Why do you want to bring projects into your classroom?

(Sit with grade levels)

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Using Project-Based Learning in the Classroom to Provide *All* Learners Access to Rigorous Mathematics

Megan Correll: 7th Grade Math Teacher

A little about Field Middle School

- Located in the Northern Suburbs of Chicago
- Approximately 300 students between 3 grades
- Students and families speak about 26 different languages at Field

Experiences that have shaped my passion for project-based learning

Introduce yourself to your groupmates

- Name
- School
- Grades/Subjects
- One thing that makes your student population unique
- Your why for bringing projects to your students

Objective...

- Collaborate with grade-level colleagues to fully outline one standards-aligned project to implement in the 2023-2024 school year
- Explore project resources and adapt to your students' needs

Agenda

- Intro
- Brainstorm and share out
- Points of differentiation for diverse learning communities
- Work time throughout
- Closing
- Reflection/survey

Why project-based learning?

- Opportunity for kids to explore within a structured, yet flexible environment; “easy” opportunities for differentiation for **all** learners
- Practice “life” skills and work through struggle
- Learn to collaborate and communicate with peers in a productive and respectful manner
- Work from a place of purpose and urgency
- Try something, fail, give up, think, and try again

"**McDonalds** turned **house** turned **boat** turned **houseboat**"

Sample 7th Grade Projects and Unit Alignment

Rates and Proportions
Great Math Bake-Off

- Groups select a recipe to make
- Students scale the recipe using proportions
- Students shop for the better buy of the ingredients
- Students actually bake/cook recipe (if available)

Probability
Carnival!

- Groups design and create a theoretically or experimentally based probability "carnival" game
- Students construct the games and hold a carnival for other classes or community members

Surface Area and Volume
Cardboard Sculptures

- Groups create a scale drawing of what will become a large scale cardboard sculpture
- Students will use the scale drawing to construct the sculpture then calculate the surface area and volume of the piece
- Project culminates in a gallery opening.

Project Friendly Standards

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6th Grade	7th Grade	8th Grade
7.G.1 + 2	7.SP.6, 7, 8, + 9	8.EE.6
6.EE. 6, 7, + 8	7.G.1, 5, + 6	8.EE.7
6.NS. 2 + 3	7.EE. 3 + 4	8.EE.8
6.RP. 1, 2 + 3	7.RP. 1 + 2	8.F.1
	7.RP. 3	8.G.6,7, + 8
		8.G.9
		8.SP.4

Brainstorm...

- What are your students' interests?
- What are life skills and math skills (outside of the standard) your students need?
- Which standards align with projects and student exploration?
- Thinking of your standards and units, where do you see a project fitting into your pacing?

Share Out

Partner → Whole Group

Light Up Clouds!
-Provide a calm atmosphere for the classroom.
-Can play calming music for a relaxing mood!!
-Good option for making classroom fun!

Light Up Clouds Link!

$14.99

What Does Our Classroom Need?

Standards: 6.EE.2; Beginning of the year

What Does Our Classroom Need?

Mathematical Outcomes

- Develop mathematical and verbal evidence to support an argument
- Create equivalent expressions
- Simplify expressions using order of operations
- Shop under, but close to a budget

Cooperative Learning Outcomes

- Learn what things are important for students to have in a classroom
- Work within a timeline
- Reference a rubric while working
- Successfully communicate ideas and plans with peers

Differentiation Strategies for students who...

Need more support

- Exemplars
- Template for visuals
- Sentence stems for presentation
- Examples of mathematical evidence

Receive language services

- Translation with pictures
- Sentence stems for presentation information
- Template for visual
- Key vocabulary (translated and/or with examples)

Need more challenge

- Challenge students to get as close to the budget as possible
- Represent mathematical reasoning in different ways (equation, inequality, etc.)
- Calculate tax

Planning your project

1. Project Topics and Outcomes- Choice vs. Structure
2. Project Purpose: Extension or Assessment?
3. Groupings
4. Planning for Specific Learners
5. Rubrics
6. Teaching Timeline
7. Student friendly planning documents and checklists
8. Examples/Exemplars
9. Reflection

Differentiation: Project Topics and Student Choice

Extra Support

- Provide a short list of possible project options/examples
- Give content specific roles/tasks
- Standards can be accessed in different ways

Language Learners

- Provide students with visual representations and key vocabulary
- Partner students strategically
- Encourage students to bring culture into the project

Need more?

