

Preparation Notes

Please review and customize this deck to prepare it for use. Some notes:

- These professional learning (PL) materials (slide deck and accompanying handout) are being offered in editable forms so that you may make adjustments to better support the specific work happening in your school or district.
- These PL materials are designed to easily accommodate remote delivery:
 - A [Jamboard template](#) is provided to facilitate discussion of student work; the facilitator will need to make a copy of this and be ready to share the link with participants as noted in the deck.
 - Text that can be readily pasted (marked with “—”) into a video call’s chat feature is included when participants need to reference the handout.
 - There are placeholders for handout links to be shared with participants in the notes field of selected slides; the facilitator will need to add a link to the handout where indicated by “[insert link].”

M100 Overview

**XQ Badge Project PL Series Baseline
Session**

Month XX, XXXX

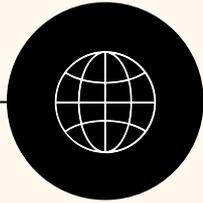


Welcome!

Joining Question:

What song or piece of music is at the top of your playlist right now?

Outcomes and Agenda



Participants will be able to:

- Explain the content and practice expectations for the M100 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

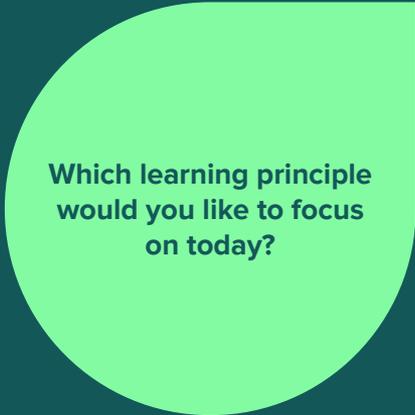


Agenda:

- Exploring the Content
- Task 1: Expectations and Learning Principles
- Task 1: Student Work
- Task 2: Expectations and Learning Principles
- Task 2: Student Work
- Closing

Learning Principles

1. Engage with cognitively demanding tasks in heterogeneous settings.
2. Engage in social activities.
3. Build conceptual understanding through reasoning.
4. Have agency in their learning.
5. View mathematics as a human endeavor across centuries.
6. See mathematics as relevant.
7. Employ technology as a tool for problem-solving and understanding.



**Which learning principle
would you like to focus
on today?**

01

Exploring the Content

What comes to mind?
What knowledge and skills
should students learn to
earn this badge?



**Come off mute
or put your
thoughts in the
chat!**

What's the Story of these Standards?

Selected Common Core Standards for Mathematics – Quantities

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

**How would you synthesize these?
What are the key takeaways
for students?**

What's the Story of these Standards?

Selected Common Core Standards for Mathematics – Quantities

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

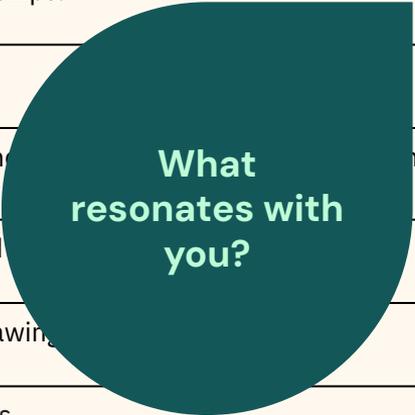
Share your thinking!

M100 Content and Practice Expectations (CPE)

100.a	Identify quantities of interest for modeling purposes.
100.b	Reason with units in problems, formulas, and data displays to solve problems.
100.c	Interpret simple numeric and algebraic expressions that arise in applications in terms of the context.
100.d	Interpret equations, tables, and graphs that arise in applications involving proportional relationships.
100.e	Interpret data displays, such as line plots, histograms, and box plots in terms of the context.
100.f	Solve real-world problems involving distances, intervals of time, liquid volume, mass, money, and other situations where operations with fractions and decimals are appropriate.
100.g	Solve real-world problems involving area and perimeter of polygons, as well as surface area and volume of prisms and pyramids.
100.h	Solve real-world problems involving quantities in a proportional relationship, including scale drawings.
100.i	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

