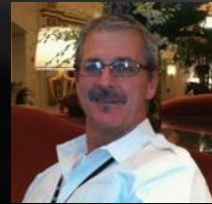




STEM Guitar

guitarbuilding.org





Mike Aikens



Doug Hunt



Nancy Wilson Chang



Debbie French



Tom Singer



Dr. Mark French

Today's Presentation Team

Webinar Outline



1. Overview and history of the STEM guitar project -- Mike
2. Why does this approach work – Debbie / Doug
3. Expectations of participants - Tom / Debbie / Doug
 - Curriculum development and implementing
 - State or national standard alignment workshop (we will be showing how to apply)
 - Surveys mid and late year survey
 - Activity data collection from class
 - Personally crafted instrument
 - What's in for me?
4. Q & A - Mike
5. Summer faculty team pictures / schedule – Mark
6. What a day is like at the institute? Nancy / Doug
7. Q&A - Debbie
8. Guitar part overview – Mike
9. Guitar cost analysis Home work - Mike / Tom
10. General Questions & Answer - All



Mike Aikens & Tom Singer attend 1st Purdue Guitar Workshop "Mark French"

2006

2007
Sinclair & Butler implement

Conducted first STEM Guitar Workshop(3)- NSF PLM Grant
SCC established as Manufacturing site for kits

2008

BC3 Awarded NSF STEM Guitar Grant

2009

Conducted 3 Workshops Guitar Body/neck re-design #3

2010

Conducted 6 Workshops CQI

2011

Conduct 5 Workshops CQI Guitar Body/neck re-design #4

2012

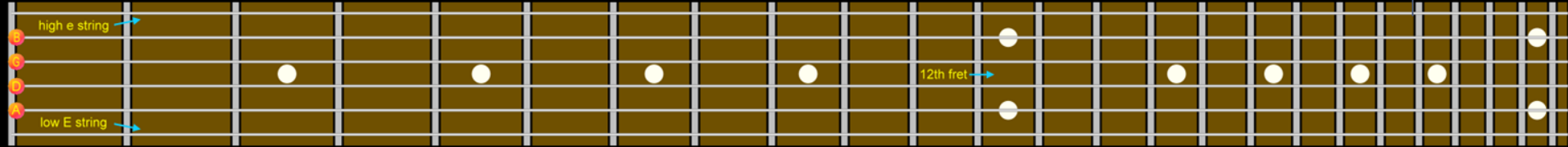
LEAD Guitars in STEM NSF grant fully funded CQI Conducted 3 workshops

2013



Summer STEM Guitar Institute Series CQI Body neck re-design #5

2014



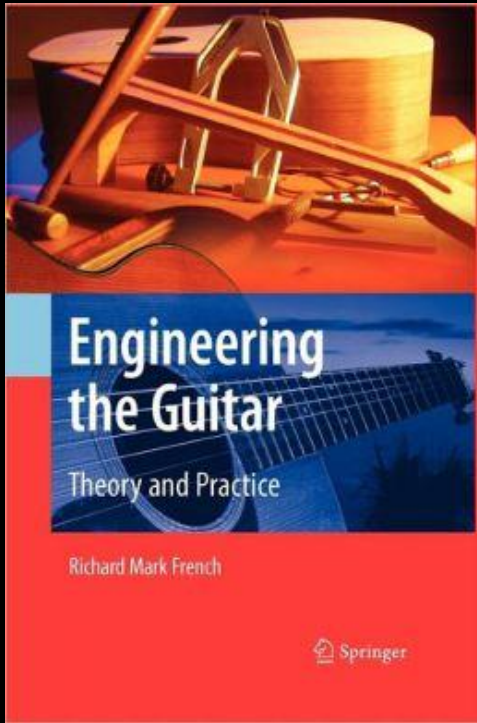
- Dr. Mark French of the Mechanical Engineering Technology department at Purdue University blazed the trail.
- Nearly 1,200 kits manufactured and shipped last year out of Sinclair CC last year – Over 4,000 kits since 2006
- Over 250 educators have attended STEM Guitar Workshops
- 45%+ of Institute participants have implemented (curriculum or build)



Dr. Mark French, Purdue University MET



Kudos to Mark French for providing the inspiration for the nationally recognized NSF STEM Guitar Project. Mark's passion for using stringed instruments to teach math and science was the catalyst for this project. Thanks Mark! You Rock!





