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EED 480

Student Project-Based Learning Outlines

I. Title and Grade Level: BUILD IT SOLID! & 1st grade

II. **BIG IDEA:** *What type of material/techniques used are the BEST to build a sturdy building that can withstand wind?*

Why does the material and technique of how you build a structure matter?

Where around us, can we find a structure that we might want to replicate because of the amazing technique they used to build it?

Let's investigate what materials and techniques will build a solid structure that will withstand the wind.

Let's be engineers and think critically how we are going to build a solid structure using materials in nature.

III. **TASKS:** We will

- A. Students will build a house for one of the little three pigs, with limited materials.
- B. Students will design, play with new materials and start building their final house.
- C. Finally, students will finish building the house structure and we will test the solidity of the house using a fan to try to blow the structure built.

IV. **JUSTIFICATION** This lesson series is STEM integrated.

V. **STANDARDS:** Grade Level and Subject Area: Kindergarten to 5th Science, Social Studies, Language Arts, Mathematics and the Arts

SOCIAL STUDIES 1.2. Students describe the rights and individual responsibilities of citizenship. 2.

Understand the elements of fair play and good sportsmanship, respect for the rights and opinions of others, and respect for rules by which we live, including the meaning of the "Golden Rule."

ELA/Literacy: R1.2.1. Ask and answer such questions as *who, what, where, when, why* and *how* to demonstrate understanding of key details in a text. **(K-2ETS1.1)**

CCSS MATHEMATICS: 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information represented in a bar graph. **(K-2ETS1-1) (K-2ETS1-3)**

NGSS (Next Generation Science Standards)

A. Disciplinary Core Ideas:

- **ETS1.B: Developing Possible Solutions:** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solution to other people. **(K-2-ETS1-2)**
- **ETS1.C: Operating the Design Solution:** Because there is always more than one possible solution to a problem, it is useful to compare and test designs. **(K-2-ETS1-2)**

B. Science and Engineering Practices:

Developing and Using Models: Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or story board) that represent concrete events or design solutions.

- Developing a simple model based on evidence to represent a proposed object or tool. **(K-2-ETS1-2)**

C. Crosscutting Concepts

Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s). **(K-2-TS1-2)**

VI. ENGAGING CONTEXT: Hook- Launch activity

Day 1

- Boys and girls, we will be reading *The True Story Of The 3 Little Pigs* by Jon Scieszka. (Read aloud)
- Now, this story was coming from the perspective of the wolf, but all of you have already read the 3 little pigs. (give students a quick verbal summary to refresh student memory)
- **NOW!** We are going to become engineers and we are going to help the 3 little pigs build a sturdy structure (*explain vocab: engineers, sturdy, structure*)
- Can someone share with me what the house were built of in the 3 little pigs?
- Today we are going to get in groups and work together a team, to build a structure with the materials I give you. Everyone will come up with a different idea and at the end, we are going to test it by blowing your structure to see if it was sturdy enough to withstand the air coming from the fan.

VII. MEASURABLE OBJECTIVES

- A. As student thinking drives this lesson, students can pursue their own inquiry: *How can I build a structure that will stay up and be strong enough so that the wind doesn't blow it down, only using this material that I was given?*

B. As the culminating activity of this PBL students will build a structure using the limited material that I provide for them. They will have limited time and materials to create it. Students must respect others' opinions and work together, following the "Golden Rule."

VIII TOTAL TIME:

Launch event-One: Class Periods of 5 minutes;

Building Knowledge: __ONE__ Class Periods; _15_ minutes

Showing Knowledge (Claims and Evidence) _25_ minutes
(Students develop and revise products and or performances)

IX. Social Skills and or Habits of Mind to Engage/Assess

<input checked="" type="checkbox"/> Persistence	<input checked="" type="checkbox"/> Problem posing
<input type="checkbox"/> Decreasing impulsivity	<input checked="" type="checkbox"/> Drawing on past knowledge
<input checked="" type="checkbox"/> Empathic listening	<input checked="" type="checkbox"/> Application to new situations
<input checked="" type="checkbox"/> Flexibility in thinking	<input checked="" type="checkbox"/> Precision of language and thought
<input checked="" type="checkbox"/> Metacognitive awareness	<input type="checkbox"/> Using all the senses
<input checked="" type="checkbox"/> Checking for accuracy	<input checked="" type="checkbox"/> Ingenuity, originality, insightfulness and creativity
<input checked="" type="checkbox"/> Questioning	<input checked="" type="checkbox"/> Inquisitiveness, curiosity
	<input checked="" type="checkbox"/> Enjoyment of problem solving

