

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.
- For the 2024–25 school year, student work samples are not provided for most sessions. The facilitator will need to collect or create student work samples when implementing these materials during 2024–25.
- 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 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].”

M211 Overview

**XQ Badge Project PL Series Baseline
Session**

Month XX, XXXX

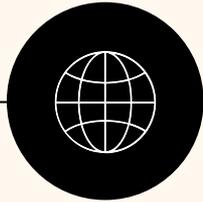


Community Building

What is your “six word math story?”

*Your story can be written as a continuous thought,
a string of words, or a combination of the two!*

Outcomes and Agenda



Participants will be able to:

- Explain the content and practice expectations for the M211 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

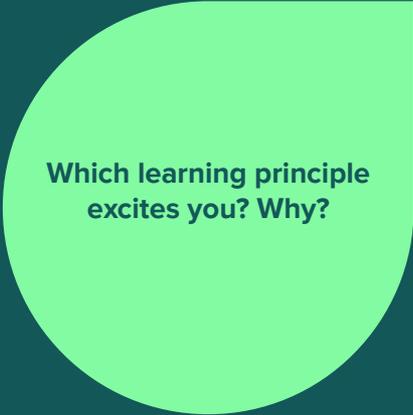


Agenda:

- 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
excites you? Why?**

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 High School – Statistics and Probability

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables

1. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).

2. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
 - a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
 - b. Informally assess the fit of a function by plotting and analyzing residuals.
 - c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

1. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
2. Compute (using technology) and interpret the correlation coefficient of a linear fit.
3. Distinguish between correlation and causation.

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

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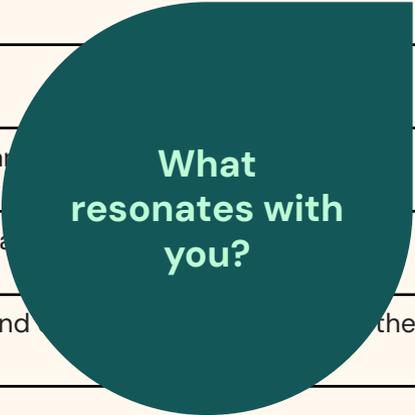
Share your thinking!

M211 Content and Practice Expectations (CPE)

211.a	Identify features that make some graphs of quantitative and categorical data misleading.
211.b	Identify the subjects and variables in a data set.
211.c	Interpret and compare graphical representations of quantitative data and categorical data.
211.d	Describe key features of raw quantitative data and categorical data.
211.e	Create graphical representations of quantitative data and categorical data.
211.f	Prepare raw data for predictive modeling by organizing, cleaning, summarizing, aggregating, and feature engineering.
211.g	Understand where data comes from and how to collect primary and secondary sources of data.
211.h	Perform data practices (collecting, generating, analyzing, and disseminating data) ethically, and evaluate data practices on their use of ethics.

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211.e	Create graphical representations of quantitative data and categorical data.
211.f	Prepare raw data for predictive modeling by organizing, cleaning, summarizing, aggregating, and transforming data.
211.g	Understand where data comes from and how to collect primary and secondary sources of data.
211.h	Perform data practices (collecting, generating, analyzing, and disseminating data) ethically, and understand their use of ethics.



**What
resonates with
you?**

M211 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
211.a: Identify features that make some graphs of quantitative and categorical data misleading.	i. demonstrate understanding that axis scale, truncated axes, and pictographs can exaggerate differences between values.
211.b: Identify the subjects and variables in a data set.	i. given a data visualization, set of raw data, or study description, identify who or what the subjects are.
	ii. given a data visualization, set of raw data, or study description, identify what was collected or observed from the subjects.
	iii. demonstrate understanding in context of what the rows and columns represent in a set of raw data (i.e., rows represent subjects and columns represent variables measured or collected).



What new
insights do you
have?

Let's Investigate

Choose at least one task to explore:

- The Animals Dataset
- Data Visualization & Misleading Data

Which content and practice expectations are evident in each one?

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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

Seven of the ten fastest growing job categories in the United States are data centered, and an incredible 90% of the data ever created by humanity has emerged in the last two years. When our young people enter the workforce they will need to be confident and skilled at working with big data sets but we are woefully under preparing our students for this important mathematical work (Boaler & Levitt, 2019).

