

ARTS IMPACT PROJECT BASED LEARNING UNIT PLAN

Dance and STEM Infused PBL Unit

Cookie Dance

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Project Idea:

Dance in order to demonstrate understanding of what happens when two or more substances are mixed (substances with different properties are formed). Apply this understanding of properties to determine what goes wrong when a recipe is missing a crucial ingredient and make a plan to fix the recipe and make it work.

Driving Question:

How can we use what we know about how different substances mix to figure out what's missing from our recipe?

Unit Summary (Completed at end of project. Use for sharing out public product.)

Students explore properties of matter and what happens when two or more substances are mixed through dancing and baking. When cookie baking fails, students work collaboratively to figure out what unknown ingredient might be missing. They develop a hypothesis and amend the recipe, then write an opinion piece about their findings using supporting evidence and scientific reasoning.

Learning Targets and Assessment Criteria

Target: Understands the results of two substances mixing together.

Criteria: Creates a dance that clearly demonstrates substances mixing with an accurate result (e.g. separating, combining, and reacting to create a new substance, blending, or dissolving).

Target: Identifies failure points in a recipe and identifies elements of the design that need to be improved (e.g. texture, flavor, color).

Criteria: Develops a hypothesis and a plan to amend a recipe with an unknown missing substance.

Target: Collaborates with peers.

Criteria: Actively participates in group dance and contributes ideas to choreographing the dance. Contributes ideas constructively to group discussion about recipe design.

Target: Explains final cookie recipe in writing.

Criteria: Follows the structure of opinion writing: uses supporting evidence and scientific reasoning to back up thinking.

Vocabulary

Arts:

Duet, choreography, movement, shape, levels, tempo, energy, formation

Arts Infused:

Cause and effect

Evidence

STEM:

Molecule, substance, emulsifier, matter, particles, mixture, react, properties, hypothesis, model

English Language Arts:

Opinion piece

Social Emotional Learning:

Collaborate

21st Century Skills:

Collaborate, Communicate, Persevere, Problem-solve

Materials

Resources (Websites, experts, texts)

Amplify Modeling Matter curriculum, Chemistry Cookie Recipe Experience and related articles (NPR Creation of Cookies, Edutopia).

Museum Artworks or Performance

Pacific NW Ballet Field Trip: *Behind the Scenes Tour*, January 12th

Materials

- Baking ingredients and cooking tools, toaster oven
- Modeling Matter science kit
- Music and music playing device
- Class assessment worksheet
- Graphic organizer for recipe revisions
- Copies of recipe
- Mixtures Dance – substances, cups, spoons
- Observable Properties Recording Sheets
- Class assessment worksheet

Standards to Drive the Inquiry

Arts

WA Arts Learning Standards

For the full description of each anchor standard and the grade level performance standards, see:

<http://www.k12.wa.us/Arts/Standards>

Anchor Standard 1: Generate and conceptualize artistic ideas and work.

Performance Standard (DA:Cr1.1.5): a. Build content for choreography using several stimuli (for example, music/sound, text, objects, images, notation, observed dance, experiences, literary forms, natural phenomena, current news, social events).

Anchor Standard 2: Organize and develop artistic ideas and work.

Performance Standard (DA:Cr2.1.5): b. Develop a dance study by selecting a specific movement vocabulary to communicate a main idea. Discuss how the dance communicates non-verbally.

Anchor Standard 7: Perceive and analyze artistic work.

Performance Standard (DA:Re7.1.5): a. Find meaning or artistic intent from the patterns of movement in a dance work.

Anchor Standard 8: Interpret intent and meaning in artistic work.

Performance Standard (DA:Re8.1.5): a. Interpret meaning in a dance based on its movements. Explain how the movements communicate the main idea of the dance using basic dance terminology.