IX. Level of Voice Appropriate for Activity:



X. **BSCS 5-E Framework**

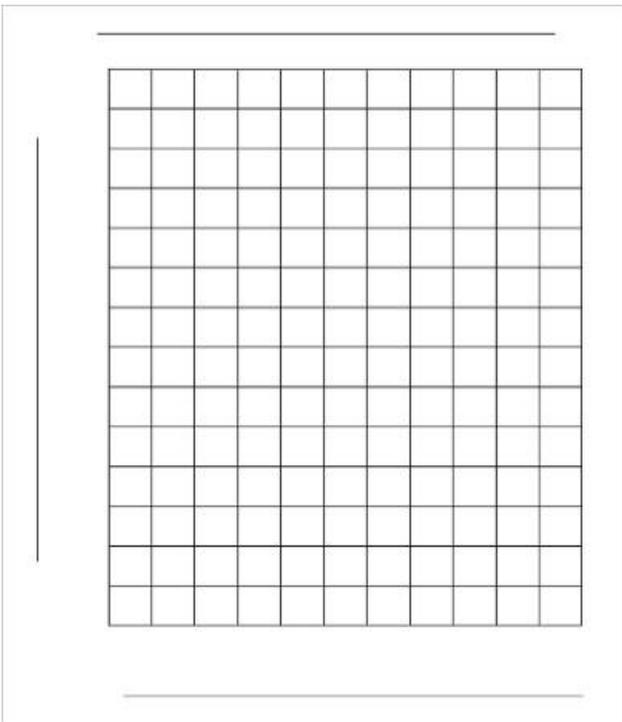
Engage:

A. DIRECT INSTRUCTION: forming groups, assigning roles, describing roles and tasks

Materials Manager/ Spy Tasks: Make sure your team receives and uses the materials given ONLY.

Checker's Tasks - Make sure you are checking the time and that your team knows how much time they have left to continue designing and building the structure. Help others complete their tasks. Let instructor know when your team has completed the solid structure.

Recorder's Tasks: Carefully observes and counts the number of materials that they used. Write down what materials you used and which ones you did not. How many of each material did you use? **Complete bar graph to show what materials were used. Top side (NAME OF MATERIAL) & Side (numbers by 2's, 2,4,6,8,10,12)**



Encourager/Observer' s Task - Coach the team to persevere and stay together while sharing and turn-taking. Notice, identify and record occurrence of team members' social skills and habits of mind. Make sure your team members are following the "Golden Rule".



(Observer records individual performance)

Checklists and Rubrics : Make sure that all materials used are ONLY materials that were given.

Peer Assessment: (put a checkmark (happy face, okay face and sad face) to rate your classmates participation in the team building. Assess yourself too.

Explore: We will use our inquiry skills of predicting (hypothesis testing) comparing and analyzing to: Use the materials given to build a solid structure that will withstand the fan.

4 groups of 5-6 students)

Explain: As students complete the launch, inquiry, culminating activity they share what materials they used, how much of it and what techniques they used to build a sturdy structure. Share any ideas that they had and did not use. How they worked as a team? Ask if it was difficult to build something because of the type of limited materials that were given and the limit on time.

Extend/Elaborate: In small groups and in the final performance students have opportunities to extend their knowledge and to elaborate on their ideas. The teacher provides mini-lessons as needed to scaffold student thinking and understanding. (Ask student if they could have added something that was not in the set of materials given. Ask students if they could've built the structure differently.

XI. Materials List

- Paper to sketch
- Pencil
- Sticks
- Play-doh
- Chart checklist / Peer/Self Assessment

Evaluate: (Assess):

There are several formative and summative ways to assess learning in this engaged learning PBL. The first is in the individual summative assessment of their participation and collaboration as a team.



Students will keep a daily log of how they are feeling when they built their structures and the techniques they are using.

The structure they built is the *final assessment* for the day.

Formative Assessment of Non-Cognitive Factors:

Commented [BSF1]: Just for fun, see if you can find images to place in each level that reflects your theme.

3	2	1
Student is able to cooperate to complete structure.	Student is partially able to cooperate to complete structure.	Student is unable to cooperate to complete structure.
Student participates in personal job (checker, recorder, etc.)	Student partially participates in personal job (checker, recorder, etc.)	Student is unable to participate in personal job (checker, recorder, etc.)