STEM Basics

- Science
 - Physics (wave motion, sound, electricity/ magnetism, frequencies)
 - Chemistry (finishes)
- Technology
 - CNC, Laser, Electronics, Woodworking, Tool usage (power and hand)
- Engineering
 - Design, analysis (CG), material properties, ergonomics, manufacturing, Machining (CNC)
- Math
 - Geometry, Algebra, Logarithms, Calculus





So Why does it work?

Easy to implement

- Multiple levels of integration—full class participation to after-school club

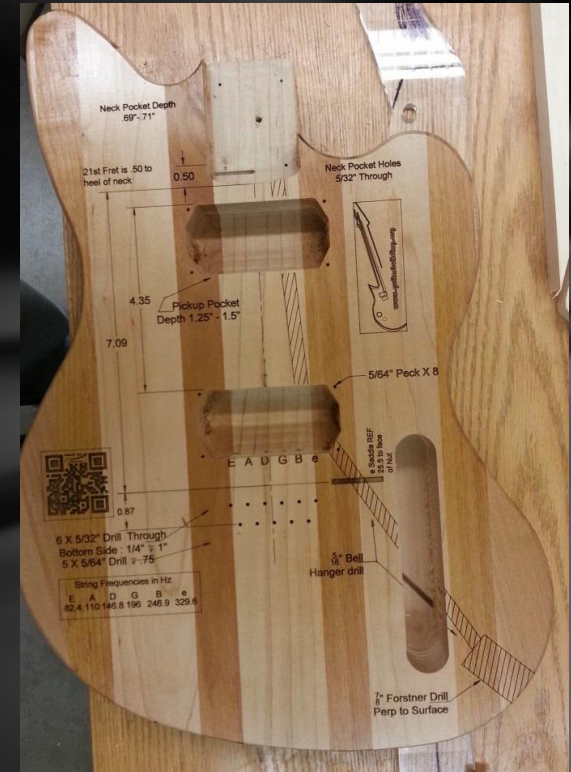
It is Gender neutral

- We are even experimenting with nail polish painting!

Students already have interest (easily recognizable)

High success rate for completed guitars

- At college level success rate is 99% (1% just stopped showing up)





So Why does it work?

PBL— Students work collaboratively, solve problems throughout the build

Appeals to all student groups...

Increased student confidence—“Oh yeah, I built that!”

Increases community interest and involvement.

- This program will generate a lot of publicity for your class.

Relatively low cost to get started (Typically under \$2500 in tools / equipment for a lab) and is a sustainable program through guitar sales





Curriculum alignment

Our team cannot align to each of the 50 states So we selected these national standards to align to.

Core activities

- Aligned to Common core – Math Standards
- Next Gen Science Standards -- Science and Engineering standards

Participant Modular activity development

- Align with Common core and Next Gen Science Standards
- Have access to state standard alignments – to align your development





Materials Required:

Graph paper, pencil, ruler, geometrical compass, basic calculator
A guitar to use for determining surface area

Safety:

N/A

References:

Lospennato, L. (2010). *Designing the electric guitar body: A guest post*.
guitarmakersonline.com. Retrived 6 January 2014 from
<http://guitarmakersonline.com/designing-the-electric-guitar-body/>

GuitarEngineer.com. (2005). *Finite element model*. (Chapter 3). Retrieved 6 January 2014
from http://www.guitarengineer.com/index_files/Page1353.htm

Standards:

Common Core State Standards for Mathematics aligned with this activity:

CCSS.Math.Content.HSG.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

CCSS.Math.Content.HSG.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

CCSS.Math.Content.HSG.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

CCSS.Math.Content.7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

CCSS.Math.Content.7.G.B.6 Solve real-world and mathematical problems involving surface area of two-dimensional objects composed of polygons and circles.



