2022 Device Agnostic User Interview Results

By Theresa Wilkinson

TABLE OF CONTENTS

PURPOSE OF RESEARCH STUDY

The research study gathered guidance and insights from internal ETS usability and accessibility experts. The following participant were interviewed:

- Irfan Ali, Principal Accessibility Engineer
- Lynnette Banning, Accessibility Contractor
- Timothy Fiser, Product Mgt Lead
- Melissa Gholson, Research Scientist
- Danielle Guzman-Orth, Ph.D., Sr Research Scientist
- Mark Hakkinen, Director Digital Accessibility
- Kris Anne Kinney, Senior Accessibility Specialist
- Leslie Nabors Olah, Ph.D., Sr Research Scientist

UNDERSTANDING DEVICE AGNOSTIC

The following document is to help understand the following:

- What is Device Agnostic?
- What is Responsive Design?
- What is the 8c decision, and how does it relate to DA and Responsive Design?
- What is the plan for the new Math and Reading Frameworks?
- What is the plan for legacy content?

Device Agnostic

Device-Agnostic (DA) is an approach that will give the NAEP assessment the ability to be delivered on a wide variety of school-based equipment across different platforms (operating systems), with the aim of offering a seamless experience across the devices within a specific range of screen sizes, resolutions and input modalities. Given the restrictions necessary to maintain the integrity of the assessment, there will be limits on what types of devices the assessment can be delivered on. These restrictions, or "requirements" will be determined and set for the following at minimum:

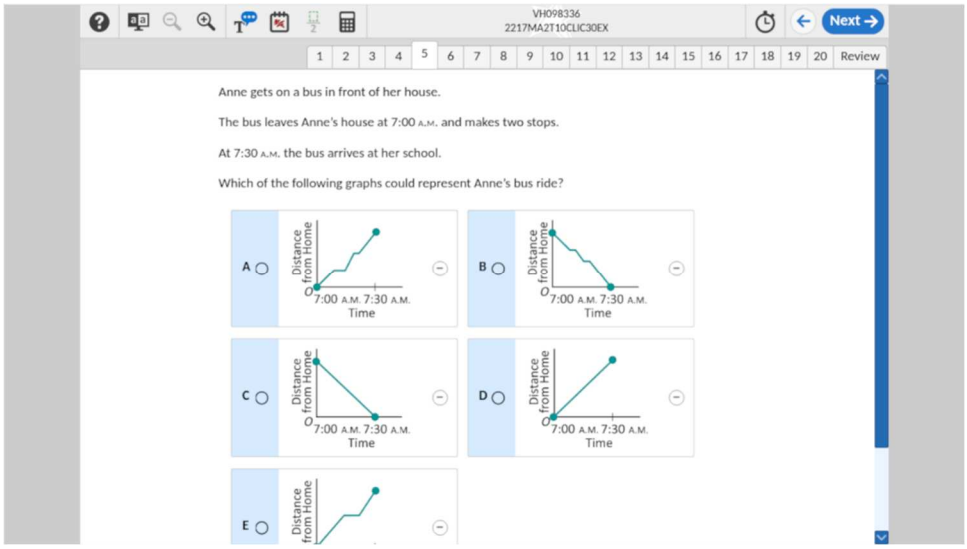
- Physical Screen Size
    - This will likely be 11.6", given that touch targets and other features of the assessment become inaccessible at smaller screen sizes.
- Screen Resolution
    - We have recommended moving to a Next Level Down (NLD) resolution of 1366x768, as it represents the lowest screen resolution across devices commonly found in schools.
- Input Modalities
    - Keyboard + trackpad
    - Keyboard + mouse
    - Keyboard + touch
- System Memory (RAM)
    - Some content, such as Science SBTs require higher levels of RAM

Responsive Design

Responsive Design is an approach to web design that would adapt assessment content to allow for a similar experience across a broader range of devices than currently supported, without the need for special adaptations. For example, content in a two-column layout could drop to a single column with more vertical scrolling. Fonts could be resized, or "respond" to the device to account for changes in the screen resolution across devices. Given the risk to trend, NCES has decided to defer this as an approach until after 2026. The DA cross-functional team (CFT) has a plan to support responsive zoom as an accommodation, potentially added to our existing magnification blocks. The investigation into this approach was approved by NCES and will be reported back to NCES for a decision on moving forward in a future assessment year.

