



## Project Planning Guide Coversheet

Fellow/Fellowship Team Members: Robert Dunn

Grade and Subject: 9-12, Computer Arts & Animation; 10, Making Musical Instruments

School/District Name: North Country Career Center, North Country Supervisory Union

Location: Newport, Vermont

1. Briefly describe the nature and focus of your Fund for Teachers Fellowship experience.

I traveled to Dartmouth, Nova Scotia and spent two weeks at the Canadian School of Lutherie where I learned to make a guitar. My teacher was master guitar builder George Riszanyi.

2. How does that experience relate to your teaching assignment?

My school is reorganizing into a career academy model. The Arts & Communications Academy is the first one to get off the ground and as part of the program, a new "Making Musical Instruments" class has been added as an elective. This course is designed to connect learning from the core classes, especially mathematics and science, to real-world, hands-on experiences. It is also designed to introduce students to some of the programs offered in our Career Center.

3. What student academic goals might your experience help to address?

Our hope is that students will learn better if they see relevance in the things that they are learning in school. This should result in more students earning honors-level credit for their classroom work and also seeing more students sign up for additional mathematics and science classes. Students will also be better able to make informed choices on careers or other pathways.

4. What needs, issues, or interests in your local community might your experience help to address?

Our school is struggling with issues such as low test scores and a high dropout rate. The community is economically challenged, affecting student success. Students need to leave our high school with skills that will make them more successful in college and the workplace.

5. Drawing upon your fellowship experience, list three student project ideas that might simultaneously address one or more student academic goals and community needs, issues, or interests.

Project	Lead Person	Email Address
Science Experiments	Bob Dunn	bdunn@ncuhs.org
Make a Mountain Dulcimer	Bob Dunn	
Instrumental/Arts Performance	Bob Dunn	

**Project Objectives:**

1. Improve student performance on standardized tests.
2. Decrease school dropout rate.
3. Involve the community in student performances.

**Describe your project.** Who are your community partners and how are they involved in planning and implementation?

Create and teach a course entitled, "Making Musical Instruments" to tenth grade students who are part of my school's new Arts & Communications Academy. Our Academy will invite a group of artists, performers, and businesspeople to serve on an advisory board. Members of the community will be invited to present to our students for a variety of purposes.

**Essential Question:** What is the theme of your project that will guide the work of students and community partners?

How do various materials affect sound in a musical instrument?

**Learning Outcomes:** What will students know and be able to do as a result of the project?

**Know:**

Woodworking tools and machines must be operated safely.  
 Natural and synthetic materials can be used appropriately for many purposes.  
 Materials can be shaped, joined, and finished to be practical and attractive.

**Understand:**

Density and species are characteristics of wood that will affect sound character and quality.  
 Select materials that are appropriate for a Mountain Dulcimer.

**Do:**

Use tools and machines to construct musical instruments.  
 Perform using constructed musical instruments.

**Standards Addressed:** (Learning Results or Benchmarks)

**Vermont Standards**

**Geometric and Measurement Concepts**

7.7 Students use geometric and measurement concepts

**Natural Resources and Agriculture**

7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed.

**Critique**

5.23 Students critique their own and others' works in progress, both individually and in groups, to improve upon intent.

**Final Project Assessment;** How will students demonstrate what they know and are able to do?

1. Notebook entry:

- Know: Physics – sound waves, density
- Understand: Stringed instrument design.
- Do: Design an experiment and write about the results.

What **major activities** will get students to the final assessment?

Analyze different sounds produced by a variety of natural and synthetic materials.

How will you **assess** these activities?

Checklist

## 2. Performance

- Know: How to play the instruments.
- Understand: Effective performances are entertaining. Music should evoke emotions from the listeners.
- Do: Public performance.

Use hand-made musical instruments in a public performance.

Rubric

**How are students involved in the planning and implementation of the project?**

Students are regularly asked key questions that define the direction that the teaching and learning should go.

**What specific Literacy Strategies will the project address?**

Writing lab reports

**What technology tools will enhance learning?**

A variety of Web 2.0 tools, including Indabamusic.com, PBWiki, and Skype. Audacity sound manipulation software. Woodworking tools and machines.