Score: ___/6

Children's Literature that Supports the PBL:

- ❖ *The True Story Of The 3 Little Pigs* by Jon Scieszka.
- ❖ *The Three Little Pigs* by Mara Alperin
- ❖ *The Three Little Pigs, Los Tres Cochinitos* retold by Patricia Seibert

VI . **ENGAGING CONTEXT: Hook- Launch activity**

Day 2

- Boys and girls, yesterday we created a house for the 3 little pigs with limited time and limited materials! That is what engineers do! Engineers think of an idea and they sketch it and try to create it in a limited amount of time! I want to share with you two videos of how engineers design something before they actually build it. First, we are going to watch a video on models! Engineers build mini models of what they hope the actual results looks like. Second video, we are going to see a sketch.
- (Vocabulary: **sketch, model, engineer**)
- <https://www.youtube.com/watch?v=E1TCHInuIOU> (11:38-12:15)
- <https://www.youtube.com/watch?v=KTPmbyZ81A> (1:29 & then click to 4:00)
- We are going to continue our engineering project! Today we are going to prepare for it before we even start to build the structure for one of the 3 little pigs.

•VII. **MEASURABLE OBJECTIVES**

A. As student thinking drives this lesson, students can pursue their own inquiry: *How can I build a structure that will stay up and be strong enough so that the wind doesn't blow it down, only using this material that I was given?*

B. As the culminating activity of this PBL students will work on a design together before they start to build the structure. Students will replicate their sketch and ideas and build the structure.

VIII **TOTAL TIME:**

Launch event-One: Class Periods of 8 minutes;

Building Knowledge: Two- ONE Class Periods; 5 minutes

Showing Knowledge (Claims and Evidence) 30 minutes
(Students develop and revise products and or performances)

IX. Social Skills and or Habits of Mind to Engage/Assess

<input type="checkbox"/> Persistence <input type="checkbox"/> Decreasing impulsivity <input type="checkbox"/> Empathic listening <input checked="" type="checkbox"/> Flexibility in thinking <input type="checkbox"/> Metacognitive awareness <input type="checkbox"/> Checking for accuracy <input type="checkbox"/> Questioning	<input type="checkbox"/> Problem posing <input type="checkbox"/> Drawing on past knowledge <input type="checkbox"/> Application to new situations <input type="checkbox"/> Precision of language and thought <input type="checkbox"/> Using all the senses <input type="checkbox"/> Ingenuity, originality, insightfulness and creativity <input type="checkbox"/> Inquisitiveness, curiosity <input type="checkbox"/> Enjoyment of problem solving
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IX. Level of Voice Appropriate for Activity:

Noise Levels

	SILENT MISSION: Silent - No talking at all
	TOP SECRET PLAN: Quiet - Only you and a partner
	SUPER TEAM TASK: Normal - Just your table team
	POWER VOICE: Strong - Hear it across the room
	BIONIC NOISE: Loud - Only used outside

X. **BSCS 5-E Framework**

Engage:

B. DIRECT INSTRUCTION: forming groups, assigning roles, describing roles and tasks

Materials Manager/ Spy Tasks: Make sure your team gets all the materials needed. Make sure everyone is working together to sketch.

Checker's Tasks - Make sure your group knows how much time they have left. Help others complete their tasks. Let instructor know when your team has completed the sketch, before you move on to building. Let the teacher know when you are done with your structure.

Recorder's Tasks: Observe and write down what materials you used. How many of the material did you use. Record the type of structure your team came up with.

Encourager/Observer' s Task - Coach the team to persevere and stay together while sharing and turn-taking. Notice, identify and record occurrence of team members' social skills and habits of mind.

(Observer records individual performance)

Checklists and Rubrics provided for student goal setting and self-assessment; Peer Assessment (Team Performance Rubric) [Rate Your Mates] Content Assessment (poster)

Explore: We will use our inquiry skills of predicting (hypothesis testing) comparing and analyzing to:

___ groups of ___ students) Modified for class composition.

Explain: As students complete the launch, inquiry, culminating activity they share...

their prior knowledge, observations and questions about why the substances behave the way they do when dropped one-by-one from the eye dropper.

Extend/Elaborate: In small groups and in the final performance students have opportunities to extend their knowledge and to elaborate on their ideas. The teacher provides mini-lessons as needed to scaffold student thinking and understanding.

XI. Materials List

- spaghetti sticks, wood sticks,
- marshmallow
- tape/glue
- play-doh
- cardboard

Evaluate: (Assess):

The students may also keep a daily log to write down why and how they created and built their structure. They will be able to reflect on their participation and collaboration.

Structure, bar graph and peer/self assessments will be the assessments for this day.

Formative Assessment of Non-Cognitive Factors:

Commented [BSF2]: See previous comment☺

3	2	1
Student is able to cooperate to complete structure.	Student is partially able to cooperate to complete structure.	Student is unable to cooperate to complete structure.
Student participates in personal job (checker, recorder, etc.)	Student partially participates in personal job (checker, recorder, etc.)	Student does not participate in personal job (checker, recorder, etc.)
Student participates in the sketch and is constantly trying to share ideas.	Student partially participates in the sketch and rarely shares ideas.	Student doesn't participates in the sketch and doesn't shares ideas.
Student works with group to build final structure.	Student partially works with group to build final structure.	Student doesn't works with group to build final structure.