8c

Given concerns about the impact of responsive design on trend, NCES decided to use an approach called "letterboxing" through at least 2026. This would mean that we would maintain the current resolution of 1368x912 found on the Surface Pro devices, as well as the aspect ratio of 3:2. If on a larger resolution, or a different aspect ratio, we would simply add bars around the content:



Current Understanding

On 7/21/2021, the Online/DA Cross Functional team made a recommendation to NCES to make a small compromise of the NLD resolution so we could have the ability to move to a lower resolution device in a way that would allow us to adjust to a lower resolution. A request was made to do more in-depth analysis to determine if the program could move forward with NLD as a minimum-resolution for school-based equipment.

New Reading Framework

Currently Reading CFT is working through ideation on a new reading interface to support the new reading framework. This new interface is being developed in a way that could potentially allow for adaptation of existing items in the pool.

Response to NCES

ETS and NCES are still discussing minimum device specifications. In the future, the program may need to administer on smaller devices. In this case, it may be necessary for students to view passages and items and other features in a single column format (versus the SBT side by side presentation). This is one reason why the new UI is focusing on single-column layout for all blocks. Additional implications for new reading development, as well as any reading-specific device-agnostic guidelines, will be shared with NCES at future biweekly content meetings and at Prototype Working Group meetings.

New Math Framework

New math framework items are currently being authored and are in the form of Word documents. These items are being reviewed by the CFT team, as detailed below in text from the mathematics implementation plan responses to NCES. IBIS entry began in September 2021.

Math Implementation Plan Text

During the 4/30/2021 math meeting, NCES stated being comfortable with the approach for accounting for device agnostic considerations for new development that were shared during the 4/29/2021 meeting with NCES-ID, ETS-ID management, and the Online/Device-agnostic cross functional team. The online/device-agnostic CFT and assessment developers are meeting to understand device-agnostic goals and to discuss examples of item layouts that may pose challenges. As item development has begun, the mathematics item developers and the CFT have begun investigations to identify potential issues. Additionally, at key points in the item development process, items will be reviewed for device-agnostic considerations. Currently, these key points include:

- Item ideation
- Entry into IBIS
- Preparation for Standing Committee 1
- Preparation for Standing Committee 2
- Feedback from Standing Committee 2

We have added text to the plan, in Section 4, to describe the above approach.

As math assessment developers are now ideating new items, this is the first phase of actual new item review for potential device agnostic constraints. The Online/Device-Agnostic CFT has brought together the assessment development team, NPD staff, and the ID Technical Team to walk through this first set of item ideas to identify potential problem areas and to begin generating a more detailed device agnostic review “checklist” for new mathematics items (beyond initial guidelines regarding drag distances and large, fixed images).

These group reviews of draft items will continue throughout the main phases of development to iterate the device agnostic review checklist. The checklist will be shared with NCES as it is iterated. Further, the checklist will be shared with other content leads for relevant cross-subject review criteria.

The Alliance has been working on an initial recommendation for screen resolution specifications, which were shared with NCES in July. We anticipate that specifications will minimize risks to trend in the 2024 and 2026 operational administrations. The recommendations also consider the next level down (NLD) display resolution; the Alliance has proposed potential technical solutions that could allow the existing item pool to be rendered at this lower resolution. Assessment developers will collaborate with NPD colleagues and the ID Technical Team in the investigation and prototyping necessary to fully understand the feasibility and potential tradeoffs of these solutions. Analysis and findings will be shared with NCES at the Prototype working group.

DEVICES USED IN THE FIELD

This information was supplied by Danielle Guzman-Orth:

- Laptops with mouse-like trackpad
- Laptops with built-in keyboard
- Laptops with external keyboards and external mouse
- Laptops using the little red joystick in the middle of the keyboard
- iPads, with built in keyboard
- iPad without a keyboard - but they took the keypad that's embedded within the iPad and they split it, and used their thumbs like they're texting (DGO)

CONTENT RENDERING ACROSS DEVICES

What is Content Rendering?

Rendering is a process used in web development that turns website code into the interactive pages that users see when they visit a website. The term generally refers to the use of HTML, CSS, and JavaScript codes. The process is completed by a rendering engine, the software used by a web browser to render a web page.

