

Teaching Fractions with Music Concepts

Rationale for Topic

Fractions can be difficult to teach and challenging for students to comprehend as quantities, instead of symbols. Kinesthetic integration promotes increased understanding in mathematical learning, known as *embodied mathematics* (Bamberger & Disessa, 2003). As music engages the mind and body, we propose its integration into fraction education in elementary school.

Related Research

- “Fractions are one of the most difficult mathematical concepts to master in the elementary curriculum” (Courey et. al., p. 251).
- Music instruction can enhance the brain’s spatial-temporal reasoning capacity, which is necessary in learning math concepts such as fractions (Grandin et al., 1998).
- Students who received music and math training achieved higher scores than their peers on proportional mathematics tasks involving ratios and fractions (Graziano et al., 1999).
- Music training, in combination with spatial-temporal training, has the most significant impact on proportional math skills of students (Graziano et al., 1999).
- When educators use multiple means of representation and allow students to construct and respond in interactive and physical ways, music can provide a foundation to a variety of mathematical concepts (Bamberger & Disessa, 2003).

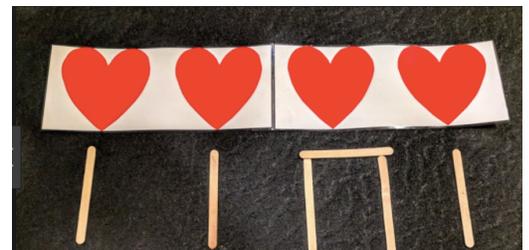
Curriculum Connections

Grade Level	Math Expectations	Music Expectations
Kindergarten	Investigate quantity and equality through identifying and comparing sets with more, fewer, or equal number of objects	Explore different elements of music
Primary	Quantity relationships: dividing the whole into equal halves, quarters, etc.; regrouping; examining the number of fractional parts and their sizes	Duration: whole, half, quarter and eighth notes; 2/4, 3/4 and 4/4 measures; creating simple compositions
Junior	Standard notation to represent the parts of a whole (denominator) and the fractional parts being considered (numerator); size and order of fractions; proper and improper fractions	Duration: sixteenth notes, all notes in combinations; 6/4, 9/8 measures; creating and performing compositions

Music and Fractions Activities

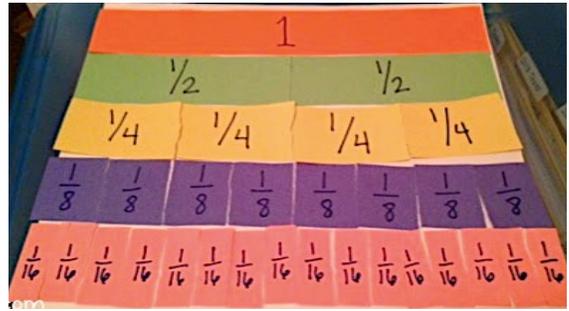
Activity 1 (Kindergarten and Grade 1)

1. Begin by making a comparison between the beat of a song and a steady heartbeat in the body
2. Students tap the beat of a song with four beats in a bar (eg. “Starlight, Starbright”)
3. Students are split into groups of four; teacher emphasizes that four students make a whole group; students take turns jumping to the beat, one person for each beat
4. Split the group in half; discuss how they know the group is divided evenly and how they make a whole group again
5. Use hearts to represent beats in a bar; have students place popsicle sticks on each beat according to the rhythm (1 stick for a quarter note, 2 sticks for 2 eighth notes)
6. Discuss how many quarter and eighth notes add up to a whole bar



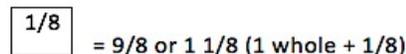
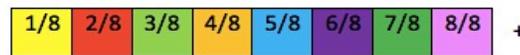
Activity 2 (Grade 2/3)

1. Get 4 strips of paper, and cut into: one whole, two halves, four quarters and eight eighths
2. Compare the sections to the whole; compare the sections to whole, half, quarter and eighth notes, clap the value and how it relates to four beats in a bar
3. Fill in a bar of music with different fractional values; clap the bar
4. Split the bar of music in half and make each side equal value with different note combinations
5. Compose their own pieces in pairs and perform to a small group
6. Extension: Discuss four beats in a bar, then three beats in a bar; listen to music with these time signatures and represent the beats in the bar with paper fractions



Activity 3 (Grade 4/5/6)

1. Teacher model: divide strip of paper into 8 parts and label as fraction and with music notation
2. In pairs: complete the same task, but for $1/16$ and create a beat/sound for each part
3. As a class, students discuss $1/18$ and $1/16$; which is bigger and how they know
4. Students represent the fraction $9/8$ using materials (strips of paper, Cuisenaire rods or unifix cubes) to demonstrate that it is greater than 1 whole; students then represent the number as a mixed number, $1 \frac{1}{8}$
5. Students work towards creating a musical composition in $6/8$ or $9/8$ time
6. Extension: students can record their composition on GarageBand (or another music recording app)
7. Students share their compositions with the class and discuss the difference in the sound between $9/8$ and $6/8$; listen to music with these time signatures and discuss/compare the feel and beat



Main Takeaways

- Music uses spatial-temporal reasoning, which supports student achievement in proportional math skills, such as fractions (Grandin, 1998)
- Embodiment through music makes the learning experience more accessible and engaging for students (Bamberger, J. & Disessa, A., 2003)
- Though teachers may experience some discomfort with teaching music, technical supports such as a metronome, audio recordings and in-school music educators can assist in lesson delivery

Teachers have the capacity to teach music and math together, without having music expertise; they need only a willingness to try something new and different

References

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