M100 Content and Practice Expectations (CPE)

100.a	Identify quantities of interest for modeling purposes.
100.b	Reason with units in problems, formulas, and data displays to solve problems.
100.c	Interpret simple numeric and algebraic expressions that arise in applications in terms of the context.
100.d	Interpret equations, tables, and graphs that arise in applications involving proportional relationships.
100.e	Interpret data displays, such as line plots, histograms, and box plots in terms of the context.
100.f	Solve real-world problems involving distances, intervals of time, liquid volume, mass, money, and temperature, in which problems with fractions and decimals are appropriate.
100.g	Solve real-world problems involving area and perimeter of polygons, as well as surface area and volume.
100.h	Solve real-world problems involving quantities in a proportional relationship, including scale drawings.
100.i	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.



**What
resonates with
you?**

M100 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
100.a: Identify quantities of interest for modeling purposes.	i. make sense of a situation and choose key quantities. Explore the relationship between those quantities to answer a question of interest.
100.b: Reason with units in problems, formulas, and data displays to solve problems.	i. determine an appropriate scale for a graph or data display.
	ii. manipulate units as part of the problem solving process.
	iii. explain how the units (including derived units, where appropriate) represented in a solution relate to the problem context, formula, and/or data display.

**What new
insights do you
have?**

Let's Investigate

Choose at least one task to explore:

- Thunder and Lightning
- Traffic Jam

Which content and practice expectations are evident in each one?

Let's Investigate

Choose at least one task to explore:

- Thunder and Lightning
- Traffic Jam

Which content and practice expectations are evident in each one?

**Come off mute
or put your
thoughts in the
chat! What did
you find?**

What's the Same?

What's Different?

1. How do these content and practice expectations align to ways you've taught this topic before?
2. How are they different?

**Come off mute
or put your
thoughts in the
chat!**

Inequity Is our Reality

About

60%

of community college students and 40 percent of four-year students are placed into non-credit bearing developmental mathematics (Ganga et al., 2018)

Only

33%

of community college students complete the developmental math sequence. Only 20 percent complete a college-level math course over three years (Bailey, Jeong, & Cho, 2010).

We Must Lead the Movement

How can this approach give space for what math can be?

Is math...?

- About getting one right answer, the teacher's way
- Irrelevant
- About doing procedures
- Independent work
- Something my teacher made up
- Formulaic

Or could math be...?

- About using multiple strategies flexibly
- Connected to the real-world in ways that make sense
- About understanding and applying
- Collaborative work
- Lived across continents and centuries
- Novel, challenging problems

02

Task 1: Expectations and Learning Principles

Let's Do Some Math!

Ayhan came across his great grandmother's recipe for lemon cake. He mixed all the ingredients together in his 3 quart mixing bowl and noticed the batter almost filled up the bowl.

Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use?

Do the task as a student would. Jot down any reflections that you have as you do the math!

Content and Practice Expectations

Ayhan came across his great grandmother's recipe for lemon cake. He mixed all the ingredients together in his 3 quart mixing bowl and noticed the batter almost filled up the bowl.

Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use?

Choose 1–2 Content and Practice Expectations that student work could give evidence of.

Content and Practice Expectations

Ayhan came across his great grandmother's recipe for lemon cake. He mixed all the ingredients together in his 3 quart mixing bowl and noticed the batter almost filled up the bowl.

Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use?

100.g: Solve real-world problems involving area and perimeter of polygons, as well as surface area and volume of prisms and pyramids.

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across centuries (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and understanding (LP 7).

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across cultures (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and understanding (LP 7).

Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across cultures (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and deep understanding (LP 7).



**Share what
you came up
with!**

03

Task 1: Student Work

Round 1: What do you notice?

Jot down

- One thing you notice about each piece of student work.

Round 1:

Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use? Why should he use that pan?

Note: This is your chance to convince me!

The 3rd one because you get the most cake doesn't matter the shape it's the size!

Round 1: What do you notice?

Jot down

- One thing you notice about each piece of student work.

