Passing Notes in Class: The Music of Math

***Robert Allwarden**- SmART Schools- February 24-25, 2014*
Grade Levels: 5, 6
Disciplines: Math, Music

Stage One: Identify Desired Results

What do we want students to know, understand and be able to do?

UNIT OVERVIEW:
What will be studied and why?

Students will study rhythmic values in music and how they relate to fractions within the Common Core State Standards (CCSS) at grades 5 and 6:

- Grade 5: instructional time should focus on…(1) developing fluency with addition and subtraction of fractions.
- Grade 6: instructional time should focus on...(3) writing, interpreting, and using expressions and equations.

This program will have a positive effect on the understanding of musical rhythms as well as the understanding of equivalent fractions, numbers and operations.

How does this study ask fundamental questions about the content of the disciplines being studied?

As students explore mathematical fractions and perform “musical fractions,” they will discover the undeniable relationship between the two.

Enduring Understandings:

Can music exist without math?

Essential Questions:

How do you play fractions?

Is a smaller fraction faster or slower then a larger one?

Where do rhythms come from?

Desired Outcomes for Student Learning:

Students will be able to summarize, synthesize, and analyze numbers and fractions and turn this synthesis into an original percussion composition.

CCSS:

CCSS.Math.Content.5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

CCSS.Math.Content.5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2*.

CCSS.Math.Content.6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

CCSS.Math.Content.6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively

CCSS.Math.Practice.MP7 Look for and make use of structure.

MADOE Standards:

In grade 5, instructional time should focus on three critical areas, one of which is: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)

Number and Operations—Fractions **5.NF**

Use equivalent fractions as a strategy to add and subtract fractions.

In grade 6, instructional time should focus on four critical areas, two of which are: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers.

Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems.

The Number System **6.NS**

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Music Standards *(at this time these are still drafts)*

Music National Core Arts Standards:
Artistic Process - Creating: *Conceiving and developing new artistic ideas and work*.
Common Anchor Standard #1: Generate and conceptualize artistic ideas and work.
Discipline: Music - **Imagine**

MU:Cr1-5.b - (Imagine) Generate and demonstrate musical ideas within specific related tonalities, meters, *and styles.*
MU:Cr1-6.a - (Imagine) Create musical ideas, choosing tonalities, meters and styles to create music for a specific purpose/function or mood.
MU:Cr1-5.b - (Imagine) Generate and demonstrate musical ideas within specific related tonalities, meters, *and styles.*
MU:Cr2-5.b - (Plan & Make) Document *the development* of selected ideas using iconic or standard notation and explain the evolving plan.
MU:Cr2-6.a - (Plan & Make) Explain the plan, including the decision process used in selecting idea, style, and expressive intent.
MU:Cr3-5.a - (*Evaluate & Refine)* Evaluate and refine their music, applying teacher-provided and *student*-developed criteria and feedback.
MU:Cr3-6.a - (*Evaluate & Refine)* Consider feedback from the teacher, and describe their rationale for making revisions in their music.
MU:Cr3-5.c - (*Present)* Present the final version of their original music, and explain how it conveys interest, context, expressive intent, and *craftsmanship.*
MU:Cr3-6.b - (*Present)* Present the final version of their composition or arrangement, using notation, the elements of music, craftsmanship, and originality to demonstrate an effective beginning and ending and to convey a mood or idea.

Stage Two: Determine Acceptable Evidence Of Understanding

How will we know if students have achieved the desired outcomes and met the standards? What will we accept as evidence of student understanding and proficiency?

Participants will demonstrate their level of understanding in and through their musical performances and compositions. Evidence will include the following: the compositions are balanced (i.e. the songs are equivalent on both sides of the room and/or group); students perform their pieces correctly.

Stage Three: Plan Learning Experiences and Instruction

What teaching and learning experiences will equip the students to demonstrate the targeted understanding?

Develop the Instructional Plan: *This lesson is based on the gradual release model where the teacher demonstrates and teaches to the class as a whole before gradually releasing independence to the students.*

A) Intro

-Instructor leads class through a whole group exercise with note values
-Whole notes to half to quarter to eighth to sixteenth
-Explanation of corresponding rests
-Using movement and drums play through simple rhythms as class.

B) Playing the Instructor's Examples

-Instructor shows written examples of equivalent rhythms.
-Class plays though these
-Class starts passing notes as a group led by instructor
-Play through these as group

C) Materials Distributed

-students given cards all with same building blocks (cards with notes on them, fractions on back)
-Materials gone over as group
-Explain the exchange bank
-Can trade with partners and groups or exchange at bank

D) Writing Original Compositions: Developing the Equivalent Musical Pieces or Formulas

-Work with groups to come up with pieces
-Be careful to keep them balanced
-i.e. you must trade two sixteenth notes for 1 eighth note
-Look for variety- who will you trade with?
-Practice playing
-Share/Perform for class

Identify Materials and Resources:

Handouts

Instruments:

-Drums and other various Unpitched Percussion (UPP)

Resources: CCSS, MADOE, CCAS (www.nccas.wikispaces.com)

Stage Four: Alignment and Reflection

Looking back at our essential questions did our activity give us insight into some possible answers?

Does this activity work for non-musicians?

Did it help to bring understanding of math/music forward that might be missing from a non-integrated unit?

Are there other standards being addressed?

Could this be adapted to work with geometry?

Reflection Prompts:

In what ways have you already integrated the artistic discipline presented in this workshop in your own classroom? What ideas do you have to offer others?

How can you adapt the arts practice you experienced in this workshop to your own classroom setting? What would you add or change?

What are the natural connections between this artistic discipline and the subject-area you teach in your classroom?