STEAM UNIT			
Teacher	Donna Swift - Chilmark School/IMP for Kids		
Grade Level(s) for Lesson	4-5	Subject	MUSIC –SCIENCE MATH -ART
Unit Topic	Making Musical Instruments	Duration	7 - 60 min. classes

Summative Assessment	Diagnostic/Formative Assessments
Rubric	Pre – Assessment - Diagnostic Teacher Feedback Form - Formative

Integrated Subjects	21st Century Skills	Arts Concepts
Science – Math	Collaboration Creativity Financial, Economic, Business and Entrepreneurial Literacy	Music – Visual Art

ESSENTIAL QUESTION(S)

How do financial limits effect the creation of a musical instrument that produces sound vibration?

Standards Alignment

Arts Standards	Content Standards
National Art Standard (MU:Cn11.0.4) Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life. National Art Standard (MU:Pr4.2.4b) When analyzing selected music, read and perform using iconic and/or standard notation. National Art Standards (VA:Cr1.2.4a) Collaboratively set goals and create artwork that is meaningful and has purpose to the makers.	Mass Math Standards (4.MD.A.2) Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and MONEY, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. Next Gen Science Standards (1-PS4-1.)Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Objective(s)	Key Vocabulary	Materials
See attached	Sound Vibration Pitch Budget Materials Engineer design process	See attached

Posted Agenda	Opening Activities
-I can design and build a musical instrument to play a song. -Explore on the website how other's created instruments using provided materials. -Brainstorm alone your ideas. -Design with a partner an instrument combining your ideas. -Make a materials list. -Using the price list, total the amount the project will cost. -Reduce your total by 10%. - Use your new budget to adapt your design. -Purchase the materials. -Build the instrument. -Test the instrument by playing all parts of the song. -Improve the instrument using your observations and teacher feedback.	I see, I hear, I think, I wonder. Yesand castles Mad Money Dash

Pacing	
Day	Objective/Topic
1	***Introduce Project*** and **ASK** How do financial limits effect the creation of a musical instrument that produces sound vibration? Tell the students the I can statement: "I can make a working musical instrument to play the song *Skin and Bones*." *Warm Up*: I see, I hear, I think, I wonder... The teacher plays four instruments: (Drum, Shaker, Recorder, and Guitar.) The instruments will be passed around for the students to see. The class discuss their answers to the following: I see... I hear... I think... I wonder. Encourage students to add onto each other's ideas. Pre-assessment - Have the students answer the pre-assessment short answer questions on a blank piece of paper.
2	***The Science of sound vibration*** and **EXPLORE** how others have solved the problem.

	ASK: What is sound and how is it created? Have the students watch the following: https://www.youtube.com/watch?v=ymCa87hYIUE Add the following to the discussion board: What makes a higher pitch? (Longer/bigger or shorter/smaller) What makes a lower pitch? Have students use the following link to explore different ideas to make their own musical instruments. http://www.nyphilkids.org/lab/content.html
3	**BRAINSTORM IDEAS** then **DESIGN COLLABORATIVELY** Warm up: *Yesand* castles. **IMAGINE:** Have students brainstorm alone for five minutes how they would make a working musical instrument using the provided materials. **DESIGN:** Pair up students. Have them design an instrument using a combination of their ideas. After they complete the design have them make a materials list.
4	**Budgets and Materials** Warm Up: Mad Money Dash **ASK:** How do limitations effect the creativity? How do we use math in everyday life? Let the students know the materials they will use cost money. Give the students the price list for all the provided materials. Have the students take their materials list and put prices next to each item and then add it up. The teacher announces there have been budget cuts to the whole project. Each group is given a budget that is 10% lower than the cost of their project. Have the students use the worksheet to calculate the percentage. Have them revise their material lists. Each group adjusts their design and/or materials list. Give the students their budget amount in the fake money. Once they have reworked their design and materials according to their budget, the students "go shopping" and purchase their materials from the teacher exchanging money for their materials.
5-6	**CREATE:** Using their designs the pairs build their instruments adapting if needed. They then rehearse all the parts of the song their instrument can play. **TEST**: Have the students play the song using standard musical notation with their instrument for the teacher. Give the students feedback. **IMPROVE:** Students write up how they would improve their instrument based on what they learned and teacher and peer feedback. If time, let the students rework their creation to improve their instrument.

