracting.
- To turn off notifications (audible/visual)
  - Select "Edit" from the tool bar at the top of your screen
  - From the drop down menu select "Preferences"
  - Scroll down to "General"
    - select "Audible Notifications" then Uncheck anything you don't want to receive and "apply"
    - Select "Visual Notifications" then Uncheck anything you don't want to receive and "apply"
  - For Screen Reader User – Set preferences through the setting options within the Activity Window (Ctrl+slash opens the activity window)

10

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**Technical Assistance**

- If you experience any technical difficulties during the webinar:
  1. Submit a message regarding your issue via the chat area and the Moderator will address your concern via a private chat with you and/or refer it to one of the Great Lakes ADA Center IT Staff to contact you off line; or
  2. Call 877-232-1990 (V/TTY)

11

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**ACCESSIBLE TECHNOLOGY WEBINAR SERIES**

**Accessibility & Inclusion in K-12 Computer Science Education:  
Meeting the Needs of Students with Disabilities  
in the CS for All Movement**

January 17, 2019

- **Maya Israel** - Associate Professor of Educational Technology, University of Florida
- **Todd Lash** - PhD Student, University of Illinois Urbana-Champaign

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Presenter: Maya Israel

- Associate Professor of Educational Technology, University of Florida
- Director of Creative Technology Research Lab (CTRL)
- Research: strategies for supporting students with disabilities meaningful engagement in science, technology, engineering, and mathematics (STEM)
  - Emphases on computational thinking and Universal Design for Learning (UDL).
- PI of National Science Foundation (NSF) project – Project TACTIC
  - Teaching All Computational Thinking through Inclusion and Collaboration, which focuses on accessible and inclusive computer science instruction.
- Works with multiple school districts on meaningfully including all learners in K-8 computer science education.

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Presenter: Todd Lash

- Doctoral student at the University of Illinois at Urbana Champaign.
- Elementary educator for 16 years who oversaw computer science instruction.
- Research interests: increasing equity in and access to high-quality computer science education for all students.
- Writer for both the K-12 CS Framework and on the 2016-2017 CSTA Standards revision working group.

14

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Roadmap

- Introductions
- What is CS for All?
- How who is accessibility being addressed in CS for All?
- Research and development focused on accessibility in K-12 CS education
- Next steps that should be taken

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**Computer Science Education in K-12 involves**

The broad range of topics including the study of:

- Algorithmic processes/thinking
- Coding/programming
- Ethics of computing
- Collaborative computing
- Hardware
- Etc.



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**What is CS for All in the U.S.?**

- White House initiative in 2016
- Petition signed by 26 governors (bipartisan) and dozens of industry CEOs
- National Science Foundation investments
- State and district initiatives



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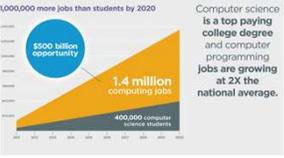
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**Why focus on CS for All?**

- Jobs/career opportunities
- Equity/access
- Transferable skills including:
  - Persistence
  - Collaboration
  - Creative problem solving



Credit: Code.org

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What about accessibility & inclusion in K-12 CS Education?

- Most programming platforms for young learners:
  - Have limited access with screen readers
  - Do not focus on cognitive supports
  - Rely on visual representations
- Many activities are open-ended with ill-defined problems
- There is still a bias about who can/can't be successful in CS

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The good news....

- Students generally are motivated to engage in creative problem solving
- Teachers buy into CS for All and want to include all their learners in CS activities
- National momentum towards increasing access



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### Advantages of text-based languages

- Generally easier to use with a text-reader
- Language more similar to professional coding languages

```
1 background(180, 145, 200); // moon table
2 fill(200, 200, 200);
3
4 //plate
5 stroke(34, 183, 183);
6 strokeWidth(2);
7 ellipse(200, 200, 250, 250);
8 fill(200, 225, 200);
9 ellipse(200, 200, 300, 300);
10
11 //green
12 stroke(34, 183, 183);
13 fill(200, 200, 200);
14 ellipse(250, 200, 150, 150);
15 stroke(70, 183, 183);
16 fill(200, 200, 200);
17 ellipse(250, 200, 72, 72);
18 stroke(170, 183, 183);
19 fill(247, 228, 182);
20 rect(217, 187, 40, 35);
21 //green beans
22 stroke(34, 143, 193);
```



Request Help Spin-off Save 25

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### Accessibility issues in text-based programming

- Discoverability of features within the system
- Reading code line by line, including indentation levels (How can we read white spaces efficiency?)
- Reading code comments embedded in the code

\*Pictures are of Codesters which proactively was designed with access in mind.

```
1 stage.set_background("moon")
2 sprite = codesters.Sprite("rocket")
3 sprite.go_to(-100, -150)
4 def click(sprite):
5     sprite.say("Blast Off!")
6     sprite.set_say_color("white")
7     sprite.set_y_speed(3)
8     sprite.event_click(click)
```



Blast Off!