**Come off mute
and share what
you saw!**

Round 1:

Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use? Why should he use that pan?

Note: This is your chance to convince me!

The 3rd one because you get the most cake doesn't matter the shape it's the size!

Criteria for Success

Conference and Provide Revision Support	Accept with Revision	Accept
<p>The student's artifact shows an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).</p>	<p>The student's artifact is approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.</p>	<p>The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).</p>

What resonates with you? What questions surface for you?

Humanizing Assessment

Grading echoes the economic framework of testing, presuming that we can encapsulate learning in a number or a letter. Street data reminds us that our primary task as educators is to provide regular feedback to students so they can grow, not to evaluate them in order to anoint them academically capable or not. (Safir and Dugan, 2021, p. 135)

Source: Safir, Shane, and Jamila Dugan. *Street Data: A Next-Generation Model for Equity, Pedagogy, and School Transformation*. Corwin, 2021.

Round 2: What evidence of learning is there?

100.g: Solve real-world problems involving area and perimeter of polygons, as well as surface area and volume of prisms and pyramids.

Let's examine some work together:

Conference and Provide Revision Support

The student's artifact shows evidence of an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).

Accept with Revision

The student's artifact shows evidence of approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.

Accept

The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).

Examining Student Work

The image shows a digital workspace interface for reviewing student work. At the top, there are three buttons: "Conference and Provide Revision Support", "Accept with Revision", and "Accept". On the left side, there is a vertical toolbar with several icons: a pencil, an eraser, a mouse cursor, a document icon (highlighted with a red circle and a red arrow), a photo icon, a circle icon, a text box icon, and a scissors icon. In the center of the workspace, there is a large red callout bubble with the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a red circular badge with the text "Work Sample 1".

Example #1

Round 1:

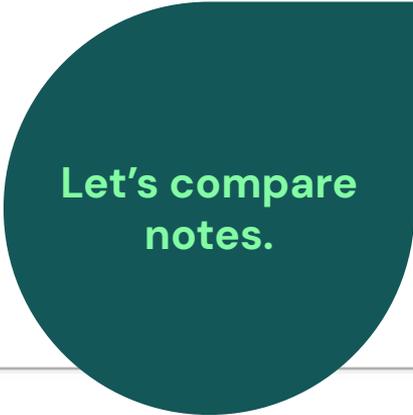
Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

Which pan should he use? Why should he use that pan?

Note: This is your chance to convince me!

The 3rd one because you get the most cake doesn't matter the shape it's the size!



Let's compare notes.

Example #2

Lemon Cake Task

7 quarts go into 1 gallon

- 3 quart mixing bowl

- $57.75 \text{ in}^3 \times 3 = 173.25 \text{ in}^3$

* 1 qt = 57.75 in^3

3	12	25%
4	16	33%
5	16	33%
6	24	4
9	18	22

1. loaf pan:
 $8.5 \text{ in} \times 4.5 \text{ in} \times 2.5 \text{ in} = 95.625 \text{ in}^3$

square pan
 $8 \times 8 \times 2 = 128 \text{ in}^3$

Oblong pan:
 $13 \text{ in} \times 9 \text{ in} \times 1.75 \text{ in} = 204.75 \text{ in}^3$

2. he should use the oblong pan because it is the only one that can fit all the batter in the pan.