**Project Timeline** (attach a detailed Timeline to Planning Guide)

2010-2011 School Year (See attached Unit Plan)

**How will you document and celebrate the project?**

I will document the project using a Blog, Wiki, and Photographs. Frequent submissions of photos and articles to local news media will keep the community informed. A culminating performance by students will bring the community together to close the project.

**Budget for the Project**

My school has budgeted over \$4000 so far in materials and supplies to support this project.

**Please attach any lesson plans to this Guide.**

## Creating 21st Century Classrooms II: Connecting the Dots

### Making Musical Instruments – Bob Dunn

*Lesson 1:* How are musical instruments made?

*Grade level(s):* 10

*Recommended Duration:* 1 block (blocks are 80 minutes)

*Essential Question:* What key decisions are considered when people make musical instruments?

*Specific Learning Goals for this lesson:*

*Students will know:* Instruments are used by humans and need to be ergonomic. There are traditional design elements in musical instruments.

*Students will understand:* Materials and workmanship are factors in the quality of sound.

*Students will be able to:* Formulate questions that clarify the process of instrument making.

*Lesson Overview:* Invite a local instrument maker to present a class about the tools, materials, processes, and design considerations necessary for the completion of a project.

*Description & Sequence:* In small groups, have students think about things that they will need to know about the process of making musical instruments. Form three questions that may be asked after the presentation. Invite an instrument maker to present to the class and perform with an instrument.

*Pre-Assessment:* What is the essential knowledge for successfully making a musical instrument? Students in small groups formulate questions that may be asked after the presentation.

*Lesson Description:* The northeast part of Vermont has many residents that are instrument makers by trade. Invite one or more in to class to demonstrate the process of making an instrument. If inviting a craftsman to class isn't possible, use Skype to schedule the demonstration. Students will develop clarifying questions that may be asked after the presentation.

*Formative Assessment(s):* Teacher observation, classroom discussion participation.

*Summative Assessment:* Each student will create a blog entry about the experience.

*How will you **Differentiate Instruction** for various learners?* Students will report on the most compelling parts of the presentation in their blogs.

*Student-centered learning:* Students develop questions that are important to them.

*Inquiry-based learning:* Instrument maker presentation will respond to student-created questions.

*Materials:* Presenter supplied.

*Resources:*  
PBWiki.com,

*Vermont Standards & Grade Expectations Addressed:*

Natural Resources and Agriculture

7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed.

*21<sup>st</sup> Century Skills including Technology:* Blogging,

File Attachments: (List here)

## Creating 21st Century Classrooms II: Connecting the Dots

### Making Musical Instruments – Bob Dunn

*Lesson 2:* Review the Concept of Sound Waves

*Grade level(s):* 10

*Recommended Duration:* 3 blocks (blocks are 80 minutes)

*Essential Question:* How do various materials affect sound in a musical instrument?

*Specific Learning Goals for this lesson:*

*Students will know:* Natural and synthetic materials can be used appropriately for many purposes.

*Students will understand:* Density and species are characteristics of wood that affect sound quality.

*Students will be able to:* Select materials that are appropriate for a Mountain Dulcimer.

*Lesson Overview:* Part 1: Review concepts taught in science classes about sound waves.

Part 2: Experiment with a wide variety of natural and synthetic materials to determine their sound characteristics.

*Description & Sequence:* Part 1: Two blog entries - Respond to these two questions: How do humans differentiate between sounds? How do other living organisms respond to different sounds?

Part 2: Students will experiment with a variety of natural and synthetic materials and record their results.

*Pre-Assessment:* How could we describe the characteristics of materials and how they bring about changes in tonal quality? Collect ideas in a list. Review concepts of density, specific gravity, and sound waves. In small groups, have students design a short experiment to differentiate characteristics

*Lesson Description:* Teacher provides each small group with a variety of natural and synthetic materials. Students predict how each sample will sound when rapped. After making their predictions from the pre-assessment, students will take the materials (including several wood species). Using “Audacity” and a microphone, rap each one multiple times using a wooden dowel. Characterize

the sound – sharp, muted, type of pitch, etc. and look at the wave pattern created in Audacity. Take screen shots and number them then import them into an MS Word table. Move to a partner's computer and look at the patterns that were made by their materials when they were recorded in Audacity. Guess which of your partner's sounds match a material, based on the wave pattern. Compare notes with your partner. Report to the class using a variety of media and methods.