7	**FINAL TEST/PRESENTATION:** Using standard musical notation, the entire class plays the composition with their instruments.

Teacher Overview

This STEAM unit is designed for grade 4-5. In this 7-class unit, students use the engineering design process to collaboratively create a working musical instrument to play the song *Skin and Bones*. The students must use their knowledge of sound vibration and instrumental families to design, built, and test a musical instrument. This project requires the students to use a budget to purchase the materials for their design. The budget limitation is given to the students after they design so they must adjust their project. Being able to adapt their projects is a component that the MV school system uses in their STEAM projects. There is always something (a phone call that the budget is cut, a natural disaster, etc…) that requires the students to adjust. The unit ends with the whole class playing the composition together.

Learning outcomes:

- The students will make connections between music and art and science and math.
- The students will demonstrate how to use the engineering design process to create an instrument that vibrates and makes sound.
- The students will calculate the money amount needed to create their designs, follow a budget and purchase materials using money.
- The students will adjust their designs when a budget is introduced.
- The students will build their instrument collaboratively using their design.
- The students will play a song with their instruments using standard musical notation.

Materials List

Material table with the following:

Glass bottles	copper pipe - various lengths
Water bottles	PVC pipe – various lengths
Balloons	elastic cord
Straws – various sizes	string
Rubber Bands – all sizes	masking tape
Cardboard boxes	glue guns
Paper towel tubes	Popsicle sticks
Ziploc bags	

fake money in various denominations
Trays
Pencils
Paper

Technology resources: Computer and projector system for videos.

Handouts: Brainstorm worksheet, design sheet, material list worksheet, teacher feedback form, Skin and Bones score, student reflection form.

Pre – Assessment

Discussion Board Questions: (students answer on a blank piece of paper)

Day 1
What is your favorite instrumental family?
How do instruments make sound?
What materials do you need to make an instrument?
If you were to design an instrument what parts would it need?

ADD on Day 2
What makes a higher pitch? (Longer/bigger or shorter/smaller)
What makes a lower pitch? The students add their answers to their paper.

WARM Ups

Yesand Castles (10 min.)
Put students in groups of 2 or 3.
Each group builds an imaginary sand castle through mime. Students take turns adding one thing and their partners respond by saying "yes and" before adding their idea. After the groups build the castle, ask the students if they would have built such a great castle alone? Have each student tell the whole class one detail they added because of a detail their partner(s) added first. (*Created by IMP for Kids*)

Mad Money Dash (15 min.)
Give each pair of students a tray of the following fake money: The tray has two marked sides.

3 – one dollar bills
1 – five-dollar bill
4 – quarters
5 – dimes
10 – nickels

Ask the students to put all the money on one side of the tray. Tell them you will put an amount on the board they will move that amount to the other dies of the tray.

Put the following amounts on the board one at a time. Give the students time to put the money equaling that amount on the other side of the tray. Assign the pair that finished first 3 points, second 2 points, when everyone else completes the task they get 1 point.

$10.00	$2.40
$3.35	$6.55
$7.20	$9.85

BRAINSTORM by _____

Here are my ideas in words and/or pictures for a working musical instrument:

MUSICAL INSTRUMENT DESIGN BY

_____and _____

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MATERIALS LIST

_____and _____

ITEM	How many ?	Total
TOTAL FOR THE ENTIRE PROJECT (Add all the numbers together)		

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PERCENTAGE WORKSHEET

Oh no! You get a phone call that you must reduce your project by 10%

1. Take the total of materials _____

2. Divide by 10

3. Subtract that from the Total of the Materials

New Total: _____

How will you revise your project so you can buy everything you need?

Go back to your materials list – in a different color pencil write your revisions on your sheet.

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STUDENT REFLECTION Form –
MAKING MUSICAL INSTRUMENTS

Student Name:_____ Date: _____

What was challenging about this project?

What did you do that made your project successful?