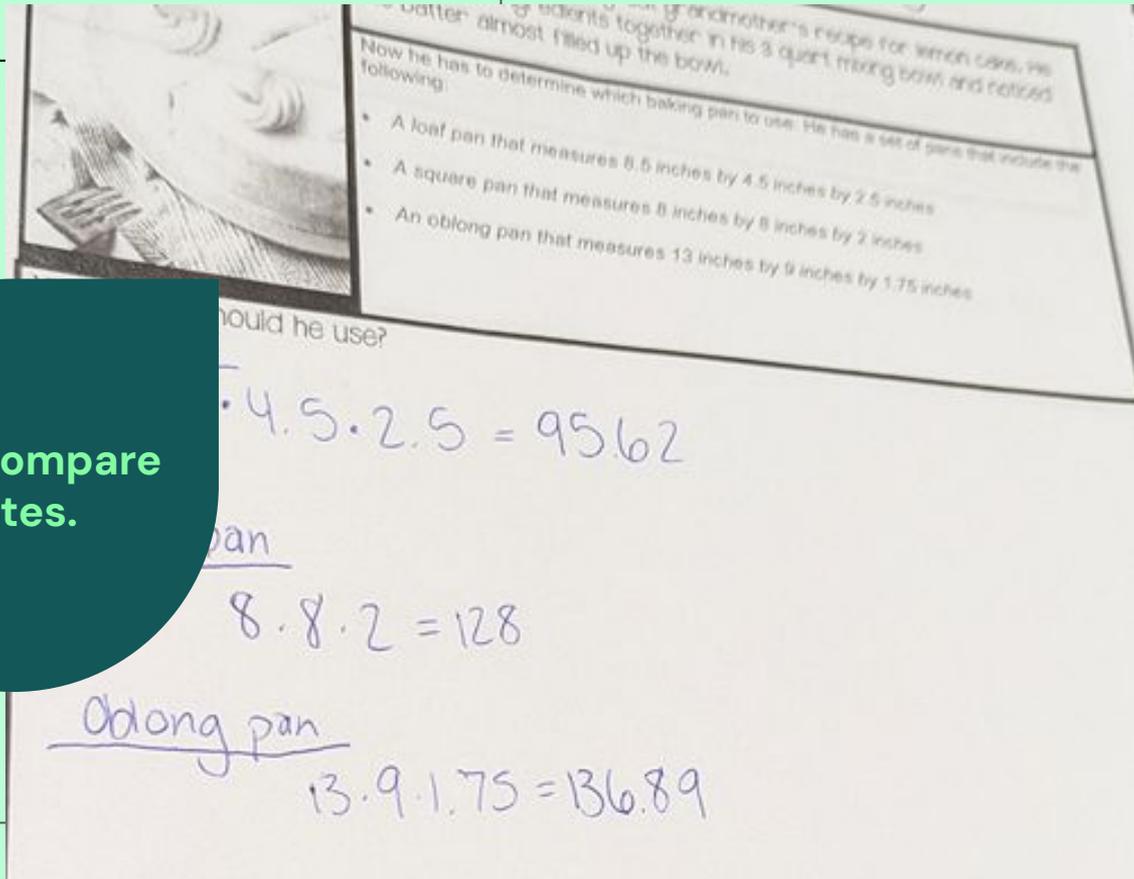
3. I worked it in my head, I thought about it in my head and I rounded it at that point.

4. the dessert bars I made where that all of my calculations were correct and that.

5. 16: was probably baking it does not since because you want them to be eaten.

Let's compare notes.

Example #3



The image shows a math problem and a student's handwritten solution. The problem is about determining which baking pan to use based on volume. The student has calculated the volume for three different pan options.

Problem Text:

...batter almost filled up the bowl.
Now he has to determine which baking pan to use. He has a set of pans that include the following:

- A loaf pan that measures 8.5 inches by 4.5 inches by 2.5 inches
- A square pan that measures 8 inches by 8 inches by 2 inches
- An oblong pan that measures 13 inches by 9 inches by 1.75 inches

...should he use?

Handwritten Solution:

Loaf pan
 $8.5 \cdot 4.5 \cdot 2.5 = 95.62$

Square pan
 $8 \cdot 8 \cdot 2 = 128$

Oblong pan
 $13 \cdot 9 \cdot 1.75 = 136.89$

Let's compare notes.

Three Key Components of the Math Badging System

- Content and Practice Expectations
- Learning Principles
- Criteria for Success

Which one excites you the most?

What one will have the greatest impact on students?

What questions surface for you?



**Come off
mute or share in
the chat!**

04

Task 2: Expectations and Learning Principles

Let's Do Some Math!

