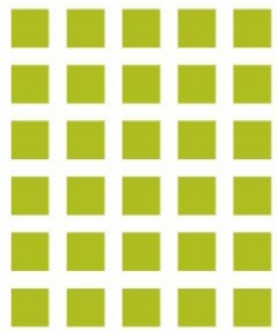ATEA
Accessibility for Technology-Enhanced Assessments

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Purpose of the ATEA Project

- Investigate how to make innovative, technology-enhanced assessment items accessible and equitable for students with vision and motor disabilities.
- Questions
  - How can TE items be adapted or altered for delivery to students who require accommodations such as audio, switches, print, or braille tests?
  - When TE items are presented in alternative formats, does the performance of students without vision or motor disabilities change?
  - Does construct measurement change when item format changes?
  - Does the performance of students on accommodated forms (audio, print, braille) vary by modality?
  - What are the characteristics of this low-incidence population?

Activities of the ATEA Project

- <u>Expert Review</u>: experts in vision and motor disabilities reviewed prototype items in spring 2013 and final items in fall 2014

- <u>Teacher Panels</u>: teachers in five states contrasted original items and the first round of accessible formats in fall 2013

- <u>Cognitive Labs</u>: one-on-one labs with students with vision disabilities in fall 2013

- <u>Field Tests</u> in spring 2014 in Kansas to test alternative TE formats with general students

- <u>Item Tryouts</u> in partner states in fall 2014 in order to obtain larger samples of students with vision and motor disabilities

Characteristics of Technology-Enhanced Items

- Presentation
  - Tools, color, interactive graphics, reverse contrast, screen magnification, auditory calming
  - Linked embedded audio and video, data files, dictionaries, or other resources
  - Alt text for graphics, language translations, braille-ready files, sign language interpretation
  - Touch screen tablets and assistive technologies
- Engagement
  - Opportunity to manipulate content interactively
  - Authentic, real-world experience and application
- Response
  - Response latency, time spent on item, history of changed responses
- Scoring
  - Partial credit, graded response, multiple correct answers, and other complex scoring algorithms
- Construct Measurement
  - Increased cognitive complexity (e.g., application rather than recall or recognition)
  - Efficiency of combining the content of several traditional items into one stimulus

Presentation and Response Options

- Presentation
  - Visual and audio presentation online
  - Print and braille forms
- Response
  - Click-to-select responses: radio buttons, tab-and-enter keys, switches
  - Drag-and-drop responses: click or touch and hold an item element, move to another location on the screen, release
  - Drop-down menus: click on the menu to open the drop-down list, scroll to select response with mouse, trackball, or arrow keys
  - Optical scan sheets
  - Constructed responses with keyboard, dictation, braille writer, or paper

Goals for Accessible Items

- Remove inaccessible actions like dragging and dropping elements onscreen
- Create static alternatives for print and braille test forms
- Maintain content and wording of original TE items
- Use vocabulary that represents cognitive task requirements (choose, compare, sort) rather than physical requirements (click, open, move)
- Maintain construct consistency with original TE items
- Enable accommodations such as screen magnification, text-to-speech audio, reverse contrast, and switch support

Drag and Drop: Labeling (one to one)

Select the *x* value that makes each equation true.

x = −3	*x* = −2	*x* = −4	*x* = −1

drop correct response here	$x^2 - x - 6 = 0$
drop correct response here	$3x^2 - 12x - 15 = 0$
drop correct response here	$6x^2 - 6x - 72 = 0$
drop correct response here	$6x^2 + 18x - 24 = 0$

Accessible Alternative: Matching

Select the *x* value that makes each equation true.

$x = -3$	$x^2 - x - 6 = 0$
$x = -2$	$3x^2 - 12x - 15 = 0$
$x = -4$	$6x^2 - 6x - 72 = 0$
$x = -1$	$6x^2 + 18x - 24 = 0$

Drag and Drop: Labeling (unlimited)

Compare the fractions below using the correct symbol for each pair of fractions. A symbol may be used more than once.