Expectations of participants



Curriculum development

- Develop at least one modular activity for your classroom (Begin it during the institute), test it, share it on guitarbuilding.org
- Templates are provided

Implementation of Core Modular Learning Activities

- Implement 2+ core activities that will be shared online
- Core Modular Learning activities will use Quia to provide automatic scoring to faculty for grading and to our evaluator.

Both Implementation items are required to receive “Guitar Bucks”

** Additional personal funding for completing end our year evaluations once curriculum has been used.



What's in it for me?



A total direct fellowship package of \$1,300

- \$300 cash stipend for participation in the different activities during the five-day institute, (except some events that may have a fee to attend)
 - In addition, each Fellow will receive lunch everyday

Account access to Quia software

Guitar support package (\$85+ value) provided at the workshop;

Custom electric guitar built during the five-day institute.
\$\$\$



What's in it for me?



\$400 “guitar bucks” [*"guitar bucks" are credit at the STORE FRONT on guitarbuilding.org*] supplies fund for integrating the curriculum. Upon completing the online student scoring and upload of Modular learning activities.

\$400 cash for completing follow-up activities mid-way through the project, such as surveys and submission of related requirements as proof of project implementation.





Description

2015 NSF “LEAD WITH GUITARS IN STEM” participants have the option of taking 3 graduate credits (semester) through the Outreach Program at the University of Wyoming.

Requirements

- Attend and actively participate in the week-long faculty professional development institute.
- Completion of homework and Quia assignments during institute
- Submit one (1) complete Modular Learning Activity (MLA) after completion of institute.
- Submit participating students’ responses to 3-4 Quia Pre-and Post-Test Quizzes after completion of institute.
- Required paperwork from the University of Wyoming.
- Payment for courses.

Registration

Registration forms will be available at each workshop. Payment by check is required.

Cost is \$150.00

The fine print

UW Professional Development class credit is not transferable to a UW degree program.



Surveys and Data Collection



Faculty surveys will be sent to you to fill out and trigger fellowship incentives (End of year, and yearly follow-ups)

Core activities used in the classroom and graded through Quia assist in providing aggregate data on student performance.

Pre and post institute surveys

Data and reporting done through the:



Evaluation Services Center



Q&A



Meet the Team



Faculty

Tom Singer

Doug Hunt

Mike Aikens

Nancy Wilson Chang

Web Development - Sean Hauze

Dr. Mark French

Karen Columbe

Additional Team Members:

Mel Cossette

Steve Wendel

Marketing & Social Media - Kevin Murphy

External Evaluation - Dr. Imelda Castañeda-Emenaker



Steve Brown (not pictured)

Scot Rabe (not pictured)

Debbie French (not pictured)

David Lake (not Pictured)

Ed Ufford (not pictured)





How to get the most out of the Guitar Building Institute





1. Do Your Homework

Explore the website: guitarbuilding.org

Watch the videos on how to build

Answer the question:

“What might this look like in my classroom?”

Know your state’s learning standards





2. Set a Goal

To build guitars with your students

To create or modify a workspace

To integrate guitar building into existing curriculum

To incorporate guitar building activities into math and science lessons





3. Dress Appropriately

Be prepared for dust, paint, sweat

Bring safety equipment: Safety glasses, hearing protection , dust mask

Wear closed-toe comfortable footwear

Wear comfortable clothes that allow for movement

Wear layers: t-shirt and zip sweatshirt or sweater





A Typical Day at the Guitar Building Institute

Build your own custom guitar in five days!

Explore guitar building curriculum activities to use in class with your students!