Students are given a task like this:

The United States Environmental Protection Agency (EPA) “estimates that more food reaches landfills and incinerators than any other single material in our everyday trash, constituting 24 percent of the amount landfilled and 22 percent of the amount combusted with energy recovery.” [source: [Regional Resources to Reduce and Divert Wasted Food Across the United States | US EPA](#)]

A study completed by The Drawdown Review: Climate Solutions for a New Decade shared “composting organic waste versus landfilling can reduce more than 50% of carbon dioxide-equivalent greenhouse emissions, for a total of 2.1 gigatons between now (2020) and 2050 if climate change is curbed to a 1.5 degree Celsius rise in the average global temperature.” [source: [The ComPOSTer: How much can composting help in solving the climate challenge? \[UPDATED\]](#)]

Your task is to develop a public service announcement (PSA) in the form of an infographic or advertisement (suitable for radio, social media, or television) to inform your community about what you can help minimize the amount of food and organic waste that goes into landfills.

Your PSA should include information that informs your community about:

- *waste trends in your local area*
- *the long-term impact of current trends*
- *ways to change current trends for positive impact*

Your PSA should:

- *identify relevant quantities*
- *use appropriate graphical displays of these quantities*

Do the task as a student would. Jot down any reflections that you have as you do the math!

Content and Practice Expectations

Students are given a task like this:

The United States Environmental Protection Agency (EPA) “estimates that more food reaches landfills and incinerators than any other single material in our everyday trash, constituting 24 percent of the amount landfilled and 22 percent of the amount combusted with energy recovery.” [source: [Regional Resources to Reduce and Divert Wasted Food Across the United States | US EPA](#)]

A study completed by The Drawdown Review: Climate Solutions for a New Decade shared “composting organic waste versus landfilling can reduce more than 50% of carbon dioxide-equivalent greenhouse emissions, for a total of 2.1 gigatons between now (2020) and 2050 if climate change is curbed to a 1.5 degree Celsius rise in the average global temperature.” [source: [The ComPOSTer: How much can composting help in solving the climate challenge? \[UPDATED\]](#)]

Your task is to develop a public service announcement (PSA) in the form of an infographic or advertisement (suitable for radio, social media, or television) to inform your community about ways you can help minimize the amount of food and organic waste that goes into landfills.

Your PSA should include information that informs your community about:

- *waste trends in your local area*
- *the long-term impact of current trends*
- *ways to change current trends for positive impact*

Your PSA should:

- *identify relevant quantities*
- *use appropriate graphical displays of these quantities*

Choose 1-2 Content and Practice Expectations that student work could give evidence of.

Content and Practice Expectations

Students are given a task like this:

The United States Environmental Protection Agency (EPA) “estimates that more food reaches landfills and incinerators than any other single material in our everyday trash, constituting 24 percent of the amount landfilled and 22 percent of the amount combusted with energy recovery.” [source: [Regional Resources to Reduce and Divert Wasted Food Across the United States | US EPA](#)]

A study completed by The Drawdown Review: Climate Solutions for a New Decade shared “composting organic waste versus landfilling can reduce more than 50% of carbon dioxide-equivalent greenhouse emissions, for a total of 2.1 gigatons between now (2020) and 2050 if climate change is curbed to a 1.5 degree Celsius rise in the average global temperature.” [source: [The ComPOSTer: How much can composting help in solving the climate challenge? \[UPDATED\]](#)]

Your task is to develop a public service announcement (PSA) in the form of an infographic or advertisement (suitable for radio, social media, or television) to inform your community about ways you can help minimize the amount of food and organic waste that goes into landfills.

Your PSA should include information that informs your community about:

- *waste trends in your local area*
- *the long-term impact of current trends*
- *ways to change current trends for positive impact*

Your PSA should:

- *identify relevant quantities*
- *use appropriate graphical displays of these quantities*

100.a: Identify quantities of interest for modeling purposes.

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across centuries (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and understanding (LP 7).

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across cultures (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and understanding (LP 7).

Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?