=	>	<

$\frac{7}{8}$ ⬚drop correct response here $\frac{6}{8}$

$\frac{5}{6}$ ⬚drop correct response here $\frac{5}{4}$

$\frac{4}{4}$ ⬚drop correct response here $\frac{6}{6}$

$\frac{6}{4}$ ⬚drop correct response here $\frac{3}{2}$

Accessible Alternative: Matrix

Compare the fractions below using the correct symbol for each pair of fractions. A symbol may be used more than once.

	=	>	<
$\frac{7}{8}$? $\frac{6}{8}$	◯	✅	◯
$\frac{5}{6}$? $\frac{5}{4}$	◯	◯	◯
$\frac{4}{4}$? $\frac{6}{6}$	◯	◯	◯
$\frac{6}{4}$? $\frac{3}{2}$	◯	◯	◯

Drag and Drop: Ordering

Read the sentences below. They are not in the correct order. Put the sentences in the correct order.

"Next time let's come earlier and catch even more fish!" Andy added.

"That sounds like a great idea," said Grandpa Bill.

"Anytime, buddy," his grandpa answered.

"Thank you, Grandpa Bill, for helping me learn to fish!" Andy exclaimed.

Accessible Alternative: Matching

Read the sentences below. They are not in the correct order. Put the sentences in the correct order.

1.	"Next time let's come earlier and catch even more fish!" Andy added.
2.	"That sounds like a great idea," said Grandpa Bill.
3.	"Anytime, buddy," his grandpa answered.
4.	"Thank you, Grandpa Bill, for helping me learn to fish!" Andy exclaimed.

Drag and Drop: Venn Diagram

Choose the correct category for each property.

all sides
equal

all
angles
equal

four
sides

four
angles

SQUARE
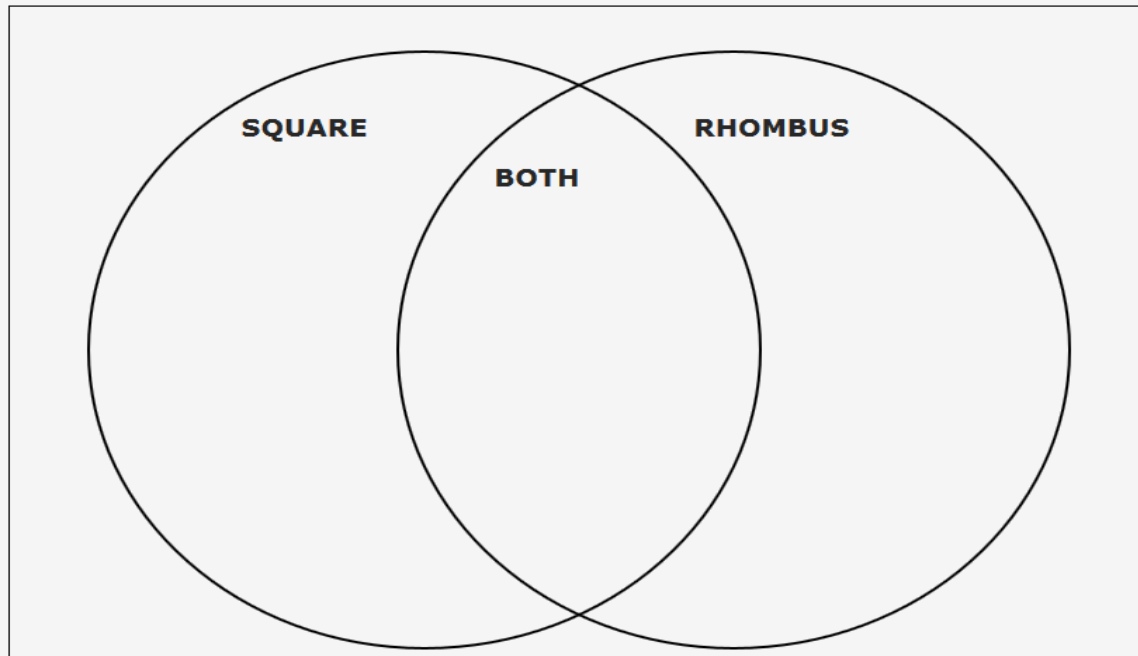
RHOMBUS

BOTH

Accessible Alternative: Matrix

Choose the correct category for each property.