*Formative Assessment(s):* Blog entries, teacher observations.

*Summative Assessment:* Each student will select a way to report their results with a written lab report, Powerpoint presentation, video production, or other vehicle (teacher approval required) and then present their results to the class.

*How will you **Differentiate Instruction** for various learners?* Students will assume multiple roles in the production/presentation of their experiments.

*Student-centered learning:* Students design their own experiment and select a means of reporting to the class.

*Inquiry-based learning:* Students respond to leading questions and develop their own. The experiment will be designed by students to find solutions to these questions.

*Materials:* A variety of materials, including plastics, metals, wood varieties, carbon or fiberglass with resin, and more. Audacity.

*Resources:*  
PBWiki.com, Audacity.com,

*Vermont Standards & Grade Expectations Addressed:*

Natural Resources and Agriculture

7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed.

*21<sup>st</sup> Century Skills including Technology:* Blogging,

File Attachments: (List here)

## Creating 21st Century Classrooms II: Connecting the Dots

### Making Musical Instruments – Bob Dunn

*Lesson 3:* Make a pvc flute

*Grade level(s):* 10

*Recommended Duration:* 2 blocks (blocks are 80 minutes)

*Essential Question:* How do tools and machines extend human capabilities?

*Specific Learning Goals for this lesson:*

*Students will know:* Safe uses of tools and machines. Basic forming techniques.

*Students will understand:* Careful measuring and workmanship are important factors in how effectively the instruments work.

*Students will be able to:* Make a working flute and learn to play it.

*Lesson Overview:* In order for students to work effectively with real materials to make things, they must understand how to work safely in the lab and how to modify and join pieces together.

*Description & Sequence:*

- Safety in the lab demonstration.
- How to make a flute
- Students make a flute.

*Pre-Assessment:* Take an informal poll to see who in class has had experience using tools and machines to make something.

*Lesson Description:* Safety is the most important thing to teach to students. Discuss what safe practices look like in the lab. Teacher demonstrates how to use each tool and machine needed to construct the flute. Students are given a safety quiz and are checked out at each machine. These actions are documented by the teacher.

A plan for the basic flute will be distributed to the members of the class. The teacher demonstrates each step in the process and then works with students individually until the flute is completed. The flute is round so a special jig needs to be made that will hold the project firmly while it is being drilled. Measuring instruction will be provided as needed. Those who finish first can practice playing with their flutes.



*Formative Assessment(s):* Student safety checklist.

*Summative Assessment:* Rubric for the completed flute.

*How will you **Differentiate Instruction** for various learners?* Alternative sources for presenting lab safety may be utilized to supplement teacher presentations. Students will be given opportunities to practice using a variety of tools and machines.

*Student-centered learning:* Students add to their log in the wiki.

*Inquiry-based learning:*

*Materials:* A variety of materials and access to a woodworking/tech ed lab. This class can also be done by bringing in portable tools and machines but this raises some safety concerns.

1/2" pvc pipe

3/4" pvc pipe for lip plate – cut lengthwise to make a curved rectangular section of pipe 2-1/2" long. This part will be glued onto the 1/2" pipe which is the main tube for the flute. (see plan)

1/2" Cap PVC Socket Fitting – to plug one end of the pipe. (see plan)

*Resources:*

PBWiki.com

Working drawing for making the pvc flute.

*Vermont Standards & Grade Expectations Addressed:*

Natural Resources and Agriculture

7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed.

*21<sup>st</sup> Century Skills including Technology:* Blogging,

File Attachments: (List here)

Pvc flute plan

Flute rubric

## Creating 21st Century Classrooms II: Connecting the Dots

### Making Musical Instruments – Bob Dunn

*Lesson 4:* A flute that plays in a different key

*Grade level(s):* 10

*Recommended Duration:* 2 blocks (blocks are 80 minutes)

*Essential Question:* What are the factors that change pitch?