Summer 2015 Institute schedule

Required Pre-attendance Webinar / video for participants include a guitar terminology primer and worksheet / short cycle assessment.

Sunday

12pm – 4:00pm

Room setup Training team only

- Equipment and tool inventory
- Table layout
- Dust collection – floor covering
- Materials sorted
- Kits **assembly**
- Purchase list of items
- Prepare finish area



Monday

AM SESSION

Arrival at event 8:00 am

8:15 – 9:00

Welcome

- Introductions and Workshop Overview
- Administrative Paperwork
- Attendance Form, Photo Release Form, etc.

Expectations / goals for the week & year, review of Cost Analysis of Guitar Homework and short cycle assessments, Mapping national or state standards to curriculum, Outline of curriculum development project for the week (Thursday & Friday faculty discussion)



Summer 2015 Institute schedule

10:15 – 11:15

Guitar Headstock Design –sketching. *Additional activity development ideas: surface area, geometry of design, angles & trigonometry, measurement* Lab time for Headstock Design,

11:15 – 12:00

Short Cycle assessment on Cost Analysis of Guitar activity using quia

12:00 – 1:00

Lunch and Learn event: Digital FABLAB Learning Community

PM SESSION

Goal: Body sculpted, neck and fretboard Glued (back of neck scraped)

1:00 – 1:20

Shop Orientation, Safety and Demonstrations

1:20 – 4:00

Task 1 – Body Sculpting (optional) – rasps & bladder sander

NO FLY ZONE ALERT

Task 2 – Drill pickup access hole and Jack hole

Task 3 – Drill and install fret dots on fretboard.

4:00- 4:30

Task 4- Glue fret board onto neck – group activity

4:30- 5:00

Seal body with Bona Seal or tru-oil

5:00 – 5:30

First application of clear Bona Mega water based polyurethane or tru-oil

HOMEWORK: Review Videos on Neck finishing, fretting + initial thinking on learning activity





Classroom – Computer Lab

Overview of daily tasks

Instructor presentations

Do pre-written curriculum activities

Write new curriculum lessons/activities

Align tasks and activities to state standards





Construction Lab

Guitar body: contouring, sanding

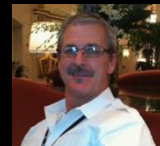
Neck: headstock design, fretting

Electronics: pickups, wiring, soldering

Intonation: strings, action, fine tune



Q&A



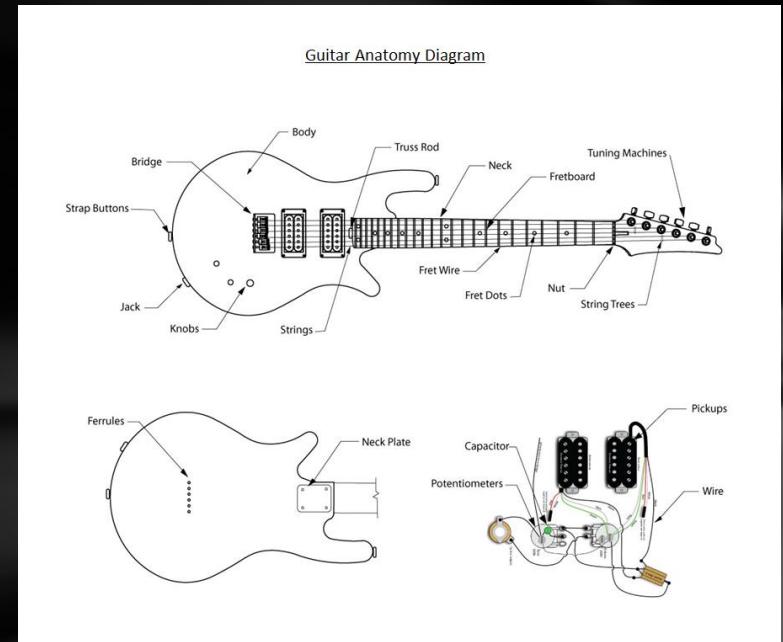
Homework

Guitar part overview

- Learn the parts and pieces of a guitar
- Modular learning activity Found on

Guitar building.org under the learn tab, Faculty Institute resources

[Guitar Anatomy and Cost Estimate Activity](#)