- Leave it open ended and see where things go!
- Encourage students to think outside the norm
- Can differentiate within groups for individual students

Differentiation: Extension or Assessment?

Extension

- Not all projects need to go into the grade book
- Using a project as an opportunity to explore concepts
- Work on the project as you teach
- Generates a purpose for learning

Assessment

- Teach → Practice → Assess
- Use projects to generate project-based performance task assessments
- Students must apply what they did and learned during the project
- Tactile experience for learners

Differentiation: Student Groupings

Number of students in each group

- 3 students
- 4 students

Types of grouping

- Student choice
- Teacher selected
- Random

Group roles and responsibilities

- Time keeper
- Organizer
- Material Gatherer
- Group Lead

Differentiation: Student Groupings

Student Choice

- Less content heavy/ beginning of the year projects
- Select one person
- Culturally responsive projects

Teacher selected

- Strategic groupings: strengths vs collaboration
- Content specific/heavy

“Random”

- Can be strategic
- Heterogenous by strengths, culture, and interests
- Love what happens from random groups

Pause and Plan

1. Project Topic and Outcomes
2. Extension vs. Assessment
3. Groupings

Scan for planning doc

The Great Math Bake- Off

Standards: 6.RP.1,2+3; 7.RP.1,2+3

Great Math Bakeoff

Mathematical Outcomes

- Find the “Better Buy” using unit rate
- Scale a recipe using unit rate or proportions
- Converting measurements: tablespoons to teaspoons

Cooperative Learning Outcomes

- Practice those “real life skills”: shopping, scaling a recipe, baking, budgeting, etc.
- Collaborating with peers to choose an appropriate recipe
- Time management

Differentiation Strategies for students who...

Need more support

- Students select a recipe from three choices
- Modify conversion amounts: scale a recipe from making 24 to 12; still practicing the standards.

Need more challenge

- Change the scale to make it more obscure/result in more problem solving
- Students will convert measurements to different forms (⅛ of a cup = ? tablespoons)

Receive language services

- Provide visuals for ingredients and measurements on the recipe
- Encourage students to bring their culture into the recipe selection

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- Specific Learner Needs
- Rubrics
- Teaching Timeline

Differentiation: Specific Learner Needs

Extra Support

- What visual supports will you provide students?
- What mathematical supports?
- Group structures?
- IEP goals? Communication and Math

EL Services

- What vocabulary is included in this project?
- Visual supports
- Communication supports: sentence stems for communicating with group

Extension

- What other mathematical elements can this project include?
- Questions to promote deeper thinking.

Plan on flexibility

Differentiation: Rubrics (Group and Individual)

Math/Standard

- Include specific content standards and expectations (exemplar, meets, approaching)
- Clearly distinguish between categories

Cooperative Learning

- Include categories for cooperative learning (communicating with group mates, self and group reflection, etc.)
- Can include specific learning goals for students

Specific Needs

- Tracking an individual goal? Put it on the rubric.
- Students with EL services: include language/vocab goals

KEEP SPECIFIC Yet BRIEF

Differentiation: Teaching Timeline

Project→ Teach→ Project

- Introduce the project and get “buy in”
- Students will sit with group for the unit
- Explore concepts
- 3-4 days for project completion

Teach→ Project

- Explore/teach concepts
- Introduce project
- 3-4 days for project (or more if needed)
- Students do not have to sit with group mates throughout unit

Teach/Project

- Teach and work on project simultaneously
- Incorporate elements of the project into stations/daily tasks
- 1-2 day project days at end

What works with your schedule?

Pause and Plan

1. Specific Student Needs
2. Rubrics (general ideas)
3. Teaching Plan

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Cardboard Sculpture Project

Standards: 6.G.1, 2; 7.G.1, 4 + 6; 8.G.9

Sculpture Project Guidelines

- **Objective:** Create a large-scale cardboard sculpture (must be larger than 4.5 feet). Calculate the surface area and volume of the sculpture.

Students must:

- Create a detailed, accurately measured scale drawing
- Use the scale from the scale drawing to measure and construct the sculpture
- Use the final sculpture to find the surface area and volume of the piece

Surface Area Project

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Mathematical Outcomes

- Create an accurately measured scale drawing
- Use a ruler to measure in centimeters, inches, and feet
- Find the surface area and volume of three-dimensional shapes
- Compare the surface area and volume of scale drawing to actual

Cooperative Learning Outcomes

- Visualize final product
- Work within a specified timeline
- Communicate effectively so all students are contributing to the creation of the sculpture
- Use materials properly (scissors, yard sticks, rules, tape, etc.)
- Realize the power of planning and preparation

Differentiation strategies for students who...