Learning Principles

In M100 Quantitative Reasoning, students will employ the following learning principles:

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
- Have agency in their learning (LP 4).
- View mathematics as a human endeavor across cultures (LP 5).
- See mathematics as relevant (LP 6).
- Employ technology as a tool for problem-solving and deep understanding (LP 7).



**Share what
you came up
with!**

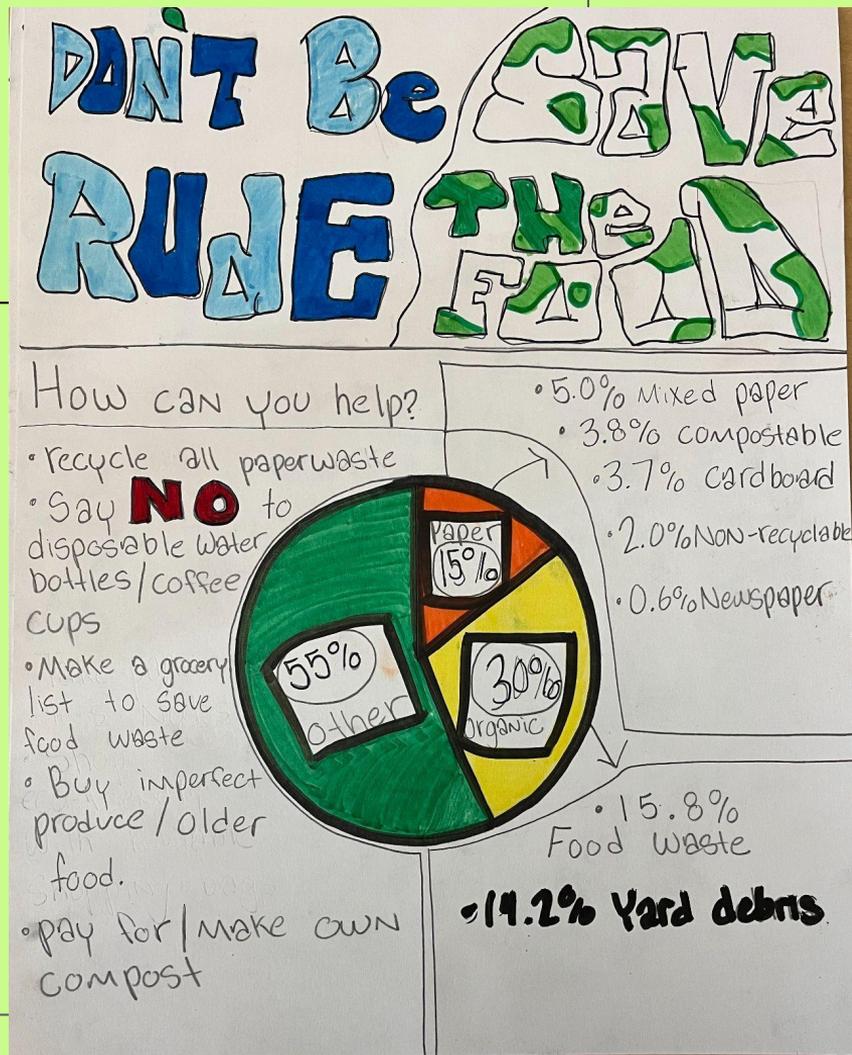
05

Task 2: Student Work

Round 1: What do you notice?

Jot down

- One thing you notice about each piece of student work.