Quotes

- “...the most important thing is to **ensure that the resolution makes effective use of the display** that's available to the student." MH
- “… when graphical elements are designed for one resolution, a lower resolution, then you begin zooming it for students who need magnification, you start getting **pixilation of either graphics or bitmaps**.” MH
- "... in our user usability testing with low vision test takers, one of the complaints that they have is when they begin magnifying things like **math expressions or parts of charts** that are pixel based, they **get blurry and fuzzy and are very hard to read at higher magnification levels**." MH

- "… some of the little (kids) I've seen **get up close to the screen, depending on the size of the font**, whether or not they have a disability..." DGO
- "The way that the text is rendered on the screen. But when you have a lowercase d, and you have that line that extends above and the lowercase y in the line that extends below. So, **anything that extends above or below, those (letters) seem to touch**. The touching text is not following the WCAG success criteria. So again, was it programmed appropriately? Did it exactly follow WCAG success criteria? Was it tested at all levels of zoom? Plus, assistive technology levels? That's an open question. So, I think it begs a lot more exploration and discussion." DGO
- "Well, historically, the answer for me has been consistency of user experience. I think that needs to give way to a more **consistency of a different type where the interaction and the content** and the context are made clear, regardless of the device." TF
- "I would say we certainly want to consider **clarity of text as it's presented**. So, we want to make sure that the **text is clear, not pixelated**. Everything has to render exactly the same for every student." KK
- "Different (students) may have different needs. And when it comes to the different screens, so you need to be more cautious to provide that content. For example, if you have a big screen and then you are providing other features, such as zoom or magnify, there could be several methods to **(ensure) that the content is accessible, visible and easily identifiable**. And that includes using the **right font, size, and spacing** is, of course, important. And when I say different users, some users use TTS engine. If somebody is **using TTS, then you need to use some form of content selection**. So, the user can see what the particular content is being read, especially with small devices. So now the question is, how small?" IA
- "Most of the **states have standard assessment platforms**. And they have **minimum requirements for rendering**. There are things outside when you go with the device agnostic, they have nothing to do with the testing content except **making sure that somebody is reviewing to (ensure) that content is being displayed correctly**. Are you actually creating a list of device agnostic devices that would work?" MG
- "And a lot of schools use Chrome devices right now, because they're cheap. Also know that sometimes **Chrome devices don't have the same screen size**. So, it **could be cutting off content** for students. It's also **difficult to use other devices with add-ons**. So, if I'm a student with a disability, and I need to have access to that text to speech, I might have to minimize something and maybe I can't even use that device. And I still have to go back to the computer platform. **There needs to be some recommendations around the devices** and how the students might **interact if at all with specific tools** and then **attention to detail plan on any platform updates** that would occur." MG
- "Because different users may have different needs. And when it comes to the different screens, so you may need to be more cautious to provide that content." IA
- "If you have a **big screen**, let's say you're using the desktop application, and then you are providing other features, such as zoom or text increase, or there could be **several methods to (ensure) the content is accessible and visible and easily identifiable,** and that includes using the **right font, font size, and spacing**." IA
- "And when I say like different students, if a **student is using TTS**, then you need to use some kind of **way to select the content**. So, the student can see what the particular content is being read, but since we are talking about the device agnostic, and especially the small devices." IA

LETTERBOXING

Overview of Letterboxing

Letterboxing is the process of adding black bars to the top and bottom of a movie or video after shrinking the whole image to fit a smaller screen, which otherwise could not accommodate the wide resolution of the film.

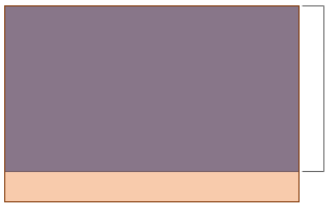
3:2

16:9

Rendering one aspect into another aspect is optimized via autoscaling to the largest available dimension, maintaining the original aspect ratio.