*Specific Learning Goals for this lesson:*

*Students will know:* List from lesson 3, plus Fibonacci numbers (review of mathematics concept), sizes of instruments and finger hole spacing are two factors in changing pitch.

*Students will understand:* List from lesson 3, plus instrument length, circumference, and volume affect pitch.

*Students will be able to:* Make a working flute and learn to play it.

*Lesson Overview:* Students will apply mathematics concepts to design an instrument that plays in a different key.

*Description & Sequence:*

- Safety in the lab review.
- Class discussion – What are some factors that will affect the pitch of an instrument? Will finger hole spacing change due to these changes in the instrument? How can we predict where to place the new finger holes in our flute?
- Review math and science concepts as needed.
- Students create a working sketch of the new instrument, including measurements.
- In the lab, students create their new instrument. Experiment with it to see if it plays in a different pitch and if the finger hole spacing enables it to play on key. **Note: Successful instruments are not criteria for a good grade! Students learn as much from failure as they do from success.**

*Pre-Assessment:* Class discussion – What are the factors that will affect pitch and the accurate playing of notes?

*Lesson Description:* Now that students have created their flute, they will be given an opportunity to apply what they have learned from science and math class to create a new instrument. Students will be asked to design and make a new flute that plays in a different key. Important design factors will be that the new

instrument will be a different size so students will have to predict where the new finger holes will be located. Students will determine the pattern of the holes of the first flute and figure out how to apply that pattern to the new flute. What is the mathematical relationship between the hole locations?

If possible, have the mathematics teacher come in as a guest presenter to lead the discussion of finger hole patterns.

Students will make sketches of their new instrument with measurements and then go back into the lab to make the new instrument.

*Formative Assessment(s):* Students will work independently to make the new flute and use tools and machines appropriately.

*Summative Assessment:* On their wiki or other web 2.0 communication tool, students will report on their experience and how their flute works. What worked? What didn't work? Why or why not?

*How will you **Differentiate Instruction** for various learners?* Students may select a wiki or any other communications tool to report on their findings.

Students may choose to sketch their plan with pencil and paper or use the CADD program.

*Student-centered learning:* There are many questions to answer in this lesson. Students will be encouraged to find their own ways to the answers. For example, to determine the mathematical relationship in the finger hole spacing, students may explore the net, use a calculator, try measuring tools, interview resource people, search for videos, etc.

*Inquiry-based learning:* Students will be encouraged to formulate their own questions.

*Materials:* A variety of materials and access to a woodworking/tech ed lab. This class can also be done by bringing in portable tools and machines but this raises some safety concerns.

*Resources:*

PBWiki.com

Pencil/Paper or CADD

*Vermont Standards & Grade Expectations Addressed:*

Geometric and Measurement Concepts

7.7 Students use geometric and measurement concepts

*21<sup>st</sup> Century Skills including Technology:* Blogging,  
*File Attachments: (List here)*

## Creating 21st Century Classrooms II: Connecting the Dots

### Making Musical Instruments – Bob Dunn

*Lesson 5:* Make a Mountain Dulcimer

*Grade level(s):* 10

*Recommended Duration:* 6 blocks (blocks are 80 minutes)

*Essential Question:* What materials will provide the desired tonal quality in my mountain dulcimer?

*Specific Learning Goals for this lesson:*

*Students will know:* List from lesson 3

*Students will understand:* List from lesson 3, plus the nature of materials affects tonal quality.

*Students will be able to:* Make a mountain dulcimer

*Lesson Overview:* Using a plan, students will select appropriate materials and make a mountain dulcimer in the lab.

*Description & Sequence:*

- Safety in the lab review.
- Analyze working drawings of the dulcimer.
- Students select their materials and follow the step-by-step tutorial.

*Pre-Assessment:* From a list of available materials, students check off the ones that they want to use and add notes on why they made their choices.