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### What are we doing about this issue?

- CS for All Accessibility Pledge
- National Science Foundation focus on access and inclusion as part of it's broadening participation mission
- Work with school districts to educate about options

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**CSforALL Accessibility Pledge**

- Aimed at engaging:
  - Content creators, Program providers, School districts/states, Researchers, & Investors
- Focus on “first steps” and “ongoing commitment” to accessibility in CS education

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**Commitment from Content Creators (making tools & curricula)**

- Assess content and tools for accessibility and usability for a broad range of users (including those with disabilities)
- Create an improvement plan to address targeted gaps and meet accessibility standards
- Include accessibility guidance along with tools and curricula for users
- Make accessibility a priority in developing future CS education content and tools

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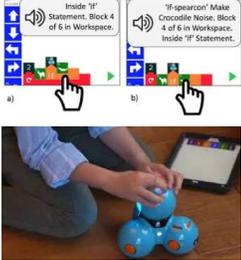
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**Example: Blocks4All**

- High contrast image blocks that can be resized
- Audio and visual outputs
- Readable through text-reader
- Used with physical robot (Dash) that can be felt, seen, heard



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### Example: Quorum Programming Language

Quick Introduction to Quorum | Hour of Code



**Core Track**

Learn to code in Quorum with built lessons. This track is for folks who already have some programming skills.



**Visual Track**

Learn to code in Quorum with lessons that incorporate visual programming.



**Audio Track**

Learn to code in Quorum with lessons that incorporate audio programming.



**Robotics Track**

Learn to code in Quorum with lessons that incorporate robotics programming. This track requires access to a LEGO™ robot kit.

- “Born accessible” text-based programming language based on universal design principles.
- Focus on users who utilize screen reader technologies.
- Use of visual, auditory, and tactile design elements including custom vibration library

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### Example: Bootstrap

- Curriculum to teach algebra, physics, and data science through CS education
- Use of text-based programming language
- Accessibility features include:
  - ARIA labels: navigation of tool bar, interaction area, definition areas
  - Use of keyboard shortcuts & other navigation aids
  - Multiple means of representing data beyond graphical output



computing creatively  
thriving mathematically

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### Commitment from Program Providers:

- Acquire materials, curricula and technology that is accessible.
- Review program content and tools for accessibility.
- Create an improvement plan and set target dates to fill identifiable gaps
- Include accessibility guidance for facilitators, teachers, and other content implementers

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**Example: Deaf Kids Code**

- CS and making workshops and school programs for students who are deaf and hard of hearing.
- Focus on hardware and robotics
- Support deaf education teachers and other school personnel that work with students who are deaf and hard of hearing



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**Example: Tech Kids Unlimited**

- Not-for-profit education organization that does after school, weekend, hackathons, and summer programs for students with a range of abilities and needs.
- Focus on students with autism spectrum disorders, social/emotional challenges, etc.
- Emphasis on job skills, cognitive access, problem solving, and social interactions.



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**Commitment from School Districts and State/Regional Education Assoc.**

- Acquire materials, curricula, and tech that is accessible for students with a range of needs
- Work with school personnel that have knowledge of assistive technologies, accessibility, and student needs (AT coordinators, special educators, occupational therapists, etc.)
- Identify systemic barriers to inclusion
- Offer professional development on Universal Design for Learning, accessibility, and inclusion

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Example: Broward County Public Schools

- Teacher professional development focused on including ALL learners in CS education opportunities.
- Investment in physical robotics as well as software



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Example: New York City Public Schools

NYC Department of Education Computer Science for All

- Development of a Blueprint for K-12 education based on Universal Design for Learning (UDL)
- Creation of model units that are accessible and built through UDL and differentiation
- Ongoing professional development for teachers



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Commitment from CS Education Researchers

- When possible, gather demographic data on research participants including disability status
- Consider impact of research on a range of users
- In developing pedagogies and technologies for CS education, consider a range of instructional need
- When working in K-12 schools, advocate for the inclusion of a range of learners in CS education opportunities

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Example: Our work with the CTRL Research Lab

- Creative Technology Research Lab (CTRL)
- NSF projects focused on inclusion of all learners with a focus on elementary and middle school
  - Focus on Universal Design for Learning, accessibility, and inclusion
  - Work with school districts and provide resources for inclusion of all learners, including those with a range of instructional needs



