

## Effectively Introducing Technology-Enhanced Items

The implementation of new, more rigorous standards and their associated assessments have introduced technology-enhanced items (TEIs), which are computer-based items that allow a student to interact with content in ways beyond traditional assessment methods.

Technology-enhanced items provide insight into a student's thought process and can be used as an effective strategy for both formative and summative assessments. By using a variety of interactions such as sorting, ordering, dragging and dropping, editing, and highlighting, TEIs provide educators with a wide range of options for measuring student knowledge.

Research has shown that technology enhanced items enrich the assessment process by

- engaging students
- measuring higher-level cognitive skills
- requiring students to produce information
- reducing guessing

In response to the use of TEIs, a variety of products have been introduced. When evaluating TEIs, not all are created equal. This paper attempts to highlight the various TEI types and give an example of its best use to gauge student understanding and teacher action.

Educators will find that successful technology-enhanced items are:

- aligned with the Common Core State Standards and other rigorous standards for ELA and math;
- categorized according to the complexity of thinking required to successfully complete them;
- easy to use; and
- supportive of the learning process.

Successful TEIs also expose students to a variety of technology skills needed to succeed on standardized online assessments. With adequate practice, students will be familiar with the typical technology tools so that, in a testing environment, they can focus on using those tools to demonstrate proficiency.

Here are some examples:

## Drag and Drop:

What do students do with this tool?

Students drag an item from one part of the screen to another.

How does this show evidence of understanding?

In ELA, students can:

1. Drag boxes containing statements from an accompanying text to a designated area to identify multiple details in a text.
2. Sequence events in a story or process steps in information texts.
3. Complete graphic organizers.
4. Identify supporting evidence.
5. Arrange a summary.
6. Identify central ideas .

In math, students can:

1. Categorize types of solutions.
2. Arrange values in numerical order.
3. Match algebraic expressions to English expressions.
4. Sequence steps in proofs.

## Text Selection or Highlighting:

What do students do with this tool?

Students click on words, phrases, or entire sentences to answer questions about specific parts of a text.

How does this show evidence of understanding?

Q: Find the number and nature of the solutions to each quadratic equation.

DRAG DROP VALUES

$2x^2 + 2x + 3 = 0$

$x^2 + 6x + 9 = 0$

$-0.5(x^2 + 20x) = 12$

$x^2 + 4x - 19 = 0$

$0.5x^2 - 0.25x + 8 = 4$

One Real Root

$x^2 + 6x + 9 = 0$

Two Real Roots

$x^2 + 4x - 19 = 0$

$-0.5(x^2 + 20x) = 12$

One Complex Root

Two Complex Roots

$2x^2 + 2x + 3 = 0$

$0.5x^2 - 0.25x + 8 = 4$

Math HSA.REI.B.4b Solve quadratic equations by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as  $a \pm bi$  for real numbers  $a$  and  $b$ .

Q: Which sentence contains a figure of speech that shows exaggeration?

As a budding writer, I love taking trips to the zoo. Observing the animals gives me ample material for my short stories. Last week, I watched two monkeys get in a fight. **they looked like angry siblings as they pulled each other's hair and squawked** results at each other. The seals, too, are always good for a story. **I'm convinced that seals are the sneakiest animals alive, an opinion I formed after watching one steal an entire bucket of fish.**

ELA\_L.9-10.5.A Demonstrate understanding of figurative language, word relationships, and nuances in word meaning.

In ELA, students can:

1. Select claims that support a central idea.
2. Choose sentences that provided context for a vocabulary word.

Multiple Select:

What do students do with this tool?

Although similar to traditional multiple-choice questions, students select many correct answers instead of one.