*Lesson Description:* In the classroom, go over the working drawings and tutorial for making the dulcimer. There are several parts that need to be made. Students will work on sub assemblies so that they don't have to wait in line and various work stations. Students will be encouraged to help each other in the lab.

Teacher will set up jigs and fixtures and set up work areas so the tasks can be performed efficiently.

*Formative Assessment(s):* Students will work independently and in groups to make the dulcimer and use tools and machines appropriately.

*Summative Assessment:* Dulcimer project checklist.

How will you **Differentiate Instruction** for various learners? Written and visual instructions will show the steps necessary for construction.

*Student-centered learning:* N/A Some students will be more comfortable working in the lab than others.

*Inquiry-based learning:* Ongoing problem solving and design choices.

*Materials:* A variety of materials and access to a woodworking/tech ed lab. This class can also be done by bringing in portable tools and machines but this raises some safety concerns.

*Resources:*

Dulcimer working drawings

Tutorial for making the dulcimer

*Vermont Standards & Grade Expectations Addressed:*

Natural Resources and Agriculture

7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed.

*21<sup>st</sup> Century Skills including Technology:*

*File Attachments: (List here)*

## UbD Unit Template

<b>Name:</b> Bob Dunn	<b>Unit Topic and Grade Level:</b> Part 2: Making Musical Instruments Grade 10	
<b>STAGE I – Desired Results</b>		
<b>Goals (Vermont Standards):</b> <b>Geometric and Measurement Concepts</b> 7.7 Students use geometric and measurement concepts <b>Natural Resources and Agriculture</b> 7.16 Students demonstrate an understanding of natural resources and agricultural systems and why and how they are managed. <b>Critique</b> 5.23 Students critique their own and others' works in progress, both individually and in groups, to improve upon intent.		
<b>Enduring Understandings (Overarching):</b> <ul style="list-style-type: none"> <li>• Natural and synthetic materials may be selected for musical instrument construction and may affect sound characteristics.</li> </ul>	<b>Essential Questions:</b> How do various materials affect sound in a musical instrument?	
<p style="text-align: center;"><b>K= Know</b></p> <p>(What key knowledge/skills will students acquire as a result of this unit?)</p> <ul style="list-style-type: none"> <li>• Woodworking tools and machines must be operated safely.</li> <li>• Natural and synthetic materials can be used appropriately for many purposes.</li> <li>• Materials can be shaped, joined, and finished to be practical and attractive.</li> </ul>	<p style="text-align: center;"><b>U = Understand (Topical)</b></p> <p>(What understandings will students have as a result of this Unit?)</p> <ul style="list-style-type: none"> <li>• Density and species are characteristics of wood that will affect sound character and quality.</li> </ul>	<p style="text-align: center;"><b>D = Do</b></p> <p>(What should students eventually be able to do as a result of this knowledge, skills and understandings?)</p> <ul style="list-style-type: none"> <li>• Select materials that are appropriate for a Mountain Dulcimer.</li> <li>• Use tools and machines to construct musical instruments.</li> <li>• Perform using constructed musical instruments.</li> </ul>
<b>STAGE II – Assessment Evidence</b>		
<b>Performance Assessment (Ideas): Making Musical Instruments</b> 1. Notebook entry: Analyze different sounds produced by a variety of natural and synthetic materials. Assessment: Checklist <ul style="list-style-type: none"> <li>• Know: Physics – sound waves, density</li> <li>• Understand: Stringed instrument design.</li> <li>• Do: Design an experiment and write about the results.</li> </ul> 2. Performance: Use hand-made musical instruments in a public performance. Assessment: Rubric <ul style="list-style-type: none"> <li>• Know: How to play the instruments.</li> <li>• Understand: Effective performances are entertaining. Music should evoke emotions from the listeners.</li> <li>• Do: Public performance.</li> </ul>		