I would improve my instrument by:

I wish we had more:

Teacher Feedback Form –
MAKING MUSICAL INSTRUMENTS

Student Name:_____ Date: _____

You achieved the goal of this project by:

The following really works in this project:

The following could be worked on:

This project is unique and creative in the following ways:

So far during this project, I learned the following about you:

PRICE LIST

Glass bottles	$ .50 each
Small copper pipe	$1.13 each
Medium pipe	$1.28 each
Large Copper pipe	$2.02 each
Small PVC pipe	$ .25 each
Large Balloons	$1.15 each
Elastic cord	$ .60 per 1 foot
Small Straw	$ .10 each
Medium Straw	$ .15 each
Large Straw	$ .35 each
String	$ .74 per 1 foot
Rubber Bands – small	$ .23 each
Rubber Bands – medium	$ .37 each
Rubber Bands – large	$ .68 each
masking tape	$3.00 per roll
Cardboard boxes	$ .82 each
Paper towel tubes	$ .13 each
Popsicle sticks	$ .03 each
Ziploc bags- small	$ .18 each
Ziploc bags – large	$ .32 each
Dry beans -	$ .51 per scoop

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RUBRIC Making Musical instruments – STEAM UNIT

STANDARD	4	3	2	1
Math- Use the operations to solve word problems involving money.	• Successfully uses different denominations of money equaling their budget to purchase the supplies needed to execute the design of their instrument. • Independently calculates the total of their materials and reduces the amount by 10%.	• Adequately uses different denominations of money equaling their budget to purchase the supplies needed to execute the design of their instrument. It takes more than one attempt and teacher support to keep to their budget to purchase their materials. • Takes more than one attempt and teacher support to calculate the total of their materials and reduce the amount by 10%.	• Demonstrates a limited grasp on how to use different denominations their budget to purchase the supplies needed to execute the design of their instrument. It takes more than three attempts and teacher support to keep the budget to purchase their materials. • Takes one or two attempts with teacher support to calculate the total of their materials and reduce the amount by 10%.	• Fails to grasp the concept of purchasing material using different denominations of money equaling their budget. • Fails to calculate the total of their materials and reduce the amount by 10%.
Science - Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	• Using their background knowledge of sound, student creates either a percussion, string or wind instrument which vibrates enough to play all the parts of the composition.	• Using their background knowledge of sound, student creates either a percussion, string or wind instrument which vibrates enough to play one or two lines of the composition.	• Student creates either a percussion, string or wind instrument which vibrates but not enough to play the composition.	• Fails to create an instrument that vibrates to make sound.
Visual Arts- Collaboratively set goals and create artwork	• Works independently with a partner to design a musical	• Works with a partner and minimal teacher assistance to	• Works with a partner and significant teacher	• Fails to work with a partner to design an instrument.