Source: [YouCubed](#)

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!

With your partner, you will write a business report for Me & the Bees. During this time, you will analyze data, synthesize your discoveries, and communicate your findings. You will use the tools and strategies you learned for working in a spreadsheet to continue to look for patterns in the data. You will then write up your findings in a business report. In your report to Me & the Bees, you will respond to the question, "What are your recommendations for Me & the Bees? Make sure to include evidence."

Your business report should include:

- An introduction
- Discussion of findings with visual evidence as support
 - Visuals along with your analysis and synthesis of those visuals
- Recommendations and conclusions
- Business report writing features: concise, clear visuals, color, and graphs as supporting evidence

Prepare to share your findings with the class.

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

Content and Practice Expectations

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

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211.h: Perform data practices (collecting, generating, analyzing, and disseminating data) ethically, and evaluate data practices on their use of ethics.

Learning Principles

In M211 Badge Data Management and Visualization, 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).
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Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?

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**Share what
you came up
with!**

03

Task 1: Student Work

Lazy

Needy

IEP Kids

Level 1

At Risk

Unmotivated

Low



Round 1: What do you notice?

Jot down

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

Insert image of student work here

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

Insert image of student work here

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

The best learning is driven by students' authentic questions– the kinds of wonderings that keep them up at night and light their cognitive fires. As an educator and instructional leader, you have the power to model relentless curiosity and the power of inquiry (Safir and Dugan, 2021, p. 112).

Source: Street Data: A next-generation model for equity, pedagogy, and school transformation

Round 2: What evidence of learning is there?

211.h: Perform data practices (collecting, generating, analyzing, and disseminating data) ethically, and evaluate data practices on their use of ethics.

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 for reviewing student work. At the top, there are three buttons: "Conference and Provide Revision Support", "Accept with Revision", and "Accept". On the left is a vertical toolbar with icons for editing, erasing, pointing, creating a Jamboard, inserting images, drawing a circle, adding text boxes, and erasing. The "Jamboard" icon (a document with a pencil) is circled in green, and a large green arrow points from a callout box to it. The callout box is a dark green rounded rectangle containing the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a circular label "Work Sample 1".

Example #1

insert image 1 of student work

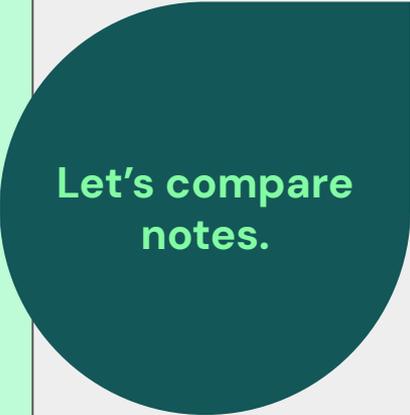
**Let's compare
notes.**

Example #2

insert image 2 of student work

**Let's compare
notes.**

Example #3



**Let's compare
notes.**

insert image 3 of student work

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!

Task 2: Household Water

Provide students with American Community Survey Data and a prompt as follows:

In this activity we will collect bivariate data to see if there is a relationship between two variables: number of gallons of water used and how many people are in a household.

After a few days or a weekend passes to allow students to collect water use data, resume the activity:

Your group will use the Colab program, Box Plots – Explore Your Own Data, to tell the story of the variable(s) from the perspective of your local data. Then you'll explore the similarities and differences in your local data set from your survey and the state data set from ACS (American Community Survey Data). For each variable, your group will consider the reasons why the similarities and differences might exist and if they point to the same need.

Adapted from YouCubed.org

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

Content and Practice Expectations

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Content and Practice Expectations

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211.g: Understand where data comes from and how to collect primary and secondary sources of data.

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**Share what
you came up
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05

Task 2: Student Work

Round 1: What do you notice?

Jot down

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

Insert image of student work here

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insert image 1 of student work

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notes.**

Example #2

insert image 2 of student work

**Let's compare
notes.**

Example #3

insert image 3 of student work

**Let's compare
notes.**

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 M211 content? Why?
3. What impact do you think using a portfolio system will have on your students? Why?