## UbD Unit Template

<b>STAGE III – Learning Plan</b>			
<b>Learning Activities</b>	<b>Know</b>	<b>Understand</b>	<b>Do</b>
	(Check any boxes that apply.)		
<p><b>1. Make sounds with several stringed instruments. Note the qualities of the sounds in a journal and the materials that were used to construct them. What is the correlation?</b></p> <p><b>Guest presenter: Bring a local luthier in to demonstrate how s/he selects wood for use in his/her instruments.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>2. Review the concept of sound waves. Experiment with both synthetic and natural materials and characterize the sounds. Compare notes with a partner. Report results to the class.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>3. In the lab, learn about the safe use of tools, machines, and other forming techniques.</b></p> <p><b>In the lab, study how separate parts are joined together.</b></p> <p><b>Use tools and machines to construct a flute using pvc pipe.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>4. In the lab, use tools and machines to construct a second flute that plays in another key.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>5. Using the CADD drawing (previous unit) and appropriate tools and machines, select your materials and make your mountain dulcimer.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>6. Learn to play the dulcimer. Select or create a piece of music. Form a group on Indabamusic.com. Record parts of the musical piece and upload. Mix into a final composition.</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Making Musical Instruments

### Web 2.0 Presentation

### Scoring Rubric

<b>Criteria</b>	<b><i>Just getting started (x.3)</i></b>	<b><i>Not yet, but close (x.7)</i></b>	<b><i>You are there... GOT IT! (x.9)</i></b>	<b><i>WOW! (x1.0)</i></b>
<b>Use of the Web 2.0 Tool</b>  15 Points	<ul style="list-style-type: none"> <li>- A few (less than ¼) of photos use the “Rule of Thirds.”</li> <li>- Most photos are snapshots.</li> <li>- Some photos are out of focus.</li> </ul>	<ul style="list-style-type: none"> <li>- More than 1 feature from the Web 2.0 tool was utilized in the presentation.</li> <li>-</li> </ul>	<ul style="list-style-type: none"> <li>★ More than 2 features from the Web 2.0 tool were utilized in the presentation.</li> <li>★</li> </ul>	<ul style="list-style-type: none"> <li>- A new or innovative use of the Web tool was utilized</li> <li>-or-</li> <li>- A second Web 2.0 tool was included in the presentation.</li> </ul>
<b>Presentation</b>  15 Points	<ul style="list-style-type: none"> <li>- Photos were lightly edited.</li> <li>- Composition was mostly unchanged from the way the pictures were taken off the camera (e.g. little evidence of cropping, few masks, inappropriate or lack of filters, ineffective levels adjustments.</li> </ul>	<ul style="list-style-type: none"> <li>- Some Photoshop tools were used to edit and enhance ½ of the pics.</li> </ul>	<ul style="list-style-type: none"> <li>★ Choices were made to make the presentation visually interesting for the audience.</li> <li>★ There is a formal title in the presentation</li> <li>★ Credit is given for the use of intellectual property.</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<b>Enduring Understandings</b>  10 Points	<ul style="list-style-type: none"> <li>- It is hard to tell what the story is in the presentation.</li> <li>- Pictures are unorganized and show little connection to a story.</li> </ul>	<ul style="list-style-type: none"> <li>- The story is present but uninteresting.</li> <li>- Pictures show some organization.</li> </ul>	<ul style="list-style-type: none"> <li>★ There is a clear connection showing the mathematics and science concepts that contributed to the sound of the instrument.</li> <li>★ Speculation on how the instrument could be re-designed shows</li> </ul>	<ul style="list-style-type: none"> <li>- The presentation tells a story that is compelling and/or humorous.</li> <li>- Every picture is important in bringing the story forward – remove a few pics and the story suffers.</li> <li>- Show it in the movie theater!</li> </ul>
<b>Software use</b>  10 Points	<ul style="list-style-type: none"> <li>- Some photos and sounds are in synch.</li> <li>- There are no transitions or extras utilized.</li> </ul>	<ul style="list-style-type: none"> <li>- Most photos and sounds are in synch.</li> <li>- Few transitions or extras are utilized.</li> </ul>	<ul style="list-style-type: none"> <li>★ Moviemaker project effectively utilizes sound, pictures, and transitions in the slides.</li> </ul>	<ul style="list-style-type: none"> <li>- Innovative techniques were used to enhance the presentation (e.g. Flash animations, sound effects, etc.)</li> </ul>