# Planning the Inquiry

## 1. What is our purpose?

1a) To inquire into the following:

- **Transdisciplinary theme:** How We Express Ourselves
  
  An inquiry into the ways in which we discover and express ideas, feelings, nature, culture, beliefs and values; the ways in which we reflect on, extend and enjoy our creativity; our appreciation of the aesthetic.

- **Central idea:**

  Sound is a form of energy produced by objects vibrating through a medium and is used as a means of communication and expression.

### 1b) Summative assessment task(s):

What are the possible ways of assessing students’ understanding of the central idea? What evidence, including student-initiated actions, will we look for?

- Foss Earth Materials End of Module Benchmark Assessments for Investigations (Dropping In; Good Vibrations; How Sound Travels; Sound Challenges) and Summative Assessment

  Performance Assessment: Student will make an instrument using common household materials which produces different pitches and perform a musical composition using their instrument. They have the option of using their voice as an instrument as well. Students will develop their own system of representing sounds. In this way they can replicate their composition again and again.

  Students will be asked to explain the message (feeling/emotion) they are trying to communicate through their composition.

  Rubric: creativity (originality of materials and ability to transform/recycle (use objects in a new way); aesthetics of sound (melodic quality); composition; shows elements of music (rhythm, pitch, melody, dynamics); craftsmanship of instrument

## 2. What do we want to learn?

What are the key concepts (form, function, causation, change, connection, perspective, responsibility, reflection) to be emphasized within this inquiry?

**Key concepts: form, function, connection**

What lines of inquiry will define the scope of the inquiry into the central idea?

- The physics of sound and how sound is produced (form)
- Communication with sound (function)
- The universal language of music (connection)

What teacher questions/provocations will drive these inquiries?

What is sound? How is sound made? How does the sound get from the source to our ears? How do we know sound travels? What happens to sound when it travels through different media (solids, liquids, gases)? What can you do to change the pitch? How do living things communicate with sound? What is the purpose of music? How does music make you feel?
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### 3. How might we know what we have learned?

*This column should be used in conjunction with “How best might we learn?”*

What are the possible ways of assessing students’ prior knowledge and skills? What evidence will we look for?

- **Pre-assessment:** Class-created concept web map looking for prior knowledge to include: Sound is energy; forms of matter are solids, liquids, gases; sound all around us all the time; we hear sound using our ears; people and animals make sounds to communicate; musical instruments make sound; artists can organize sound and create music; people (artists and scientists) can make instruments to measure, observe and create sound.

What are the possible ways of assessing student learning in the context of the lines of inquiry? What evidence will we look for?

- **Formative assessments** will include teacher observations, scoring of student sheets where students organize data during an investigation, and response sheets where students make observations and develop explanations, and performance assessments of students’ ability to plan, organize, and conduct investigations.
- **Students** will write and illustrate how sound formed in logs. Teachers will look for understanding that sound is a form of energy causing vibrations in matter; sounds have identifiable characteristics; sound travels from source through medium to a receiver. Skills assessed: observe sounds made by objects when dropped; communicate with others using a code; compare sounds to develop discrimination.
- **Students** will inquire into how sound is produced by making a musical instrument with straws and cardboard. Teachers will look for understanding that length of straw determines pitch. Skills assessed: create instrument using fine motor skills.
- **Students** will keep science lab notebook to develop abilities to do and understand scientific inquiry. Teachers will look for ability to ask and answer questions; plan and conduct simple investigations; employ tools to gather data; use data to construct reasonable explanations; communicate investigations and explanations; understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge.

### 4. How best might we learn?

What are the learning experiences suggested by the teacher and/or students to encourage the students to engage with the inquiries and address the driving questions?

**Science - Foss “Physics of Sound”**

**Week 1: Foss Investigation 1**

- **Dropping In:** Students explore their ability to discriminate between sounds, by dropping objects into a drop chamber and identifying each object by the property of its sound. They develop a code by assigning letters to objects and send messages to one another by using their drop code.

**Week 2: Foss Investigation 2**

- **Good Vibrations:** Students explore sound generators and musical instruments in miniactivities to find out what causes sound and what changes the pitch. They investigate variables that affect changes in pitch: the length of vibrating objects and the tension on vibrating strings.
- **PBS Sound Vibrations activity - make musical instrument with straws and cardboard**

**Week 3: Foss Investigation 3**

- **How Sound Travels:** Students work in collaborative groups on miniactivities that introduce a sound source and a medium of sound travel. They observe and compare how sound travels through solids, water, and air.

**Week 4: Foss Investigation 4**

- **Sound Challenges:** Students investigate the nature of our sound receivers, ears. They are challenged to put their knowledge of sound sources, sound travel, and sound receivers to work. They take one of the instruments they used earlier and change its pitch, make its sound travel farther, or make it louder.
ELA - Students will read a variety of Foss Science Stories which include letters, postcards, expository and historical informational articles.

Writing -

- Students will maintain a science notebook and record their observations.
- Class discussion about favorite sounds and why.
- Each day a different student will take a turn sharing a favorite sound. They will bring it in or demonstrate on the computer and explain why that sound appeals to them. Teacher should model with meaningful explanation.
- Using favorite sounds, students will create an original poem to share with the class.