Score ___/12

Children's Literature that Supports the PBL:

- ❖ *The True Story Of The 3 Little Pigs* by Jon Scieszka.
- ❖ *The Three Little Pigs* by Mara Alperin
- ❖ *The Three Little Pigs, Los Tres Cochinitos* retold by Patricia Seibert

VI . ENGAGING CONTEXT: Hook- Launch activity

Day 3

- Boys and girls, today we are going to TEST out all of structures! Will they withstand the fan?
- We will test out the structures? The structure must hold for 40 seconds.
- We will then discuss which structures worked and why?
- Which structured did not work and why? What could've those structures that did not pass, have done?
- Class discussion.
- (*Vocabulary: solidity, qualify, theories*)

•VII. MEASURABLE OBJECTIVES

A. As student thinking drives this lesson, students can pursue their own inquiry: Will the type of materials we use withstand the fan? Will the way we built our structure withstand the fan?

B. As the culminating activity of this PBL students will create a project or presentation that meets the objective of the Big idea. And we are going to TEST if their idea worked!

VIII TOTAL TIME:

Launch event-One: Class Periods of 5 minutes;

Building Knowledge: Two- ONE Class Periods; 10 minutes

Showing Knowledge (Claims and Evidence) 30 minutes
(Students develop and revise products and or performances)

IX. Social Skills and or Habits of Mind to Engage/Assess

<input type="checkbox"/> Persistence	<input checked="" type="checkbox"/> Problem posing
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IX. Level of Voice Appropriate for Activity:

Noise Levels

	SILENT MISSION: Silent - No talking at all
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	POWER VOICE: Strong - Hear it across the room
	BIONIC NOISE: Loud - Only used outside

X. **BSCS 5-E Framework**

Engage:

- C. DIRECT INSTRUCTION: forming groups, assigning roles, describing roles and tasks

Materials Manager/ Spy Tasks: Make sure your team has finished the structure and has all the materials that they need.

Checker's Tasks - Make sure students know what time it is and how much time is left. Check that everything on the sketch is on the model that was built.

Recorder's Tasks: Do a bar graph with the materials and the number of materials used in your structure.

Commented [BSF3]: You need not include this again— just refer to the earlier one.

Encourager/Observer' s Task - Encourage your team to follow the “Golden Rule”. Encourage your team to be strong and confident when your structure is being tested.

(Observer records individual performance)

Checklists and Rubrics (Team Performance Rubric) [Rate Your Mates]



Explore: We will use our inquiry skills of predicting (hypothesis testing) comparing and analyzing to: Will your structure and the materials you use withstand the wind?

__ 4 __ groups of __ 5-6 __ students) Modified for class composition.

Explain: As students complete the launch, inquiry, culminating activity they share...

their prior knowledge, share their reason behind their structure and why they chose the materials that they did. What can they improve on?

Extend/Elaborate: In small groups and in the final performance students have opportunities to extend their knowledge and to elaborate on their ideas. The teacher provides mini-lessons as needed to scaffold student thinking and understanding.

XI. Materials List

- Fan
- 4 structures ready to be tested
- stopwatch
- Bar graphs
- Phone to record

Evaluate: (Assess):

There are several formative and summative ways to assess learning in this engaged learning PBL. The first is in the individual summative assessment of their participation and collaboration as a team.



Students will keep a daily log of how they are feeling when they built their structures and the techniques they are using.

Students will be assessed on being able to present their structure to the classroom.

3	2	1
Student participates in presenting their final structure to the class.	Student partially participates in presenting their final structure to the class.	Student doesn't participate in presenting their final structure to the class.
Student listens when other groups are sharing their final structures.	Student somewhat listens when other groups are sharing their final structures.	Student doesn't listen when other groups are sharing their final structures.

Score ___/6

Formative Assessment of Non-Cognitive Factors: Self Assessment Using the Habits of Mind Check Sheet and Write-up Form (Google Docs).

Children's Literature that Supports the PBL:

- ❖ *The True Story Of The 3 Little Pigs* by Jon Scieszka.
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[Content Summative Assessment:](#)

Individual information detailing student learning takeaways from the **Launch** activity

Criteria:

1. Does it include a driving question in any of the identified disciplines? Yes.
2. Does it include at least three new science vocabulary words? Yes.
3. Does it propose the development of a project--students/unit plan-teachers? Yes.
4. Does it show evidence that all team members were involved? Yes.