Options for Display

3:2 Aspect Maintained



Scale to fit height with horizontal letterbox on 16:9 - Centered or top-left aligned

Pros

- Same layout on both device types
- Vertical scrolling same as legacy

Cons

- Reduction of display pixels on NLD, scaled down interface elements
- Native aspect is not the target of future devices supported

Scale to fit width with content overflow vertically on 16:9 devices

Pros

- Best use of available width resolution
- No visible letterboxing

Cons

- Increase of items needing vertical scrollbar
- Possible new condition of items for trend
- Full frame interfaces designed on 3:2 will always scroll (Reading DI)

Quotes

- "…for **students with low vision**, it's a **waste of screen real estate** that **can be used to amplify the content**." MH
- "… when you **letterbox across display sizes**, your effective **character height will likely vary** across the different display configurations." MH
- "(Aspect ratio and letterboxing) are related. You remember watching movies on TV a long time ago, the letterbox movie? And it would show you the full aspect ratios as if you're watching a theater. So, **you're maximizing side to side but you lose vertical height**. Doing the same kind of thing, like maintaining one aspect ratio across different devices, you have to decide which one is going to be your base. And then you can letterbox accordingly -- like for a 16 x 9 screen showing 3 x 2. Okay, so that kind of aspect ratio you like maybe burns part of the sides because you don't need all the side information to get full height, that three by two ratio." TF
- "It's going to be super problematic for low vision students. And depending on passage size, it could **be frustrating for sighted students** because they're being **forced to scroll and or paginate**, where maybe they wouldn't have needed to as much because they've got a higher resolution computer or monitor." KK
- "Letterboxing is something that you **cannot** just **use** the absolute **size mechanism for fonts or the text**. It has to be relative so there should be breathing space -- there should be some padding or margins, just to make sure that the content is clearly visible." IA

SCREEN SIZE

- The starting values of 1280 x 1024 are an accepted “standard” desktop size. Zooming by 400% reduces the width to 320 (1280 divided by 4) and the height to 256 (1024 divided by 4) which are “standard” mobile sizes. Many sites today use responsive design to adjust the view of the application to match the screen size. (WCAG 1.4.10 AA)
- Generally, laptops with larger screens will be heavier, so avoid 15.6in and 17in devices unless having more screen real estate is something your kid is desperate for. A 13in or 14in device is ideal for most children, though younger kids may be better suited to a tablet or 2-in-1 with a 10.5in display. (Best laptop for kids 2021: The best child-friendly notebooks | Expert Reviews)

Quotes

- “… **screens should scale appropriately to the display that students are using**. And that means choosing your font sizing metrics, so a **normal font size is a normal font size for whatever display** it's been rendered on and not forced to an attempt to make a common you know 12 pixel high character or 14 pixel high character.” MH
- "...use **best practices for typography**" MH
- “Resolution obviously, is how many pixels per inch you have on your screen. You can have a very large screen with low resolution and vice versa. Your phones have a high resolution and a very small screen. So you can pack a lot more stuff on a smaller or higher resolution screen and you can lower resolution, but you run into all sorts of problems with keeping using the word dithering, but I think there's a better word for it, where, like, there's pixel averaging between when you have something doesn't fit exactly on the number of pixels. So, you end up running into problems, especially with accessibility, where the contrast compliance between one element and another might fade away into the frontlines. Because (of) dithering.” TF
- “If you have a very **high resolution on a very small screen**, **the text could potentially be harder to read**. If you have a really small screen size, you probably want to make the resolution slightly bigger, so that your content is easy to see without straining your eyes, leaning forward, craning your neck, things like that.” KK
- “I would say the **smallest would be 10. And that's super tiny**.” KK
- “Content is so directly associated to or related to the font size and the relative size. So, on a **smaller screen**, your **font should be clear** and font size should be defined in a way so that when it renders on a small device is it has relative size and easily readable. The font should also render with zoom or increasing the font size. But that is a very general comment in terms of the WCAG requirement.” IA

PHYSICAL SCREEN SIZE IN RELATION TO TOUCH VS MOUSE

How touch screen is different than mouse?