Math - Students will work on math extension problems related to the earth materials investigations. Idea: Every sound has a mathematical number that coincides with it (frequency) For examples A is 440 cycles per second. Students can discover a pattern with the sound (note) and numbers. (mack) Notes: What is frequency? Essentially, it’s a measurement of how often a given event repeats in time. If you subscribe to a daily paper, then the frequency of paper delivery could be described as once per day, seven times per week. When we talk about the frequency of a sound, we’re referring to how many times a particular pattern of amplitudes repeats during one second.

Not all waveforms or physical vibrations repeat exactly (in fact almost none do!). But many vibratory phenomena, especially those in which we perceive some sort of pitch, repeat approximately regularly. If we assume that in fact they are repeating, we can measure the rate of repetition, and we call that the waveform’s frequency.

Social Science - Students will examine how humans express themselves through music and how music is a reflection of individuals, cultures, and what is happening in a society at any given time.

Technology: Students investigate sound clips and sound effects and incorporate it in their own work.

PSPE (Personal, Social, PhysEd) - Second Step Learning

Art/MIRTL -

Spanish - Exploration of Latin and flamenco music.
What opportunities will occur for transdisciplinary skills development and for the development of the attributes of the learner profile?

**Transdisciplinary Skills**

**Thinking skills**: (acquisition of knowledge, analysis, application, synthesis) Students will develop these skills through the science investigations into the physics of sound and apply their knowledge to creating their own instruments of sound.

**Social skills**: (cooperating, group decision-making) Students will listen to each other and respect silences.

**Communication skills**: (listening, speaking, writing, non-verbal communication) Students will develop these skills while listening to music and discussing what emotions the music conveys and what is expressed through music without lyrics.

**Learner Profile Attributes**:

**Communicators**: Students understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others.

**Balanced**: Students understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.

**Attitudes**: Appreciation and Creativity
5. What resources need to be gathered?
What people, places, audio-visual materials, related literature, music, art, computer software, etc, will be available?

Rubric: http://academics.lmu.edu/spee/officeofassessment/assessmentresources/rubrics/examplerubrics/musiccompositionexamplerubric/

Digital sounds: http://www.audiomicro.com/sound-effects/water-sound-effects

Art/MIRTL/Tinkering:
- directions for making handmade instruments
- makey-makey musical computer interface (for drum and keyboard)
- iPad Garage Band
- other electronic and digital instruments
- World Music CDs - look for collaborations bringing world musicians

Audacity app to collect and edit sounds

https://flat.io/en

investigating sound waves http://serc.carleton.edu/sp/mnstep/activities/35525.html

http://www.msichicago.org/education/

Morse code as communication

Read Aloud Books:

Zin! Zin! Zin! a Violin by Lloyd Moss

The Cello of Mr. O by Jane Cutler

Meet the Orchestra by Ann Hayes

Informational Books:


Teacher resources:

http://www.pbslearningmedia.org/resource/phy03.sci.phys.howmove.lp_sound/sound-vibrations/


http://archive.fossweb.com/modules3-6/pdfs/PhysicsofSound/SoundInvDupMstrsENG.pdf
Roots of Rhythm - world drumming for 5th and 6th grade classrooms

Orchestra Explorers units from CSO Institute including: (The Firebird, The Pastoral Symphony, and Appalachian Spring)

Tinkering: Kids Learn by Making Stuff Gabrielson, Curt

Videos:

Magic School Bus: In the Haunted House - sound is vibration  http://www.youtube.com/watch?v=ZxYmPAEW840

Bill Nye: Sound travels in waves  http://www.youtube.com/watch?v=ACeUO4ufx2I

Transmission of sound - Designmate  http://www.youtube.com/watch?v=GkNJvZINSEY

Music CDs:

Vivaldi's Four Seasons

Stravinsky's The Firebird

Field trip resources:

http://cso.org/Institute/SchoolsAndTeachers/SpecialPromenades.aspx

How will the classroom environment, local environment, and/or the community be used to facilitate the inquiry?

A bulletin board with space where students can post questions or comments.

Word bank for academic vocabulary

Content/inquiry anchor chart

Individual project folders to place ideas/questions for further inquiry/research.

Classroom library includes books on sound, energy, and music.

Field trip to Chicago Symphony Orchestra education concert.
6. To what extent did we achieve our purpose?

Assess the outcome of the inquiry by providing evidence of students' understanding of the central idea. The reflections of all teachers involved in the planning and teaching of the inquiry should be included.

How you could improve on the assessment task(s) so that you would have a more accurate picture of each student's understanding of the central idea.

What was the evidence that connections were made between the central idea and the transdisciplinary theme?

7. To what extent did we include the elements of the PYP?

What were the learning experiences that enabled students to:
- develop an understanding of the concepts identified in "What do we want to learn?"
- demonstrate the learning and application of particular transdisciplinary skills?
- develop particular attributes of the learner profile and/or attitudes?
In each case, explain your selection.
8. What student-initiated inquiries arose from the learning?

Record a range of student-initiated inquiries and student questions and highlight any that were incorporated into the teaching and learning.

At this point teachers should go back to box 2 “What do we want to learn?” and highlight the teacher questions/provocations that were most effective in driving the inquiries.

What student-initiated actions arose from the learning?

Record student-initiated actions taken by individuals or groups showing their ability to reflect, to choose and to act.

9. Teacher notes

Kim: Initial conversation initiated by Balen resulted in groups stating the following:

The function of expression is to give us happiness, joy and identity. We express ourselves to live a happy life. We would not be active if we did not have expression. Expression is what you like to do and makes you happy. We express ourselves to live the life we want to live. Expression is about showing how you feel. We express ourselves to let our feeling show.