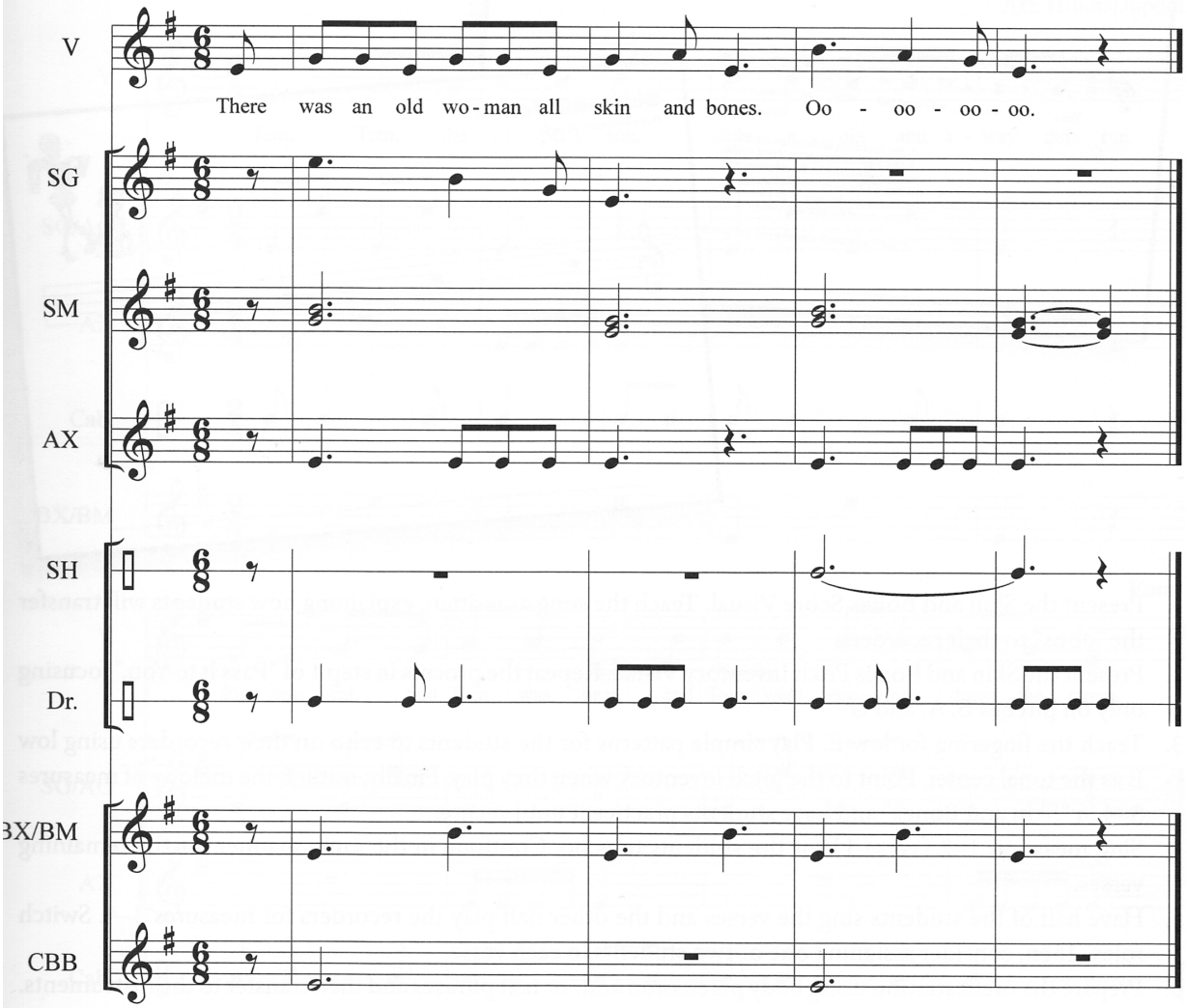
that is meaningful and has purpose to the makers.	instrument using their background knowledge of instrumental families. • Creates a unique working instrument.	design a musical instrument using their background knowledge of instrumental families. • Creates a working instrument.	assistance to design a musical instrument. Student does not recall or use background knowledge of instrumental families. • Creates a working instrument with revisions.	• Fails to create a working instrument.
Music: Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.	• Consistently uses knowledge of the instrument families (woodwind, percussion, string) from memory to create an instrument.	•Effectively uses resources found in the music room to recall knowledge of instrument families to create an instrument.	• Attempts to use resources found in the music room to recall knowledge of instrument families to create an instrument. • Struggles to maintain focus and task and needs teacher support.	• Fails to use knowledge or resources in the classroom about the instrument families (woodwind, percussion, string) to create an instrument.
Music - When analyzing selected music, read and perform using iconic and/or standard notation.	Uses their instrument to play three or more lines (parts) of the composition playing the correct pitch, rhythm and tempo using standard notation.	Uses their instrument to play two or more lines (parts) of the composition playing the correct pitch, rhythm and tempo using standard notation.	Uses their instrument to play one line (parts) of the composition and needs correction or teacher support to play the correct pitch, rhythm and tempo. Plays the composition after learning it by rote rather than using standard notation.	Fails to use their instrument to play the composition.
Collaboration	• Listens and relates to partner using all ideas to design, built, test	• Listens and relates to partner using some ideas to design, built,	• Listens and relates to partner but wants to either use mostly	• Does not listen or relate to partner. Does not use a blend

	and perform on the instrument.	test and perform on the instrument. • Blends ideas with minimal side coaching.	their own ideas or doesn't contribute and wants to use only their partner's ideas. • Needs significant coaching to blend ideas.	of all ideas to design, built, test and perform on the instrument.
Effort	• Listens and participates actively, energetically, and thoughtfully through all stages of lesson. • Consistently follows directions, classroom rules and performance behavior.	• Participates actively during most stages of the lesson. • Perseveres when challenged and moves forward with the lesson. • Follows classroom rules and procedures with one or two reminders.	• Participates actively in discussions and through most stages of the lesson. • Perseveres when challenged with teacher support. • Follows classroom rules and procedures with many reminders.	• Does not participate during most of the lesson. • Struggles or gives up when challenged. • Fails to follow classroom rules and procedures.