- Using a mouse actually requires two interfaces. The physical interface in your hand (the mouse itself) — which controls the cursor — and the digital interface on the screen, which you "touch" with the cursor. Meanwhile, a touch screen is a single interface that **you touch directly**.
- The main takeaway from the table is that there is **no single winner**. Mice and fingers each have their strong points. (Mouse vs. Fingers as Input Device (nngroup.com))

Quotes

- "What we what we tend to see when we have **touchscreens that are vertical**, such as a laptop touch display, **fatigue can set in for candidates or students who are expected to use touch exclusively on like horizontal or near horizontal displays**." MH
- "... if you're **not able to use a mouse**, you're also **not** likely **able to use touch**, which means that you're going to have to ensure that there's keyboard interactivity for everything, which **people often overlook when they design and innovate assessment items**." MH
- "I think that **smaller physical screen size will certainly be detrimental to a student's touch/mouse use**. **Smaller screen sizes** generally **make the touch targets smaller and potentially harder** for students, **especially 4th graders** or those with **dexterity issues**, to use them. Even though you may be able to make the resolution bigger, it still may not be enough." KK
- "If you get **too small of the screen, it adds to fatigue**. I've noticed that some students with vision issues, they can really get fatigued." MG
- "And if you've locked that screen size, say **12 inch devices**. You can **only blow that up to a certain level**, then it's really difficult. And the other flipside of that is, if you **start out too large, and then students are having a look all over the screen**. So, finding that sweet spot is really important." MG
- "When you're looking at looking the contents being rendered, you might also want to look at it as you increase the size of the screen. But I do think that when you consider **fourth graders** in particular, I think **screen size is really going to be key, especially when it looks like a lot more contents on a page when in the screen size is smaller**." MG
- "I do think that when you **consider fourth graders** in particular, **screen size is really going to be key**." MG

SCROLLING

The action of moving displayed text or graphics up, down, or across on a computer screen in order to view different parts of them.

Research

- Minimize scrolling as a reader behavior, so that text can be read in a more stationary way. (Nichols, 2020)

- Test-takers are aware of off-screen content, but **the extra effort of scrolling appears to be an inhibiting factor**. (Way & Strain, 2021)
- Scrolling requires readers to both maintain a surface representation of a text and engage in comprehension processes. Consistent with this explanation, **scrolling** can be thought of as **exacerbating the cognitive demands or load on readers**, which **especially** affects **working memory** capacity readers. (Sanchez & Wiley, 2009)
- Another possibility is that **lower working memory** capacity **readers** may have **difficulty controlling their attention while reading scrolling texts** and may be more likely to become **disoriented or lost during reading**. (Sanchez & Wiley, 2009)
- A third possibility is that when faced with scrolling texts, lower working memory capacity readers may fail to engage in consolidation or integration processes regularly. Without the prompt offered by page breaks, **low working memory capacity readers** may **fail** to engage in **wrap-up processes critical for comprehension**. (Sanchez & Wiley, 2009)
- **The more students scroll, the less they comprehend**. (Brady, Cho, et al., 2018)
- The amount of time spent scrolling through the text is associated with the amount of time spent reading. (Brady, Cho, et al., 2018)
- There was no relationship between scrolling and pre-test scores, reading aptitude or ethnicity. (Brady, Cho, et al., 2018)
- Increased overall reading time in the scrolling condition did not translate into a deeper understanding of the text. (Wieczorek, Klyzejko et al. 2014)
- Whenever participants had to **scroll through the text**, **their results in the recall test were significantly lower** in comparison to the pagination condition. (Wieczorek, Klyzejko et al. 2014)
- **The analysis of glance count further indicated that participants in the scrolling condition were making more eye movements across the screen.** Based on these results, we argue that although participants spent more time and made more transitions between paragraphs, they were **not able to process the information correctly, when reading a scrolled text**. (Wieczorek, Klyzejko et al. 2014)
- It was unclear whether callouts were helpful or distracting from the main text, however, the researchers observed a **significant increase in deep processing in the scrolling condition with callouts, which indicates that the callouts were beneficial for comprehension in case of less efficient formats, such as scrolling**. (Wieczorek, Klyzejko et al. 2014)
- **Paginated versions of the text might have facilitated more effective, location-based coding of information**. In the **scrolling** condition, **participants** had to **divide the content into smaller 'chunks'** themselves, and the **ability to do so** might have **depended** on their **cognitive skills, such as working memory**. (Wieczorek, Klyzejko et al. 2014)