	Square	Rhombus	Both
all sides equal	○	○	✓
all angles equal	○	○	○
four sides	○	○	○
four angles	○	○	○

Drag and Drop: Sort into Two Categories

Read the sentence below.

Sally ran to look for her pair of skates.

Sort the words from the sentence into the correct noun or verb box.

Words

Sally

ran

look

pair

skates

Noun

Verb

Accessible Alternative: Matrix Online

Read the sentence below.

Sally ran to look for her pair of skates.

Sort the words from the sentence into the correct noun or verb box.

	Noun	Verb
Sally	✓	○
ran	○	○
look	○	○
pair	○	○
skates	○	○

Drag and Drop: Sort into Three Categories

Read the sentence below.

The storms form over warm waters and sometimes strike land.

Select the correct part of speech for each of the words below.

Word

storms

form

warm

waters

strike

land

Noun

Verb

Adjective

Accessible Alternative: Matrix for Print

Read the sentence below.

The storms form over warm waters and sometimes strike land.

Select the correct part of speech for each of the words below.

	Noun	Verb	Adjective
storms	○	○	○
form	○	○	○
warm	○	○	○
waters	○	○	○
strike	○	○	○
land	○	○	○

Accessible Alternative: Matrix for Braille

Read the sentence below.

> **The storms form over warm waters and sometimes strike land.**

Select the correct part of speech for each of the words below.

	Noun	**Verb**	**Adjective**
1. storms	A	B	C
2. form	A	B	C
3. warm	A	B	C
4. waters	A	B	C
5. strike	A	B	C
6. land	A	B	C

Click to Select: Select Text with Words (before)

Natalia is writing an article for her school newspaper about traveling. Read the paragraph from her article and choose the **two** words that should be changed to fit the purpose and audience.

The **coolest** place I have ever visited is Machu Picchu, Peru. Hiking in the nearby mountains, I could see the ancient **ruins** from a distance. It was **super beautiful**. As I took in the **view**, I was **sure** that all the hours I traveled to **get** there had been worth it!

Click to Select: Select Text with Words (after)

Natalia is writing an article for her school newspaper about traveling. Read the paragraph from her article and choose the **two** words that should be changed to fit the purpose and audience.

The coolest place I have ever visited is Machu Picchu, Peru. Hiking in the nearby mountains, I could see the ancient ruins from a distance. It was super beautiful. As I took in the view, I was sure that all the hours I traveled to get there had been worth it!

Accessible Alternative: Multiple Select

Natalia is writing an article for her school newspaper about traveling. Read the paragraph from her article and choose the **two** words that should be changed to fit the purpose and audience.

The **coolest** place I have ever visited is Machu Picchu, Peru. Hiking in the nearby mountains, I could see the ancient **ruins** from a distance. It was **super beautiful**. As I took in the **view**, I was **sure** that all the hours I traveled to **get** there had been worth it!

- ☐ coolest
- ☐ ruins
- ☐ super
- ☐ beautiful
- ☐ view
- ☐ sure
- ☐ get

Click to Select: Select Text with Sentences

Read the paragraph below. Select the sentence that does not belong.

There are many different kinds of shells. Seashells, snail shells, and turtle shells are a few familiar ones. Shells come in all different colors, shapes, and sizes. I think shells are pretty. They all share the same purpose: protection.

Select Text with Sentences: Print or Braille

Read the paragraph below. Select the sentence that does not belong.

A) There are many different kinds of shells.

B) Seashells, snail shells, and turtle shells are a few familiar ones.

C) Shells come in all different colors, shapes, and sizes.

D) I think shells are pretty.

E) They all share the same purpose: protection.

Drop Down (single)

Choose the correct answer to the equation below.

6 × (5 - 3) = Choose ▾

Choose
48
24
12
8

Accessible Alternative: Multiple Choice

Choose the correct answer to the equation below.