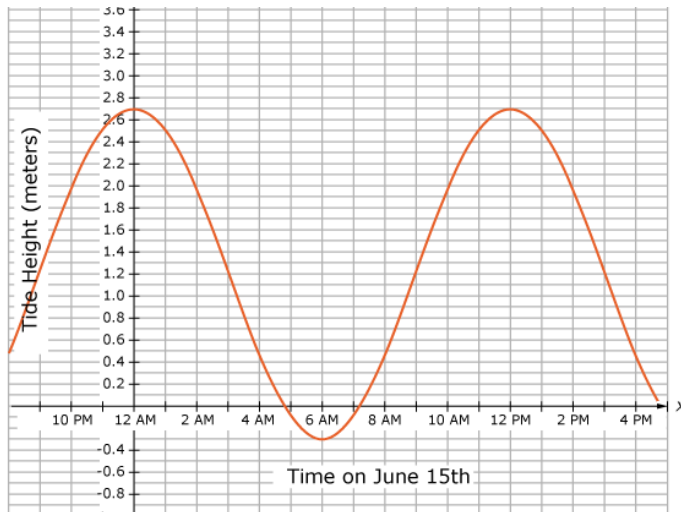
How does this show evidence of understanding?

In ELA, students can:

1. Identify multiple themes or ideas in a text.
2. Identify multiple synonyms or antonyms for a vocabulary word.
3. Identify multiple supporting details.

In math, students can:

1. Identify correct statements.
2. Select equivalent numbers.
3. Select equivalent expressions and equations.
4. Select equivalent measures .



Between which times does high tide occur? Select all that apply.

- A** 11:30 p.m. and 12:30 a.m.
- B** 4:00 a.m. and 5:00 a.m.
- C** 7:00 a.m. and 8:00 a.m.
- D** 11:30 a.m. and 12:30 p.m.
- E** 5:30 p.m. and 6:30 p.m.

HSF.IF.B.4: Interpreting Functions – For a function that models a relationship between two quantities interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship.

### Drop-Down Menus:

What do students do with this tool?

Students can choose the correct answer from a menu that expands when clicked on.

How does this show evidence of understanding?

In ELA, students can:

1. Select characteristics of text.
2. Select parts of speech.

In math, students can:

1. Evaluate graphs.
2. Build and solve equations
3. Choose the correct label for answers.
4. Identify equivalent values.

### Fill in the Blank/Equation Builder:

What do students do with this tool?

Students use the Equation Editor to solve questions and support answers to problems.

How does this show evidence of understanding?

In math, students can:

1. Write expressions and equations using the specialized palette that is tailored to their grade level.
2. Use the specialized palette to format mathematical terms such as fractions and radicals.

Q: Which of the following pronouns correctly completes the sentences?  
Ravi will do  assignment before  class today.  
 promises to be prepared this time!

Q: Which of the following pronouns correctly completes the sentences?  
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ELA Literacy.L.6.1.A Ensure that pronouns are in the proper case (subjective, objective, possessive).

Q: In her first year as coach, Ms. Foley's team won 16 games. In her second year, they won 24 games. In her third year, they won 15 games.

The percent of increase in wins from Ms. Foley's first year to her second year was  %.

The percent of decrease in wins from Ms. Foley's second year to her third year was  %.

Math\_7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

## Multiple-Part Question:

What do students do with this tool?

Students answer related, tiered questions using a combination of other item types.

How does this show evidence of understanding?

In ELA, students can:

1. Answer questions involving passages and other forms of multimedia.
2. Answer questions that have related parts. For example, a question in Part A asks students to identify the theme of the text, and then Part B asks students to choose statements from the text that supported their answer in Part A.

### Part A

Q: What inference can you make about Jack?

- A He used to have a grumpy attitude.
- B He used to have a grumpy attitude.
- C He wants his aunt to give him some money.
- D He feels sick but he does not want to show it.

### Part B

Q: Which sentence best supports your answer from Part A?

There was a pause. His Aunt remembered the old peevish ways. She did not want to encourage him to discard his winter leggings, and was doubtful what to say. But in a moment more his eyes shone, and his face took that effulgent expression which some children have when they are resolved upon being good.

ELA\_RL.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

Besides providing students with an opportunity to experience technology-enhanced items, this assessment tool incorporates a multitude of features that support both students and educators. These include:

- Multimedia content
- Tiered hints
- Immediate feedback
  - Feedback personalized for the student based on answer-specific misconceptions
- Component level scoring of multipart questions
- Rational for solutions
- Detailed reporting of performance
- Item types that are similar to those found on the Smarter Balanced and PARCC tests

As educators, our goal is to provide our students with experiences that prepare them for the future. By incorporating effective, well-designed technology-enhanced items like those developed by Words and Numbers, we are able to provide feedback essential to improving student performance.

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