Quotes

- "But for **students with low vision**. The **horizontal scrolling is a killer to read passages** of text." MH
- "I think **bi-directional scrolling increases the reading load for children**. A **fourth grader sometimes still reads printed text using their finger to scan and track**. And if they're **trying to move a mouse on a screen back and forth and to keep track of what they've read and what line they're on**. And all of **that adds to cognitive load**. And **NAEP does not allow read aloud**. **Students have no support to help them read that text**. And **vertical scrolling**, **depending on the length of the vertical scroll, is generally easier**. I think **more or attention needs to be paid to the size of the passages that are being asked to be read in NAEP**." KK

- "… **scrolling can be** significantly **challenging when students don't scroll down and see all the content**. The other problem is when there's a **lot of scrolling and students tend to get less motivated**. It takes a lot more time to answer an item and response time is critical to test scores." MG
- "I also think on a **Chromebook scrolling is terrible and a lot of students won't have a mouse**." MG
- I've been in a lot of testing environments where kids were passed out a **Chromebook**. **There is no scrolling in that they have to go down and find that little icon**. Sometimes it's very small. And that's a **lot of fine motor skills that can also be detrimental to students who have fine motor issues and or vision problems trying to even locate the item**. And it's not just students with disabilities that struggle with that, scrolling is something that I think **students are used to when they're on an iPad. Scrolling is just a finger movement, but it's a little more complicated on a Chrome device**." MG

ZOOM

Zoom is enlarging the screen to make something bigger. This increases the need for students to scroll.

Quotes

- "**Zoom is really an important feature**. For example, **in math, students use Zoom a lot.** Sometimes they use it in text, so (ensuring) it renders correctly, that it's actually not losing (image) quality, or that it's not going off screen." MG
- "I think if a **student has a real vision impairment** and needs zooming, the zooming tool is a little much, it's **probably better to use a larger screen** for students that have that and making sure that you know, the **items are rendered correctly**, **I've seen total distortion in some devices when things are blown up**." MG
- "If you **use the zoom tool** on the testing platform itself that often has set levels. What that often does for the young students though, is **it increases the scrolling** that they have to do. And because the **students are still developing the fine motor skills**, especially with the range of how they might be interacting with moving the screen, whether it's a mouse with a scroll, teeny, tiny scroll bar. **We've done a lot of our cognitive lab studies observing this, sometimes it introduces more issues**. **So, they're using the zoom to see the text, but then they can't see the text because they can't scroll the screen.**" DGO
- "**Zoom up to four times on the screen is often not enough** and students like to use magnification with Zoom. That sometimes introduces some issues with how things are programmed on the screen. **Because with the magnification, the selectable areas are not necessarily aligned with where they are visually**. So, there's a lot of challenges." DGO
- "**Zoom breaks all sorts of layout stuff**, which we've tried to like have a death grip on maintaining the same exact look and feel across presentations, even across Surface Pro for three, four and five. But when you zoom in, there's the isomorphic zoom, which is everything. NAEP has been isomorphic to date. So, everything maintains that same position relative to each other. **And the picture gets bigger in the horizontal scroll and vertical scroll to see what you want to see**." TF
- "I think Zoom is very helpful for children, like I said before, depending on screen size, depending on text size, and being able to zoom. **I think it is important (to ensure) that Zoom doesn't**

overburden the child by making bidirectional scrolling where it didn't exist before. **I think reflow Zoom is the most helpful because it restructures the text and keeps them on vertical scrolling as opposed to bi-directional scrolling.**" KK

- "Zoom is really an important feature. For example, **in math, students use Zoom a lot**. **Sometimes they use it in text, so (ensuring) it renders correctly**, that it's actually not losing (image) quality, or that it's not going off screen." MG
- "I think **if a student has a real vision impairment and needs zooming**, the zooming tool is a little much. **It's probably better to use a larger screen** for students that have that and making sure that you know, the items are rendered correctly, **I've seen total distortion in some devices when things are blown up**." MG

APPENDIX A

User Interview Questions

1. What are the most important things to consider for content rendering across multiple device types?
2. What do you think the implications of screen size are for children?
3. What do you think the implications of physical screen size in relation to touch vs mouse are for children?
4. What do you think the implications of vertical and bi-directional scrolling are for children?
5. What do you think the implications of zoom are for children?
6. What do you think the implications of target sizes are for children?
7. What do you think the implications of letter boxing are for children?

