# Slide 1: Title Slide

New Models for Creating Accessible Interactive Widgets for STEM Learning by Kyle Keane, Wolfram Research and Madeleine Rothberg, NCAM on August 7, 2014

# Slide 2: Today’s Webinar is Presented By

Kyle Keane, Research Programmer Wolfram Research and Madeleine Rothberg, Project Director, WGBH National Center for Accessible Media

# Slide 3: The DIAGRAM Center

* A Benetech Global Literacy Initiative
* **D**igital **I**mage **a**nd **G**raphic **R**esources for **A**ccessible **M**aterials
* **Goal:** Make it **easier**, **faster**, and **cheaper** to create and use accessible images for students with print disabilities.
* 5-year Research & Development Center funded by the U.S. Department of Education, Office of Special Education Programs (OSEP)
* Awarded to Benetech along with partners:
  + The Carl and Ruth Shapiro Family National Center for Accessible Media (NCAM) at WGBH
  + U.S. Fund for DAISY

# Slide 4: Housekeeping

* Download slides at http://diagramcenter.org/webinars.html
* Please enter your questions in chat window
* Q & A at the end
* This webinar is being recorded
* To see live captioning, open a second window at http://www.captionedtext.com/client/event.aspx?CustomerID=1159&EventID=2423519
* We will notify you when a recording of this webinar is posted at http://diagramcenter.org/webinars.html

# Slide 5: Interactive Scientific Graphics

Kyle Keane, Research Programmer, Wolfram Research

http://diagramcenter.org/accessible-dynamic-scientific-graphics.html

# Slide 6: Intro: Widgets

A widget is a digital representation of information that allows interactions from a user to change the information or display of the information.

Everything is a widget!

**Image:** Before and After Interaction: Left-hand side shows circle with radius labeled 1, with two radio buttons beneath the circle for user to choose either "1" or "1.5" The "1" choice is selected. Right-hand side shows the same image, except this time the circle is a little bigger and radius is labeled 1.5. The "1.5" radio button is selected.

# Slide 7: Intro: Interactive Scientific Graphics

* Widgets for STEM education and communication
* Information displayed is often data visualizations (charts, plots, graphs)

# Slide 8: Intro: Example

**Image:** Screen shot of interactive widget. A slider control titled "Number of Dogs" appears at the top of the widget with range 0-200. Below the slider control is a bar chart titled "Pets" with two columns. The left-hand bar, labeled "Dogs," is higher than the other bar and displays the number "100." The right-hand bar, labeled "Cats," displays the number "80."

# Slide 9: Overview: Deliverables

* Written Report
  + Analyze interaction stages
  + Identify components of widgets
  + Review best practices for components
  + Synthesize reviewed best practices
* Working Example
  + Demonstrate synthesized best practices
  + Create concrete example for discussion

# Slide 10:Written Report: Contents

http://diagramcenter.org/accessible-dynamic-scientific-graphics.html 

* Front Matter: 6 pages
  + Overview of project
  + Summary of recommendations
* Main Report: 31 pages
  + Methodology
  + Reviews of related resources
  + Synthesis into recommendations
  + Specific examples
* Appendices: 11 pages
  + Technical background
  + List of resources

# Slide 11: Written Report: Summary

* Analyze interaction stages
* Identify components of widgets
* Review best practices for components
* Synthesize reviewed best practices

# Slide 12: Written Report: Interaction Stages

* Discovery
  + How many controls?
  + How many linked communications?
* Navigation
  + What type of information is presented?
  + What information is presented?
* Selection
  + What is current control selection?
  + What are possible control selections?
  + What information changes?
  + How does information change?
* On-demand
  + What information is presented?
  + How to interact?

# Slide 13: Written Report: Components 1

There are two main components of a widget: Display and Control

**Image:** Before and After Interaction: Left-hand side shows circle with radius labeled 1, with two radio buttons beneath the circle for user to choose either "1" or "1.5" The "1" choice is selected. Right-hand side shows the same image, except this time the circle is a little bigger and radius is labeled 1.5. The "1.5" radio button is selected.

# Slide 14: Written Report: Components 2

Interactive Scientific Graphics are two separate components:

1. The **Dynamic Scientific Graphic** that is paused or changing with time
   * pie chart, bar chart, graph, plot, …
2. The **Digital Control Object** used to change parameter values
   * radio buttons, checkbox, dropdown menu, …

**Image:** Left-hand side shows circle with radius labeled 1, with two radio buttons beneath the circle for user to choose either "1" or "1.5" The "1" choice is selected. Right-hand side shows the same image, except this time the circle is a little bigger and radius is labeled 1.5. The "1.5" radio button is selected.

# Slide 15: Review and Synthesis: Dynamic Scientific Graphics

**Image:** This represents the five main sources of information that were synthesized into recommended best practices during this project. Five lines labeled Section 508, WebAIM, W3C, NCAM, and DCP & ADC feed into a central circled labeled, "Synthesis." A large arrow from the Synthesis circle points to "Recommended Best Practices."