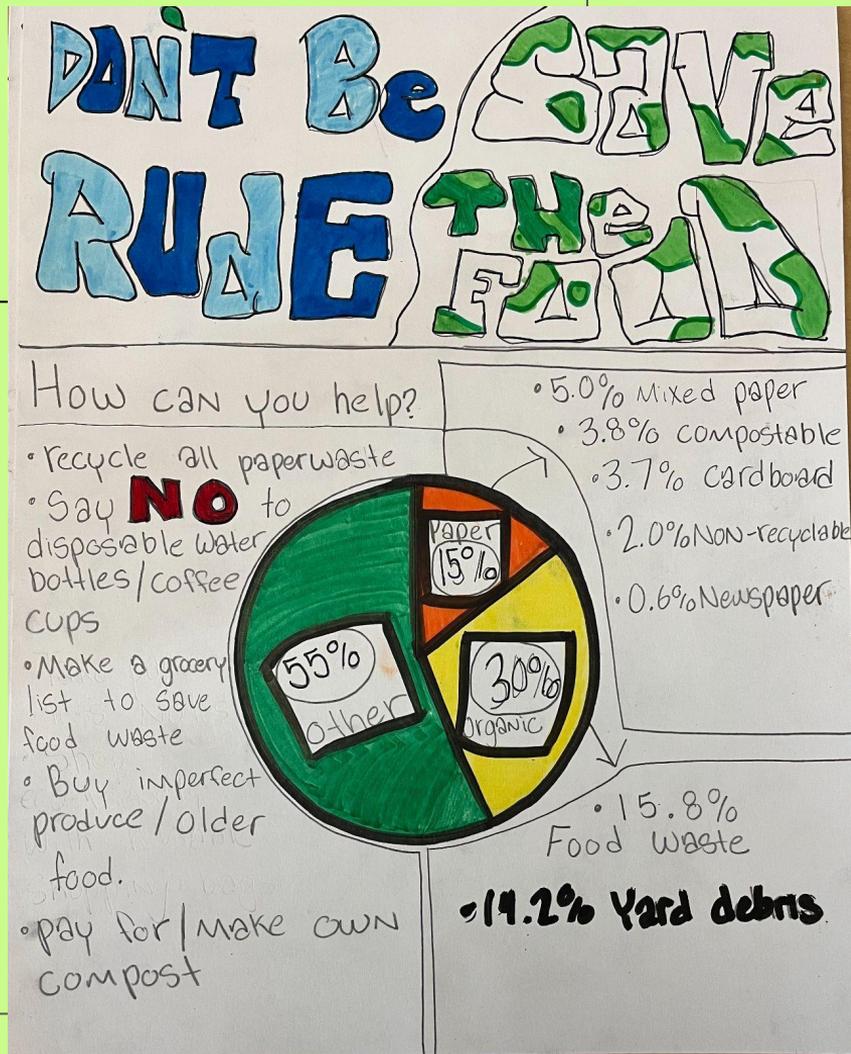


Round 1: What do you notice?

Jot down

- One thing you notice about each piece of student work.

Come off mute and share what you saw!



Round 2: What evidence of learning is there?

100.a: Identify quantities of interest for modeling purposes.

Let's examine some work together:

Conference and Provide Revision Support

The student's artifact shows evidence of an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).

Accept with Revision

The student's artifact shows evidence of approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.

Accept

The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).

Examining Student Work

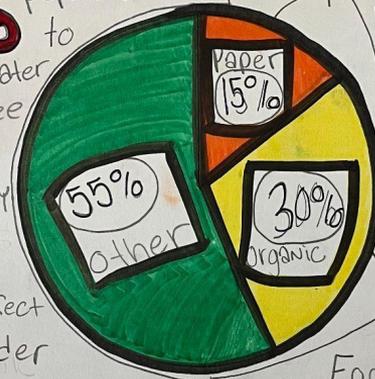
The image shows a digital workspace interface for reviewing student work. At the top, there are three buttons: "Conference and Provide Revision Support", "Accept with Revision", and "Accept". On the left side, there is a vertical toolbar with several icons: a pencil, an eraser, a mouse cursor, a document icon (highlighted with a red circle and a red arrow), a photo icon, a circle icon, a text box icon, and a scissors icon. In the center of the workspace, there is a large red callout bubble with the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a red circular badge with the text "Work Sample 1".

Example #1

DON'T BE **GREEN**
RUDE **THE**
FOOD

How can you help?