English Language Arts

Common Core State Standards in ELA

For a full description of CCSS Standards by grade level see: <http://www.k12.wa.us/CoreStandards/ELAstandards/>

W.5.1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

Math

Common Core State Standards (CCSS) in Math

<http://www.k12.wa.us/CoreStandards/Mathematics/default.aspx>

5.MD.A.1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

CCSS Mathematical Practices

1. Make sense of problems and persevere in solving them.
4. Model with mathematics.
6. Attend to precision.

Science, Technology, Engineering

Next Generation Science Standards

<http://www.nextgenscience.org/search-standards>

5-PS1-3 Matter and Its Interactions

Make observations and measurements to identify materials based on their properties.

5-PS1-4 Matter and Its Interactions

Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Scientific and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

21st Century Skills

<http://www.p21.org/our-work/resources/for-educators>

- Critical Thinking: *Asks clarifying questions; uses evidence to question or explain creative choices; constructs meaning*
- Communication: *Actively listens; expresses ideas – visually/physically/verbally; responds to others*
- Collaboration: *Communicates ideas to others; makes compromises; and incorporates input/feedback*
- Perseverance: *Persists in adapting ideas to work through challenges*

Social Emotional Learning Standards

6. Social Engagement – Individual has the ability to consider others and a desire to contribute to the well-being of school and community

6B. Demonstrates the ability to work with others to set, monitor, adapt, achieve and evaluate goals.

Teacher Project Planning

(Questions for teachers.)

1. *What will the entry event be to launch this unit?*

Recipe failure – students are given an incomplete recipe with a vital substance missing. Create hypothesis about what went wrong.

2. *What resources might we need?*

(Experts, fieldtrips, texts, websites, data, equipment, materials)

See materials. Guest appearance by professional baker.

3. *What is the duration of this unit?*

2 months

4. *What will be group work?*

Creating and presenting the dance, problem solving with the recipe, the final cookie fair

What will each individual student do?

Hypothesis, writing pieces, participating in the dance

5. *What will the formative assessments/moments for reflection be?*

(Journal entries, plans, outlines, rough drafts, sketches, turn and talk, physical brainstorm, idea mapping, diagramming)

Dance, opinion writing, hypothesis, group discussion participation

6. *What will the summative assessment/ public product be?*

(Performance, exhibition, publication, public presentation, website, installation)

Checklist, dance, cookie recipe and writing component, science unit assessment

Facilitating Student Understanding of the Problem

(Questions to guide student inquiry.)

1. *What do we know about this problem before we begin?*
2. *What do we need to learn in order to solve it?*
3. *Where will we look for resources?*
4. *Who is our audience? Who will be helped by our solution?*
5. *How will we share our solution?*
6. *How will we assess our own learning?*

PBL Unit Outline of Inquiry

(Begin each step with a question. Follow that with a brief description of what students do to address the question.)

1. What happens when two substances mix together?

- The students explore Modeling Matter science kit.
- The students understand and develop explanations for interactions and properties of materials.

Student reflection and assessment: Understands the different reactions two substances can have and why they react the way they do. Write final scientific explanations for why a specific set of ingredients combine to form an evenly mixed salad dressing.

2. How can we use our bodies to convey the different properties of each type of matter?

- The students warm up with the BrainDance.
- The students practice movements to represent different types of matter (solid, liquid, gas). Students are introduced to shape, levels, tempo, and energy (slippery, fizzy, chunky, oily, runny, dry, thick, gooey).

Student reflection and assessment: Explores communicating properties of matter using movement.

3. How can we use dance to communicate how molecules behave when they react together?

- In duos, students combine two substances, e.g. oil and water, salt and pepper, baking soda and vinegar. (Teacher assigns substances.)

- The students choreograph dances in their duos to model the reactions of the different substances when mixed. (The dances will be created using this structure: starting shape, separate substances movement, mixing movement, result movement, ending shape.)
- The students notate the results of the mixing experiment and the movements and shapes in the mixture dance on Observable Properties Recording Sheets.
- The students perform and respond to the duo mixture dances.
- The students explain what happens on a molecular level (a model or a written explanation).

Student reflection and assessment: Creates a dance that clearly demonstrates substances mixing with an accurate result (e.g. separating, combining, and reacting to create a new substance, blending, or dissolving).

4. What makes a complete cookie?

- The students collaborate to amend the cookie recipe through hypothesizing key missing ingredients through trial and error and research.
- The students document findings and propose a plan.