Need more support

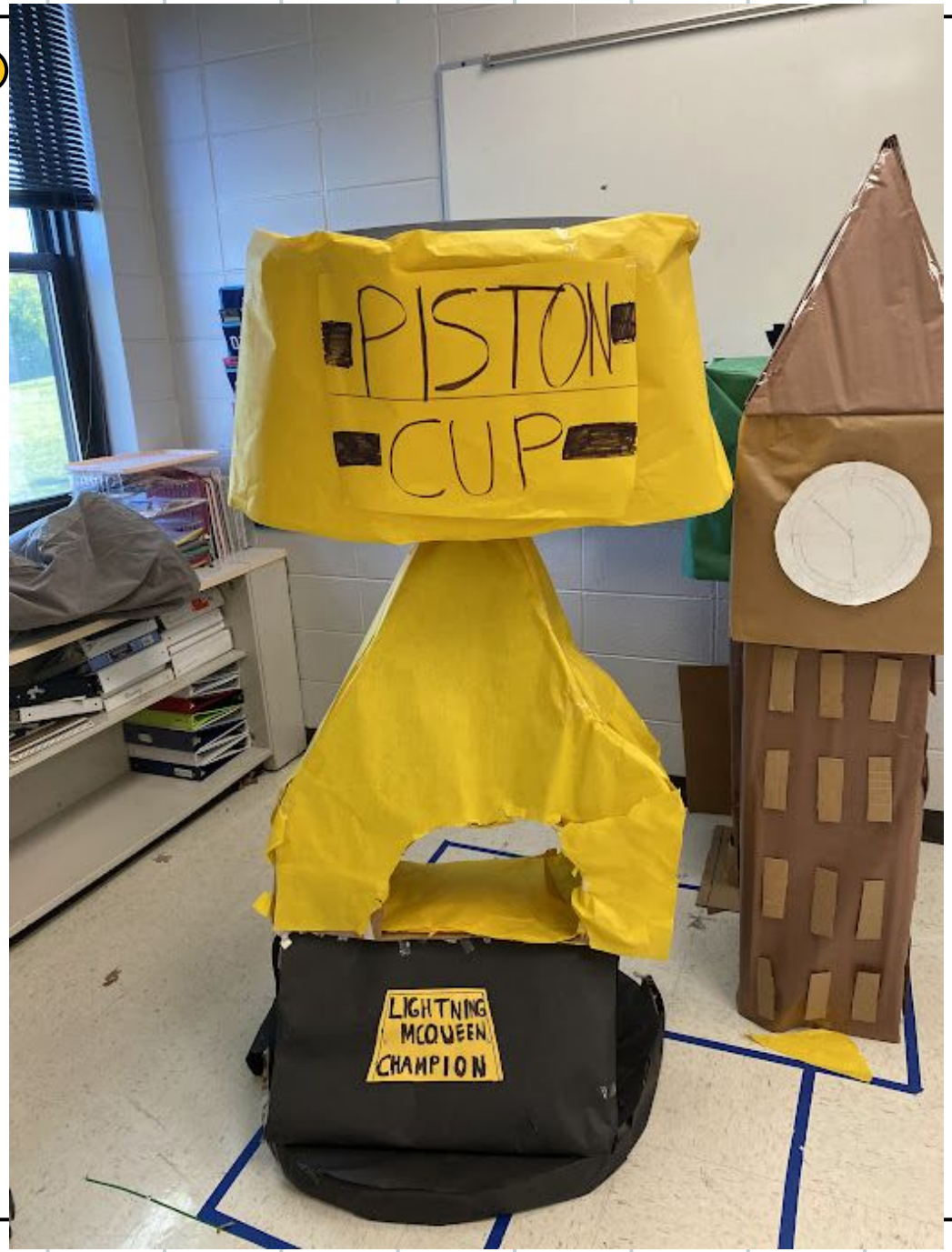
- Extra support and services in measuring
- Simplification of designs
- Fine motor skills practice

Receive language services

- Communication services to collaborate with peers
- 3D shape images with formulas/translations if needed

Need more challenge

- How do the surface area and volume of the scale drawing compare to the sculpture?
- How can you use the scale drawing calculations to calculate the actual?
- Minimum of 3 different 3D shapes