$6 \times (5 - 3) = ?$

- ○ 48
- ○ 24
- ○ 12
- ○ 8

Results

- Expert reviewers, teachers, and students in cognitive labs guided the development of altered formats and layouts for 2014 field tests
- Altered items were presented to large samples of general students 2014 field tests
- Altered item formats had very similar difficulty to original item formats
- Analysis of systematic differences in item formats across grades and subjects with include scatter plots of p values for matched pairs (e.g., drag-and-drop and matrix format of same content)
- CFA will be used to compare structure of matched test forms with original/ accessible items
- Where groups are sufficient, will contrast performance among online, print, and audio modalities
- DIF studies for disability status and ELL status

Item Pair Comparison: Ordering v. Matching

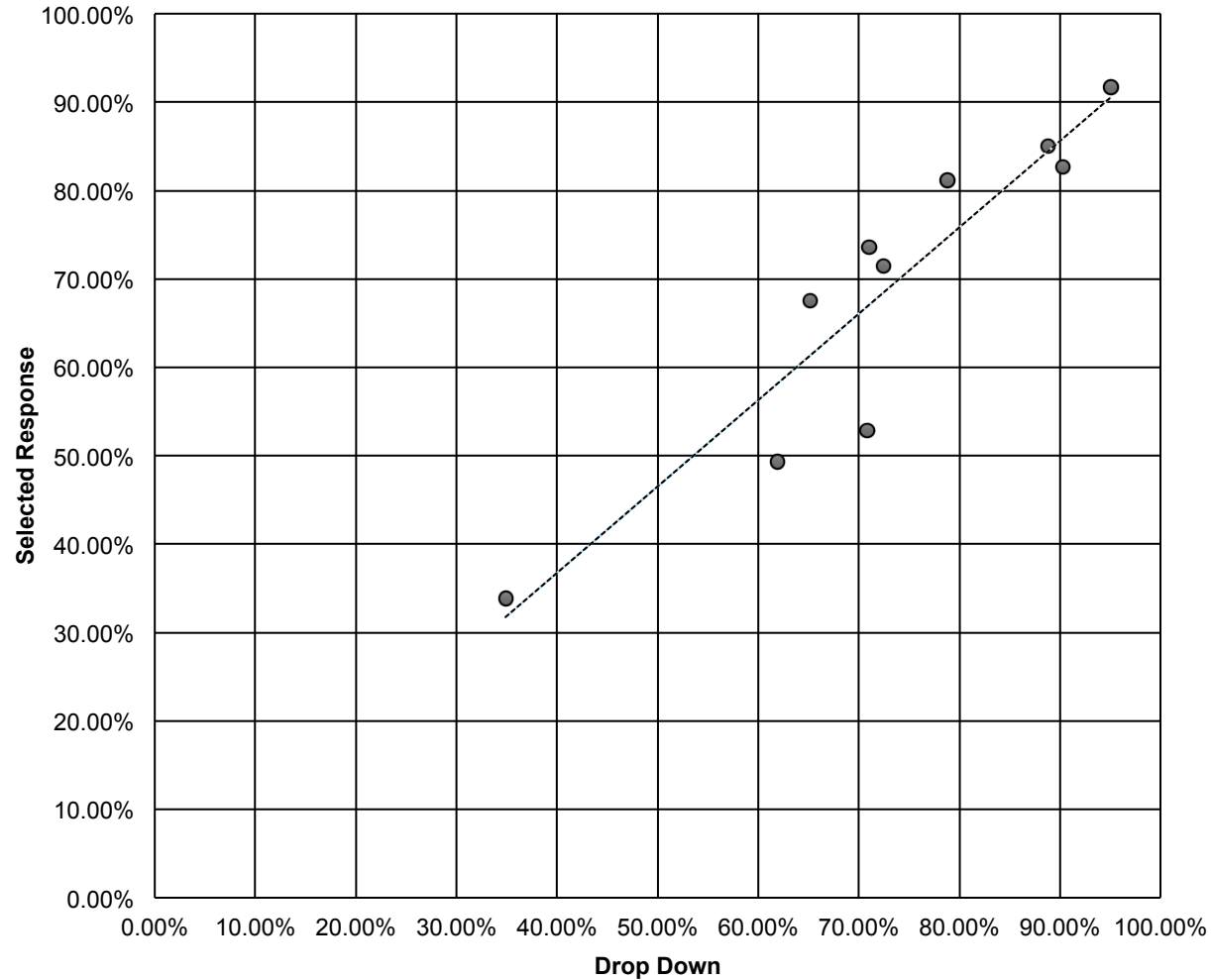Ordering v. Matching

$y = 0.9158x - 0.0023$

Item Pair Comparison: Ordering v. Matrix