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Another Example:



- Focus on increasing participation of students with disabilities in high school computing education.
- Provide professional development to teachers
- Work on software development (e.g., Quorum and Blocks4All)

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Next steps in Research:

- Continue studying accessibility, learning, and engagement to improve functionality and accessibility.
- For example, Bootstrap initial lessons learned:
  1. Students are not as familiar with screen readers as the researchers expected.
  2. For students with visual impairment, they overwhelmingly preferred text-based languages but there is a "threshold for maximum length of code".
  3. Equity goes beyond the tool and extends to the curriculum

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**Next steps in teacher professional development:**

- Teachers want resources for supporting all their students. We must create additional resources to help teachers!
- For example, the CTRL lab is creating:
  - TACTiCal teaching briefs that have strategies embedded in case studies
  - Universal Design for Learning examples in CS education
  - Face-to-face professional development for teachers

43

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**TACTiCal Teaching Briefs on the CTRL website**

**TACTiCal Briefs**

- Peer Collaboration during K-12 Computer Science Instruction
- Paraeducators during K-12 Computer Science Instruction
- Utilizing the Universal Design For Learning Framework in Computer Science Education
- Meeting the Needs of All Learners in K-12 Computer Science Through Co-Planning and Co-Teaching
- Scaffolded Project Planning During K-12 Computer Science Instruction

44

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**Universal Design for Learning Examples in CTRL**

Multiple Means of Representation	Multiple Means of Action and Expression	Multiple Means of Engagement
<p><u>Provide options for perception</u></p> <ul style="list-style-type: none"> <li>• Model computing using physical representations as well as through an interactive whiteboard, videos</li> <li>• Give access to modeled code while students work independently</li> <li>• Provide access to video tutorials of computing tasks</li> <li>• Select coding apps and websites that allow the</li> </ul>	<p><u>Provide options for physical action</u></p> <ul style="list-style-type: none"> <li>• Provide teacher's codes as templates</li> <li>• Include CS Unplugged activities that show physical relationship of abstract computing concepts</li> <li>• Use assistive technology including larger/smaller mice, touch-screen devices</li> <li>• Select coding apps and websites that allow coding with keyboard shortcuts in addition to dragging &amp; dropping with a mouse</li> </ul>	<p><u>Provide options for recruiting interest</u></p> <ul style="list-style-type: none"> <li>• Give students choices (choose project, software, topic)</li> <li>• Allow students to make projects relevant to culture and age</li> <li>• Minimize possible common "pitfalls" for both computing and content</li> <li>• Allow for differences in pacing and length of work sessions</li> <li>• Provide options to increase or decrease sensory stimulation (for example listening to music with</li> </ul>

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**Resources**

**K-12 CS Framework:**  
<https://k12cs.org/>

**Bootstrap Accessibility information:**  
<https://www.bootstrapworld.org/blog/accessibility/User-Interface-REPL.shtml>;  
<https://www.bootstrapworld.org/blog/accessibility/User-Testing.shtml> ;  
<https://www.bootstrapworld.org/blog/blocks/Block-Getting-Started.shtml>

**Blocks4All:**  
<https://milnel2.github.io/>;  
<http://stemforall2018.videohall.com/presentations/1078>

**Quorum programming language:**  
<https://quorumlanguage.com/>

46

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**Additional Resources**

**Deaf Kids Code:**  
<https://www.deafkidscode.org/>

**New York City CS4NYC:**  
<https://blueprint.cs4all.nyc/resources/>

**Creative Technology Research Lab (CTRL):**  
<https://ctrl.education.illinois.edu/>;  
<https://docs.google.com/document/d/1bga4e18U5PTxWvj3NrQmCULKEYGw3R81weiZLhfpo/edit>

**AccessCSforAll:**  
<https://www.washington.edu/accesscomputing/accesscsforall>

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**Thank You For Your Attention!**

- **Maya Israel**  
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 misrael@coe.ufl.edu
  
- **Todd Lash**  
 University of Illinois  
 toddlash@illinois.edu

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**QUESTIONS?**

You May Type and Submit questions in the Chat Area Text Box  
or press Control-M and enter text in the Chat Area

**Accessibility & Inclusion in K-12 Computer Science Education:  
Meeting the Needs of Students with Disabilities  
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The session today was recorded and will be archived at  
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**NEXT WEBINAR: *WHAT'S NEW WITH WCAG 2.1*  
MARCH 21, 2019 AT 1:00 PM [CENTRAL]**



The Accessible Technology Webinar Series is sponsored by the Great Lakes,  
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