- Student friendly documents
- Examples
- Reflection

Differentiation: Student Friendly Planning Documents (Checklists; directions; work docs)

Checklists

- Provide students a simple and clear check list of tasks they need to accomplish to complete the project
- Promotes organization, and self-directed learners

Directions

- Provide students access to the why and outcomes of the project
- Easy to identify project expectations

Work documents

- Organized, easy to use work templates
- Allow flexibility in how students use these, especially if presenting a project

Planning document examples

Bake Off

- ❑ Print off recipe (**Print enough for each person in your group AND Mrs. Sprandel**)
- ❑ Scale ingredients using proportions
- ❑ Check-in with Mrs. Correll
- ❑ Once checked, write new ingredients on original recipe
- ❑ Annotate recipe
  - ❑ Who is doing what steps?
  - ❑ Kitchen preference?
- ❑ Once done, shop for the best deal (Jewel vs. Marianos)
  - ❑ Create your shopping list
  - ❑ Shop for ingredients
  - ❑ Find unit rate and determine the best deal

Bake-Off Proportions Guide

Objective: Utilize knowledge of proportional relationships to scale your Bake-Off recipe.

$$\frac{\text{Ingredient quantity}}{\text{Serving size}} = \frac{\text{New Ingredient quantity}}{\text{New serving size (20)}}$$

Recipe:

Serving Size:

Ingredient	Measurement	Proportion	New Measurement

Language learners: pictures with checklist, recipe, and proportions
Extra Support: Proportion example, fill in ingredients

Differentiation: Examples

Examples

- Create examples of multiple project representations
- If a presentation, model it
- Do not give away too much!

Differentiation: Reflection

Reflect! Reflect! Reflect!

- Student reflection and input is pivotal to a project's return and success
- Empower that student voice
- Take notes and reflect on your experiences, too

And finally...

Your students are BRILLIANT! Share their hard work and ideas!

VIPs

Carnival!

Standards: 6.G.1, 2; 7.G.1, 4 + 6; 8.G.9

Carnival Project Guidelines

- **Objective:** Create a theoretically or experimentally based carnival game.

Students must:

- Create a theoretically or experimentally based carnival game
- Perform experimental probability trials
- Calculate compound probability of winning prizes
- Design and administer a probability simulation aligned with the game
- Predict the number of people who will win each prize
- Construct and be ready to run the game!
- Collect probability data during the game

Carnival Project

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Mathematical Outcomes

- Calculate theoretical/experimental probability
- Run compound probability trials
- Design a simulation
- Calculate compound probability
- Make probability predictions

Cooperative Learning Outcomes

- Effectively communicate with peers to brainstorm and decide upon a game
- Develop a “manning” schedule
- Time management
- Communicate game needs with teacher

Differentiation strategies for students who...

Need more support

- Visual examples of real or past carnival games
- Tactile
- Guides for during theoretical or experimental prob.

Receive language services

- Images/videos of carnivals and carnival games
- Examples of past carnival games
- Relate to students
- Key vocabulary sheets

Need more challenge

- Compare simulation predictions to actual after the carnival
- Construct a game that uses compound probability to win prizes
- Create the “impossible”

Equations Project: school improvement or prototypes

Standards: 6.EE.6; 6.EE.7, 6.EE.8, 7.EE.3, 7.EE.4; 8.EE.7 and 8.EE.8

Equations Project: Student's chose...

What is something LARGE that you would change about our school?

Students explorations:

- School PE Uniforms
- After sports bus
- Solar panels
- Creating a student lounge
- Flexible seating for all classrooms
- Touch screen chromebooks
- Redesign the cafeteria

What is something you could create, make, and sell?

Students explorations:

- After school food fundraiser
  - Cost vs. profit
- School supplies fundraiser
- New to school kits

- Encourage students to design an "invention"

Equations Project

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Mathematical Outcomes

- Generate and solve one, multi-step, or systems of equations
- Graph linear equations
- Generate equations based on real-world scenarios

Cooperative Learning Outcomes

- Think “big”
- Lifting student voices
- Design-thinking process; communicating with peers to come with and design a product

Differentiation strategies for students who...

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Need more support

- Provide structure and idea bank
- Past examples
- Example of mathematical representations
- Align with student needs

Receive language services

- Provide opportunities to bring in cultural needs or products
- Sentence stems for presentation
- Vocab and visuals

Need more challenge

- Challenge students to REALLLLLLY think deeply and plan for this project/product
- Always ask, what else?

Thank you!

Please complete this feedback survey

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