Device-Agnostic Assessment Research for NAEP Case Study

Presented by Theresa Wilkinson

Device-Agnostic Assessment Research for NAEP
Case Study

Agenda

- Project Overview
- The Problem
- Research Approach
- Key Findings
- Recommendations
- Impact

Project Overview

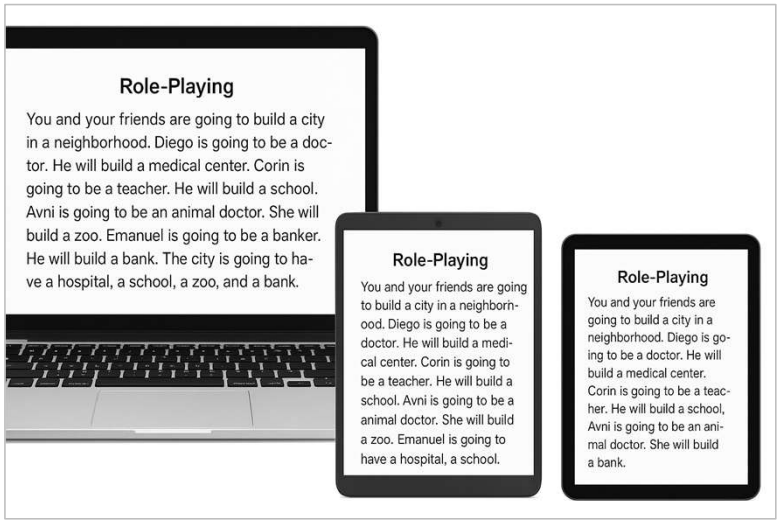
Role: Lead UX Strategy & Research
Organization: ETS
Duration: 20 months

Project Overview: The Device-Agnostic project examined how NAEP assessments should function across a wide range of school-based devices—laptops, Chromebooks, and iPads—while preserving accessibility, validity, and trend. I led expert interviews, synthesized technical constraints, and defined UX requirements to support consistent rendering, interaction, and readability across varying screen sizes, resolutions, and input methods.

Key Contributions:

- Led qualitative research with ETS accessibility, usability, and content experts to identify risks and requirements for device-agnostic delivery.
- Analyzed how device variables (screen size, resolution, aspect ratio, RAM, touch vs mouse, trackpad behavior) impact readability, scrolling behavior, zoom, and student performance.
- Evaluated constraints such as letterboxing, minimum device specifications, and non-responsive layouts to protect the trend while minimizing cognitive load for students.
- Provided UX guidance for new Reading and Math frameworks, including single-column layouts, scalable assets, touch-target standards, and zoom-safe content design.

Project Overview



Overview

As NAEP prepares to deliver assessments across a wider range of school devices, the program must ensure all students—regardless of screen size, device type, OS, input modality, or visual needs—receive an equivalent, accessible testing experience.

I led a comprehensive research effort to understand:

- How content renders across diverse devices
- How screen size and resolution affect readability
- How touch, mouse, keyboard, and trackpad impact interaction
- How scrolling and zoom influence comprehension
- How letterboxing (used to protect trend) affects usability
- What device-agnostic constraints should guide new Reading and Math frameworks

Research Objectives

We needed clear direction on four critical areas:

- **What "device-agnostic" truly means for NAEP**
- **What minimum device requirements should be**
- **What design risks exist for smaller screens, low-resolution devices, and varied input methods**
- **What implications these factors have on future Reading and Math item development**

To answer this, I conducted structured interviews with ETS's top accessibility and assessment experts.

Participants

Interviews included specialists in accessibility engineering, research, product management, and content development:

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

Interviews followed a consistent protocol covering rendering, screen size, input methods, scrolling, zoom, target sizes, and letterboxing.

Key Findings

Device Agnostic Requirements

Device-Agnostic (DA) delivery must support a variety of school-based laptops/tablets while maintaining assessment integrity.

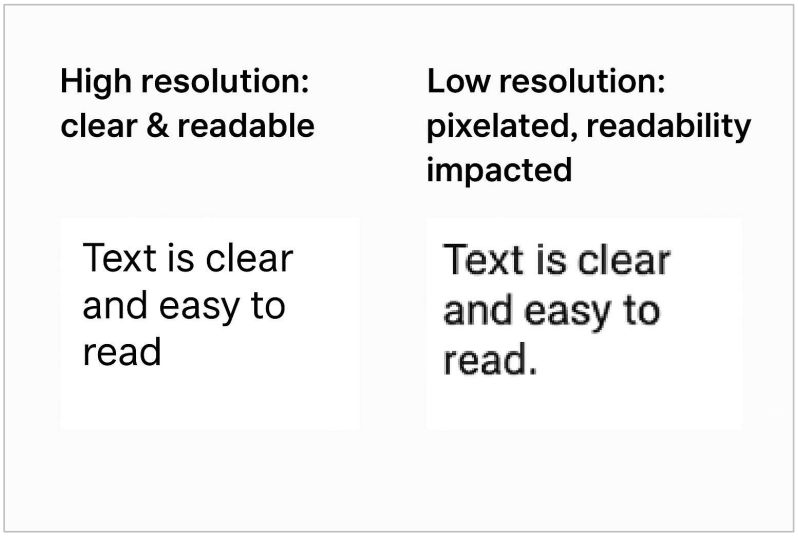
Minimum constraints recommended:

- **Physical screen size:** ~11.6"
- **Minimum resolution: 1366 × 768** (Next Level Down)
- **Input support:**
  - Keyboard + mouse
  - Keyboard + trackpad
  - Keyboard + touch
- **Sufficient RAM** for science simulations and math tools

Experts emphasized that content must remain **clear, scalable, and non-pixelated** across all supported devices.