Homework websites

Guitar part cost analysis

- Visit websites like
 - Stewart Macdonald (stewmac.com)
 - All Parts (allparts.com)
 - Guitar fetish (guitarfetish.com)
 - Luthier Mercantile (Lmii.com)
- We have to be able to purchase the parts at the same place at your cost (no buddy deals or out of the trunk deals) Ebay is OK if we can use the same vendor.
- Find the Cost analysis activity under the faculty institute resources of the Guitarbuilding.org website.
- You will need to bring it completed to the institute

Guitar Part Spreadsheet

ITEM	VENDOR/ WEBSITE	MANUFACTURER	PART #	UNIT COST	QUANTITY
Body					
Neck					
Fretboard					
Pickups and mounting screws (QTY 2)					
Potentiometers 2 - 500K ohm					
Jack & jack plate					
Fuse & holder (5 amp)					
Capacitor (.47 micro farads)					
Wire 1-1.5 feet					
Strap Buttons					
Bridge					
Knobs					
Ferrules - back of guitar for strings					
Neck plate and Neck mounting screws					
Tuning Machines					
Fret wire*					
Nut*					
Truss Rod*					
Fret Dots*					
String trees*					
Strings					

* If not included in neck assembly.

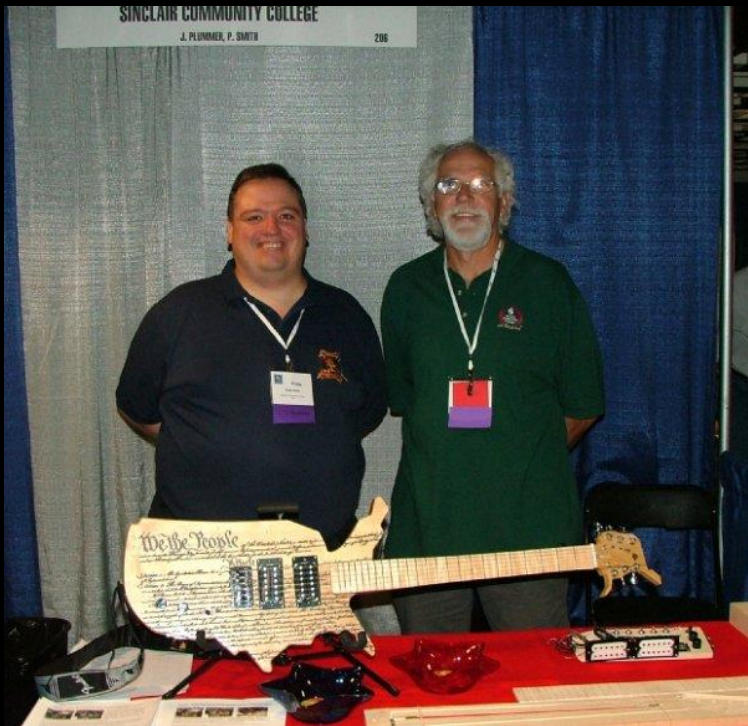
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Questions and Answer Break

What questions do you have?



Original Lab Tech team (Phillip Smith and Joe Plummer) from Sinclair w/ our special USA guitar



Take aways

Homework

Review videos and website

Cost analysis sheet (download from website) & **Bring completed to Institute**

What to bring

Safety glasses, Hearing protection, dust mask , closed toe shoes

Comfortable clothing

Laptop or internet device

Be on time!

Look for emails: Schedule, parking , details will be coming to you soon

Be ready to have a fun, busy and rewarding week!

Connect with us on
Facebook:
Stemguitarproject