Ordering v. Matrix $y = 0.9166x - 0.0197$
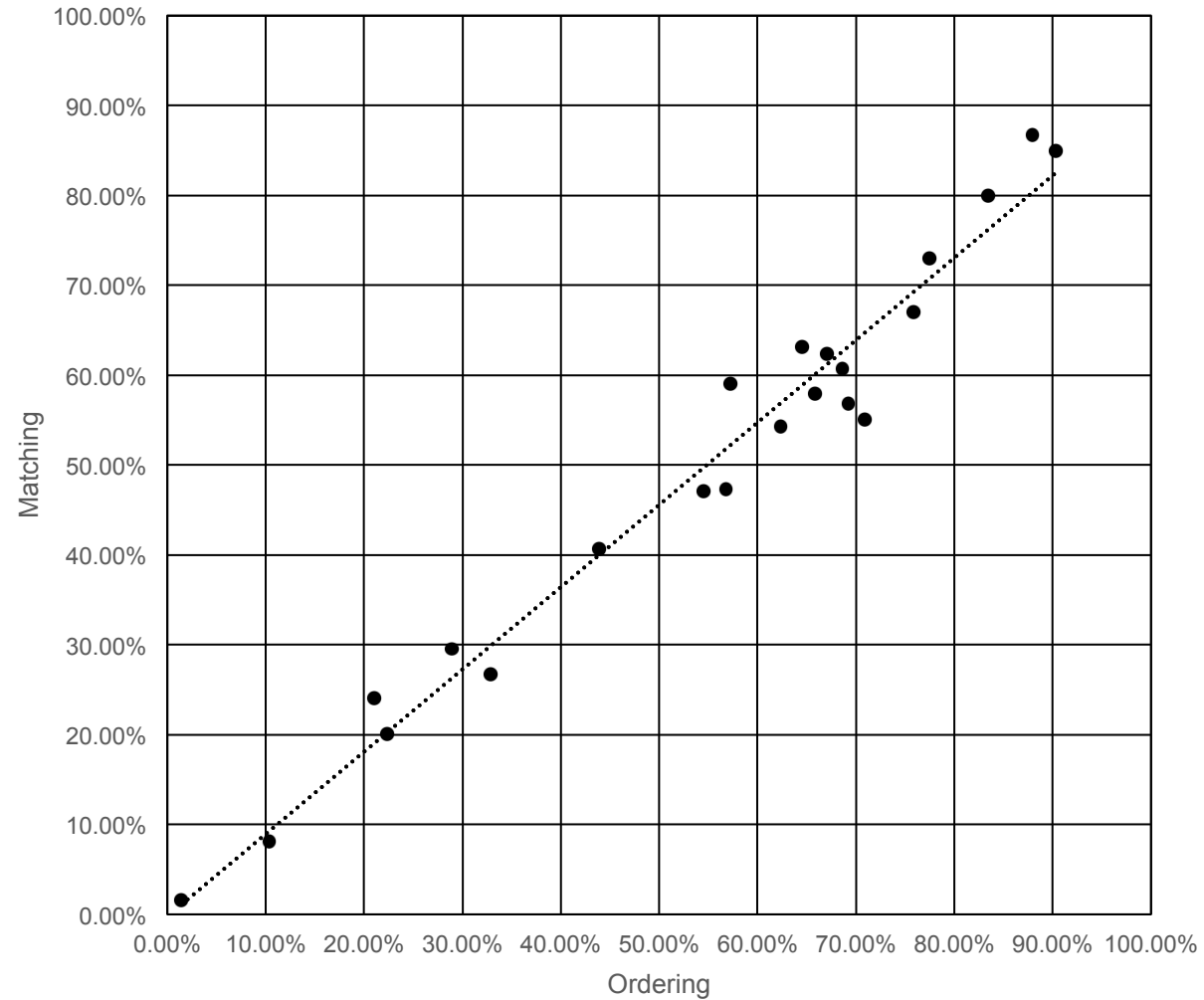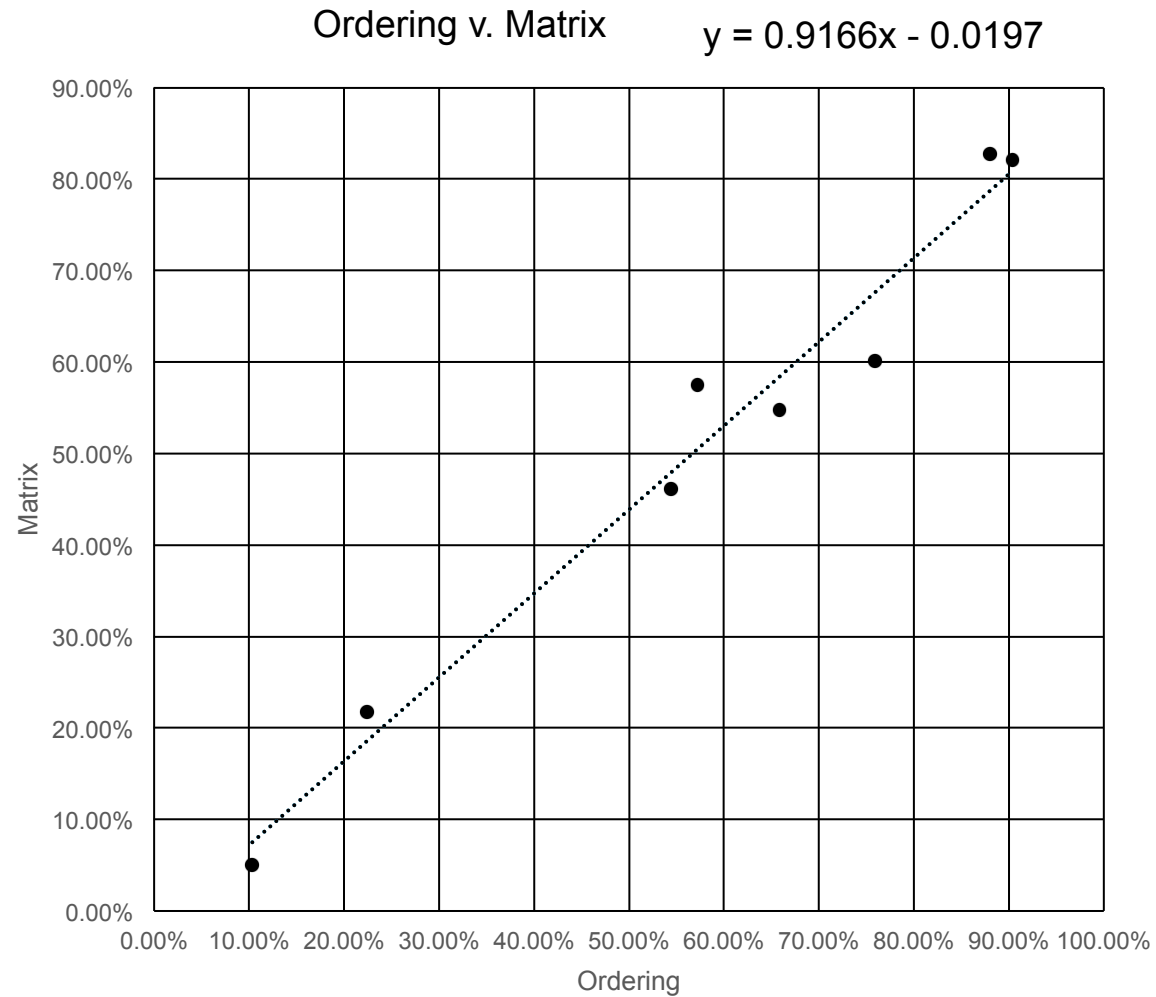
Item Pair Comparison: Drop Down v. Selected Response

Drop Down v. Selected Response   y = 0.9771x - 0.0232

Next Steps

- Complete analyses: April 2015
- Complete documentation of research activities: May 2015
- Prepare "user guides" for presentation of TE items in accessible formats/ accommodated forms: May 2015
- Post reports for public review: June 2015