Student reflection and assessment: Develops a hypothesis and plan to amend a recipe with an unknown missing substance.

5. How can we collaborate to perform the range of possible reactions that two substances can have when mixed together?

- The students collaborate in groups of three or four to choreograph a dance demonstrating how multiple substances and/or mixtures react based on their cookie baking experience.
- The students choreograph a dance with this structure: 1) dance properties of individual substances/mixtures 2) dance the mixing process 3) dance the result.

Student reflection and assessment: Actively participates in group dance and contributes ideas to choreographing the dance. Contributes ideas constructively to group discussion about recipe design.

6. How can you express your ideas through writing?

- The students explain their reasoning for their final cookie recipe in an opinion piece backed up by evidence.

Student reflection and assessment: Follows the structure of opinion writing: uses supporting evidence and scientific reasoning to back up thinking.

7. How can we most effectively share our learning process?

- The students visualize and plan a culminating event that tells the story of their learning in dance, science, and baking.

Student reflection and assessment: Collaborates with classmates to plan and create a public event that showcases their learning.

Public Product/Sharing

Who is our audience?

Peers in both 5th grade classes, school staff

Begin with a question, followed by the description of the culminating event that shares the learning from the PBL unit.

How can we share what we have learned about different substances and mixtures to make a complete cookie?

The culminating event: Cookie Fair

**Mixtures Dance
Observable Properties Recording Sheet**

Partner #1 _____ Partner # 2 _____

Opening Shape: _____

Substance #1 _____  property: _____
property: _____
partner _____

Substance #2 _____  property: _____
property: _____
partner _____

Substance 1 movements: _____ and _____

Substance 2 movements: _____ and _____

Mixing Movements (verbs, action words)

_____ and _____

Result Shape/Movement:

layered combined separated bubbling

Ending Shape: _____

ARTS IMPACT LESSON PLAN Dance and STEM Infused PBL Unit

Grade 5: *Cookie Dance*

CLASS ASSESSMENT WORKSHEET

The following assessment checklist can be used along with other assessment tools developed by teachers and students.

Disciplines	DANCE/SCIENCE	Science	ARTS/SCIENCE		WRITING/SCIENCE	Total 5
Concept	Properties/Reactions	Investigations	Collaboration		Critical Thinking	
Criteria	Creates a dance that clearly demonstrates substances mixing with an accurate result (e.g.separating, combining, and reacting to create a new substance, blending, or dissolving).	Develops a hypothesis and a plan to amend a recipe with an unknown missing substance.	Actively participates in group dance and contributes ideas to choreographing the dance.	Contributes ideas constructively to group discussion about recipe design.	Follows the structure of opinion writing: uses supporting evidence and scientific reasoning to back up thinking.	
Student Name						
1.						
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24.						
25.						
26.						
27.						
28.						
29.						
30.						
Total						
Percentage						

What was effective in the unit? Why?

What do I want to consider for the next time I teach this unit?

What were the strongest connections between arts discipline and STEM?

Teacher: _____ Date: _____

ARTS AND STEM INFUSED PBL UNIT: *Cookie Dance*

Dear Family:

We are engaged in a **dance-infused project based learning** unit in which we are trying to solve this challenge:

Driving Question:

How can we use what we know about how different substances mix to figure out what's missing from our recipe?

- We baked cookies, but our recipe failed.
- We explored what happens when two or more substances are mixed (substances with different properties are formed).
- We discovered that we could create a dance that helps us understand and clearly demonstrate substances reacting or mixing for example: separating, combining, and reacting to create a new substance, blending, or dissolving.
- Based on our dance and science knowledge of the properties of matter, we worked collaboratively to figure out what unknown ingredient might be missing in our cookies.
- We amended our recipe based on our hypothesis, then wrote an opinion piece using supporting evidence and scientific reasoning to back up our thinking.
- We shared our learning process in a delicious way at our Cookie Fair.

At home, you could extend the learning by experimenting with baking muffins, cakes, or pies and adapting and improving recipes based on your science and dance knowledge.