Participant Biographies

- **Irfan Ali,** Principal Accessibility Engineer - He is a seasoned IT leader/Architect and Accessibility Engineer experienced in Web and mobile development using modern technologies, the transformation of legacy systems, innovation, IT projects, and Accessibility Engineering. He has expertise in mobile and web applications, Web accessibility, Performance Optimization for high volume sites, User Experience, web accessibility, WCAG 2.1, ARIA authoring practices, Assistive technologies, Section 508 and web browsers compatibility. He is an advocate of accessibility using training and public speaking about digital accessibility engineering. He participates in international standards working groups (such as W3C, Aria working Group) to introduce accessibility requirements, use cases, and contribute to developing standards.
- **Lynnette Banning**, Accessibility Contractor - He is a seasoned IT leader/Architect and Accessibility Engineer experienced in Web and mobile development using modern technologies, the transformation of legacy systems, innovation, IT projects, and Accessibility Engineering. He has expertise in mobile and web applications, Web accessibility, Performance Optimization for high volume sites, User Experience, web accessibility, WCAG 2.1, ARIA authoring practices, Assistive technologies, Section 508 and web browsers compatibility. He is an advocate of accessibility using training and public speaking about digital accessibility engineering. He participates in international standards working groups (such as W3C, Aria working Group) to introduce accessibility requirements, use cases, and contribute to developing standards.
- **Timothy Fiser,** Product Mgt Lead - High-tech engineer turned educator with emphasis on authentic science, engineering, and mathematics instruction, assessment, and leveraging technology to improve outcomes for students and educators. Strives to develop authentic educational experiences that place the student in the driver's seat to engage questions, problems, and knowledge in ways that are meaningful, relevant, and parallel with the educational system as well as students' goals. Passionate about performance assessment of knowledge and skills through interactive and adaptive technologies and simulations.
- **Melissa Gholson**, Research Scientist - She has a passion for research and equitable outcomes for special and underserved populations. My areas of interest include educational policy and assessment. Her expertise includes knowledge of technical requirements for assessment development, accessibility, accommodations, meaningful inclusion of all subgroups, issues of fairness and validity in testing. She has experience in state assessment, peer review and assessment development for large-scale assessment including general, alternate and language proficiency assessments. She has practitioner experience and knowledge within the fields of

special education and assessment development and administration. I have provided technical assistance and guidance to LEA's, SEA's and assessment consortia on issues of fairness, law and policy guidance for students with disabilities, English learners, and English learners with disabilities.

- **Danielle Guzman-Orth, Ph.D,** Sr Research Scientist - High-tech engineer turned educator with emphasis on authentic science, engineering, and mathematics instruction, assessment, and leveraging technology to improve outcomes for students and educators. She strives to develop authentic educational experiences that place the student in the driver's seat to engage questions, problems, and knowledge in ways that are meaningful, relevant, and parallel with the educational system as well as students' goals. She is passionate about performance assessment of knowledge and skills through interactive and adaptive technologies and simulations.
- **Mark Hakkinen**, Director Digital Accessibility - He leads the Accessibility Standards & Inclusive Technology Group at ETS, where our focus is on research and development of educational assessments and technology that supports all learners, including those with disabilities. His interests include non-visual and multimodal interfaces supporting users with visual impairments, improving spoken presentation of content, digital accessibility policy, and technical standards that include and enhance the accessibility of digital technologies. If you want to learn more about our work at ETS, please let me know. Outside of ETS, he teaches accessibility and inclusive design each summer at the University of Jyväskylä in Finland as part of the Cognitive Science program there. He also is active in accessibility standards development in W3C and IMS Global Learning Consortium.
- **Kris Anne Kinney,** Senior Accessibility Specialist - She works as a senior accessibility specialist for Educational Testing Services, a company that is a leader in assessments. She is a co-organizer of the A11Y Princeton Meetup. She is a co-chair for the Education and Outreach Working Group (EOWG), COGA Task Force, and Accessibility for Children Community group within W3C. She is a Certified Professional in Accessibility Core Competencies (CPACC).
- **Leslie Nabors Olah**, Ph.D, Sr Research Scientist - She is a highly experienced analyst committed to improving equity through research; esteemed for leadership and mentorship; lifelong learner and collaborator who loves the generality of the forest and the details of the trees.