- Recycle all paperwaste
- Say **NO** to disposable water bottles/coffee cups
- Make a grocery list to save food waste
- Buy imperfect produce/older food.
- pay for/make own compost

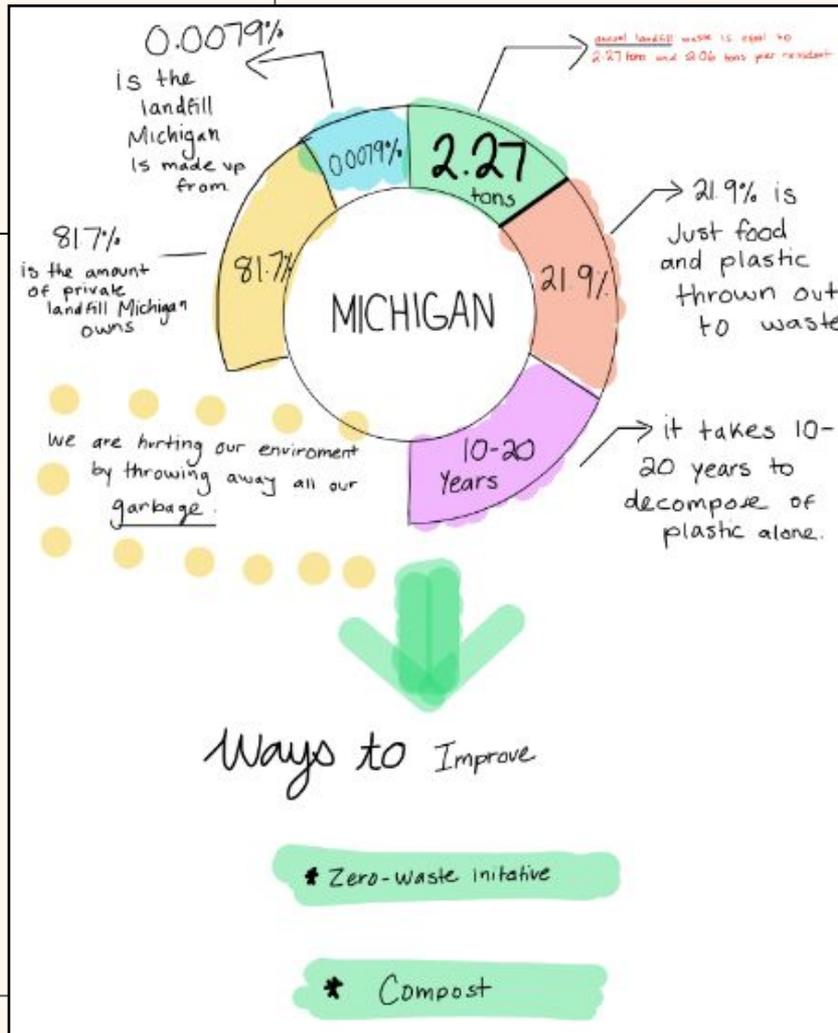


- 5.0% Mixed paper
- 3.8% compostable
- 3.7% cardboard
- 2.0% Non-recyclable
- 0.6% Newspaper

- 15.8% Food waste
- **14.2% Yard debris**

Let's compare notes.

Example #2



Let's compare notes.

Example #3

Let's compare notes.

City person: throws water bottle on floor

Reporter: "Hey! What are you doing?!"

CP: Mind your own business!"

R: How much garbage do you use a day?

CP: Idk, Idc

R: Well the average american makes 4.9 pounds of trash every day.

Now there are 8.4 million people living in the city of New York.

So 8.4 million times 4.9 is 41 million 160 thousand pounds of

trash. A DAY. IN NEW YORK CITY ALONE.

CP: Oh, I didn't know that, I'm sorry."

CP: *Throws water bottle in recycle bin.

R: America produces 254 million tons of trash a year, think

next time you wanna throw extra garbage on the

ground or in the trash

Let's Hear Some Reflections

What kinds of support will students need to demonstrate evidence of learning?

Has your thinking changed at all on how to implement this task? If so, how?

**Come off
mute or share in
the chat!**

06

Closing

What Are Your Takeaways?

Choose one question to respond to:

1. Which content and practice expectation are you most excited about? Why?
2. Which learning principle are you most excited about connecting to M100 content? Why?
3. What impact do you think using a portfolio system will have on your students? Why?