Melody: Read high C, B, A, and G and low E and D and play them on soprano recorder

Skin and Bones

Traditional
Arr. Hiller/Dupont



2. She lived down by the old graveyard.
3. One night she thought she'd take a walk.
4. She walked down by the old graveyard.
5. She saw the bones a-laying around.
6. She went to the closet to get a broom.
7. She opened the door and... "Boo!"*

*"Boo" is spoken in a spooky way and ends the piece abruptly.

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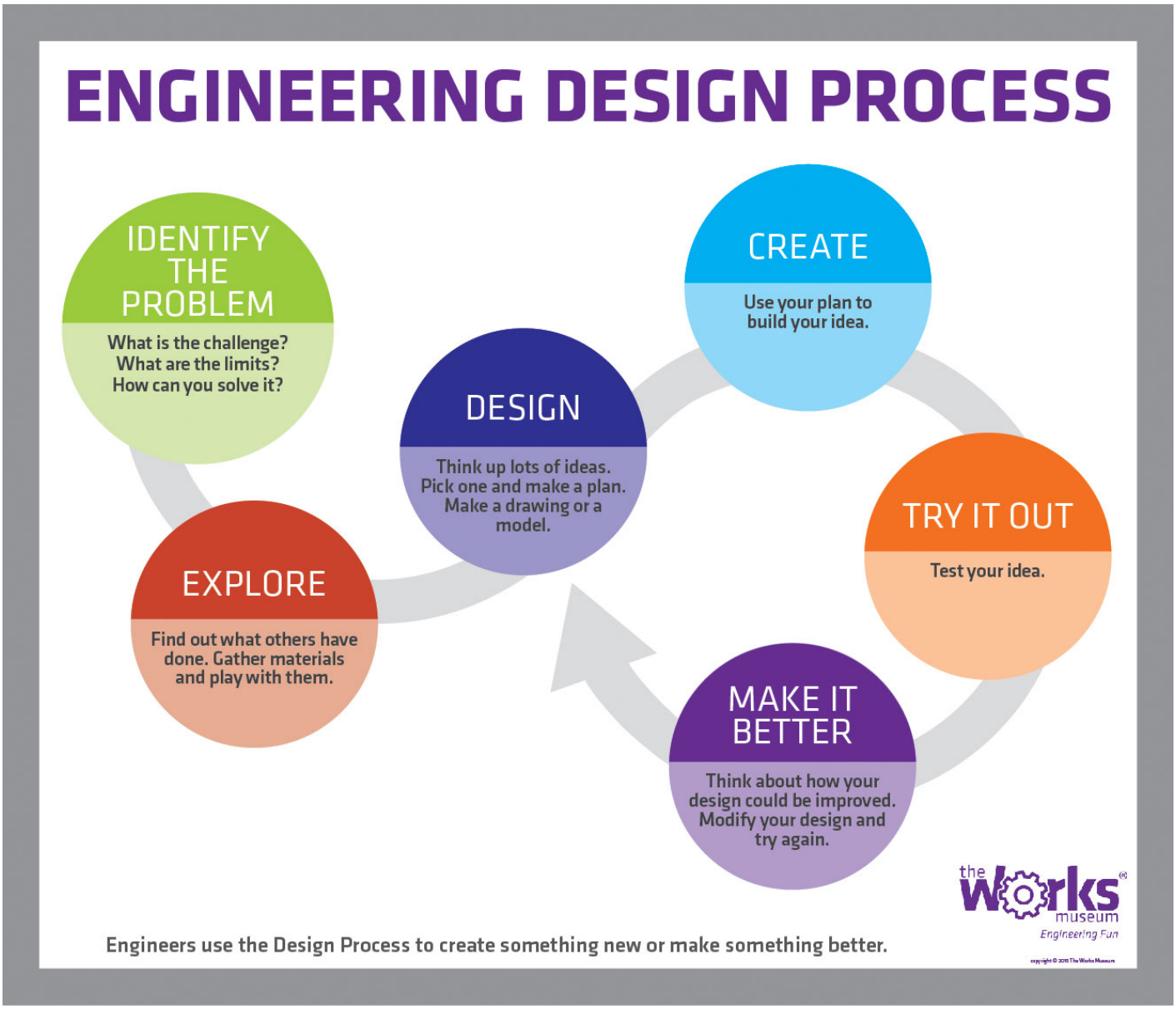

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