"Everything has to render exactly the same for every student." — KK
"The most important thing is ensuring display resolution is used effectively." — MH

Key Findings



Screen Size & Readability

Smaller screens introduce readability challenges, especially for younger students and low-vision users.

Findings:

- Content designed for one resolution degrades when magnified on smaller screens.
- Very high-resolution small screens can cause text to appear *too* small.
- Experts suggested **10–11 inches as the minimum acceptable**.

"On a smaller screen, font should render with relative size and be easily readable." — IA

"If screen size is too small, students fatigue quickly." — MG

Key Findings

Touch VS Mouse Input

Device interactions vary widely:

- Laptops with trackpads
- Laptops with external mice
- Devices with mini-joystick controllers
- iPads with and without external keyboards
- Students typing with thumb-split keyboards

Key risks:

- Smaller physical screens shrink touch targets.
- Vertical touch on laptop screens causes fatigue.
- All interactions must be keyboard-accessible for students who cannot use mouse or touch.

"Smaller screen sizes make touch targets harder for 4th graders." — KK

"If you can't use a mouse, you might not be able to use touch—keyboard must be supported for all." — MH

Key Findings

Scrolling & Comprehension

Scrolling has **significant negative impact** on comprehension -- especially for younger and lower-working-memory students.

Major research findings:

- More scrolling = lower comprehension
- Students often **miss content below the fold**
- Scrolling increases cognitive load and reduces motivation
- Chromebooks make scrolling harder because of trackpad precision issues
- Horizontal scrolling is particularly harmful

"Horizontal scrolling is a killer for low-vision students." — MH

"More scrolling increases reading load and distractibility." — KK

"On Chromebooks, scrolling is terrible; students often can't find the tiny scrollbar." — MG

Key Findings

Letterboxing

Letterboxing (required to preserve trend) maintains the 3:2 aspect ratio by adding black bars on non-native devices.

Key findings:

- Wastes valuable screen real estate for low-vision users
- Reduces effective character height
- Forces unnecessary scrolling for sighted users
- Must be paired with flexible typography and padding

"Letterboxing is problematic for low vision students." — KK

"You lose vertical height, which forces more scrolling." — TF

"You must use relative font sizing—absolute sizing fails under letterboxing." — IA

Key Findings

Implications for New Reading & Math Frameworks

Reading

- New Reading UI is moving toward **single-column layouts** to support smaller devices and minimize lateral scanning.
- Content may need to reflow for future trends in school device adoption.
- Responsive zoom may be added as an accommodation.

Math

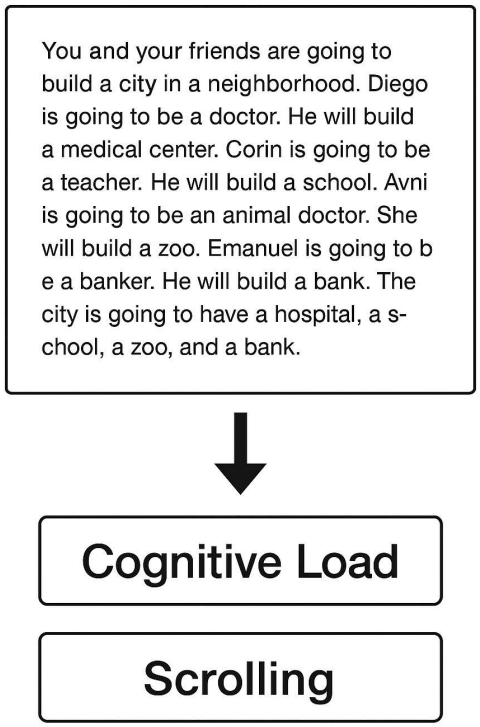
DA considerations must be reviewed throughout all phases:

- Item ideation
- IBIS entry
- Standing Committee reviews

The CFT is developing a **device-agnostic item checklist** covering:

- Drag distances
- Large fixed images
- Touch target size
- Layout risk areas

Impact



This research provided:

- **A unified definition of "device-agnostic" for NAEP**
  - Clear operational constraints for screen size, resolution, input types, memory, and rendering.
- **Guidelines that shape forward development:**
  - Reading UI now centers single-column design
  - Math item development incorporates DA reviews at every stage
  - The program is considering responsive zoom as an accommodation
  - Technical teams are investigating the viability of the NLD resolution
- **Critical evidence for NCES decisions -** Findings helped NCES understand tradeoffs of supporting smaller, cheaper school devices without compromising accessibility or trend.

Final Recommendations

- **Adopt 11.6” screens & 1366×768 as baseline until further research is completed.**
- **Require keyboard accessibility for all interactions, including drag-based math items.**
- **Avoid horizontal scrolling at all costs; limit vertical scrolling in Reading.**
- **Use scalable vector-based assets to prevent pixelation under zoom.**
- **Design touch targets large enough for 4th graders and students with motor challenges.**
- **Continue iteration of the DA checklist across Reading and Math.**
- **Work with NCES on future-proofing guidelines as devices evolve.**

Interview Questions

Contact

APPENDIX

Appendix

Interview Questions

Device & Layout

1. Which factors are most important for content to display well on different devices?
2. How does screen size affect usability or layout?
3. How does letterboxing impact content display or user interaction?

Interaction & Input

4. How do touch and mouse interactions differ for users?
5. What should we consider when setting sizes for interactive targets?

Scrolling & Zoom

6. What challenges arise with vertical vs. bi-directional scrolling?
7. How does zooming affect the user experience?

Contact

Theresa Wilkinson

Email: theresaw@columbus.rr.com

Portfolio: http://www.w-edge.com/portfolio.html

LinkedIn Profile: https://www.linkedin.com/in/theresa-wilkinson-231196/