# Slide 16: Recommendations: Dynamic Scientific Graphics

* Content
  + **Accurate**—do not misrepresent information
  + **Equivalent**—describe all information in graphic
  + **Objective**—only describe information in graphic
  + **Essential**—only represent necessary information
* Vocabulary
  + **Contextual**—use words from an appropriate STEM discipline
  + **Common**—use common and researchable words
  + **Appropriate**—use words that reflect the intended audience’s knowledge
  + **Consistent**—do not use multiple words to describe the same thing
  + **Unambiguous**—do not use one word to describe multiple things
* Phrasing
  + **Clear**—information should be easy to extract
  + **Concise**—use phrases that are as simple as possible
  + **Understandable**—repetition should be unnecessary
* Delivery
  + **Apt**—identify changing features
  + **Synchronous**—describe changing features when changes occur
  + **Controllable**—describe information from general to specific

# Slide 17: Review and Synthesis: Digital Control Objects

**Image:** This represents the five main sources of information that were synthesized into recommended best practices during this project. Five lines labeled Section 508, WebAIM, W3C, indieUI, and Accessibility APIs feed into a central circled labeled, "Synthesis." A large arrow from the Synthesis circle points to "Recommended Best Practices."

# Slide 18: Recommendations: Digital Control Objects

* Discovery
  + **Identity**—provide a clear and appropriate title
* Navigation
  + **Common**—mimic common navigation procedures
  + **Current**—approximately indicate the relative current value when changing
* Selection
  + **Common**—mimic common selection procedures
  + **Current**—precisely indicate the absolute current value after selection
* On-demand
  + **Operation**—describe how to use
  + **Overview**—describe general effects of usage
  + **Function**—describe specific effects of usage
  + **Value**—indicate the current value

# Slide 19: Working Example

http://diagramcenter.org/accessible-slider.html

* On the web page:
* Overview of functionality
* Instructions for using the working example
* Interactive Graphic
  + Standard slider control with added hotkeys
  + Bar chart displaying current data
* Speech Log
  + Visual display of what should be spoken and when

# Slide 20: Working Example (continued)

**Image:** Left side is a widget labelled "Interactive Graphic." A slider control titled "Number of Dogs" appears at the top of the widget with range 0-200. Below the slider control is a bar chart titled "Pets" with two columns. The left-hand bar, labeled "Dogs," is higher than the other bar and displays the number "100." The right-hand bar, labeled "Cats," displays the number "80."

# Slide 21: Working Example (continued)

http://diagramcenter.org/accessible-slider.html

* Slider
  + Standard HTML5 <input id=“slide”>
  + Added JavaScript functions for
    - onKeyUp, onKeyDown, and onKeyPress
    - onMouseDown and onMouseUp
    - onFocus
* Bar Chart
  + Standard SVG
  + Updated by JavaScript in Slider
* Speech Log
  + Standard list <ul>
  + Messages added by JavaScript in Slider
  + aria-live tells AT to speak messages when added

# Slide 22: Interactive Examples

Madeleine Rothberg, Project Director, WGBH National Center for Accessible Media

# Slide 23: Pearson Revel

* A new line of interactive materials for higher education
* Launching this fall
* Pearson partnered with Metrodigi and SSB BART Group to create accessible, interactive widgets.

**Image 1:** Screen shot of interactive graphic titled "Figure 7.2 The String Problem." A man holding the end of string hung from above stands next to a table that has a pair of pliers on it. A second string hangs on the other side of the man, but out of his reach. Caption says, "How can this man tie the two strings together if he can't reach both at the same time? Click 'next' to see the solution."

**Image 2:** Screen shot of interactive graphic titled "Table 7.2 Gardner's Nine Intelligences." A table of 3 columns and 10 rows. Most cells contain some text but some do not. At the bottom of the screen is a cell that can be dragged and dropped to empty cells within the table.

# Slide 24: Long Description

**Image:** Screen shot of interactive graphic titled "Figure 7.2 The String Problem." A man holding the end of string hung from above stands next to a table that has a pair of pliers on it. A second string hangs on the other side of the man, but out of his reach. Caption says, "How can this man tie the two strings together if he can't reach both at the same time? Click 'next' to see the solution."

# Slide 25: Drag and Drop

**Image:** Screen shot of interactive graphic titled "Table 7.2 Gardner's Nine Intelligences." A table of 3 columns and 10 rows. Most cells contain some text but some do not. At the bottom of the screen is a cell that can be dragged and dropped to empty cells within the table.

# Slide 26: Guidelines

* Interactive Scientific Graphics: Recommended Practices for Verbal Description by Kyle Keane (Wolfram)  
  http://diagramcenter.org/accessible-dynamic-scientific-graphics.html
* Detailed technical guide by Bryan Garaventa (SSB BART and WhatSock) at: http://whatsock.com/training/

# Slide 27: Coming up

* DIAGRAM Center guidelines on multimedia and interactive activities
  + Coming Spring 2015 http://diagramcenter.org/research.html
* IDPF ePub Widget Framework: standards collaboration of educational publishers and technologists
  + https://github.com/IDPF/widgets
* PhET: interactive, research-based simulations of physical phenomena
  + http://phet.colorado.edu/

# Slide 28: Questions?

# Slide 29: For More Information

* DIAGRAM Center Research
  + http://diagramcenter.org/research.html
* Twitter @DIAGRAMC
  + https://twitter.com/DIAGRAMC
* Email us
  + info@diagramcenter.org
* Born Accessible
  + http://benetech.org/our-programs/literacy/born-accessible/
* Benetech Global Literacy
  + http://benetech.org/our-programs/literacy/

# Slide 30: Even more resources

Visit our webinars page at http://diagramcenter.org/webinars.html

* 3D Printing for the Accessible Classroom
* Accessible Image Sample Book
* Office Hours with the Image Description Experts
* Tools for Creating Accessible Math
* Best Practices for Integrating Accessible Images into eBooks and DTBs
* Accessible Images: From Creation to End User
* How to Describe Complex Images for Accessibility
* Digital Accessible Math Images

# Slide 31: Thank you for attending!

END OF PRESENTATION