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Rockin school: an audio, visual, and kinesthetic approach to general education through music

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Rockin School
An Audio, Visual and Kinesthetic Approach to General Education Through Music
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ABSTRACT: Rockin School is a research study that aims to show that the use of music with content embedded in the lyrics within regular classroom lessons can be an effective tool to improve student enthusiasm, engagement, memory, performance and test scores. The songs composed for these studies are essentially mini lesson plans set to music and are directed towards students in third and fourth grade. The songs with content embedded in the lyrics are synced to videos that provide visual representations of the information being learned. Additionally, this information is explored further through group discussion and the use of manipulatives and/or physical activities to make the learning experience more conceptual and concrete. Pre assessments and post assessments were used to demonstrate what the students knew both before and after they were introduced to the songs. The rationale discusses the links between language and music and how this connection can serve to help improve the memory, vocabulary, and speech of students both in a general and special education setting. New discoveries in brain imaging and mapping show that music pervades all areas of the brain. This information is discussed to highlight the possibility that music with content embedded in the lyrics can be more than just a memory tool but can also enhance conceptual understanding, increase interest and engagement and promote relaxation. Finally, a description of how to introduce and use the music in conjunction with regular classroom lessons is addressed.
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Introduction

One of the great challenges educators face in the task of teaching content to students is to keep them engaged and interested in what they are learning so that the acquisition and retention of new ideas is enhanced. As teachers, we should strive to use as many tools as possible to help students learn information and retain it for years to come. However, it seems that many schools today still heavily rely on a teacher-lecture model where the primary directive is “sit and listen.” While many teachers and schools make an effort to involve group, partner and independent work that is experiential in nature, there is a long way to go. While the lecture model will always be necessary to some extent, it results in the least amount of retention (Cohen, Manion & Morrison, 2004, p.175). In order to help students learn new information in the most profound way possible, and to make it the most experiential possible, other techniques should be used such as audio, visual, tactile, and kinesthetic ideas (here to referred to as VAKT) combined with drama, art, and music. Fadel & Lemke (2008) wrote, “The reality is that the most effective designs for learning adapt to include a variety of media, combinations of modalities, levels of interactivity, learner characteristics, and pedagogy based on a complex set of circumstances (p.14).”

Music, in particular, should be used as a vehicle to engage students physically, intellectually and spiritually. Music has the ability, not just to enhance creativity, self-worth and positive attitudes, but also to aid in language acquisition, reading readiness and general intellectual development (Hanshumaker, 1980). A two-year study conducted in Switzerland (Weber, Spychiger, & Patry, 1993) involving 1,200 children in 50 schools showed that students involved in the music program were better at languages, learned to read more easily, showed an improved social climate, showed more enjoyment in school, and had a lower level of stress than non-music students. Finally, music has also been shown to improve test scores (Kelstrom, 1998). For all of these reasons and many more, I do not just advocate for a healthy traditional music
program in every school, but to push in to all classrooms and use the arts, and music in particular, as a tool for learning in different content areas.

This paper will show that the use of music with content embedded in the lyrics, combined with the use of visual aids and manipulative play raises student interest in learning, helps students learn and retain new information and as a result, improves test scores. This claim is based on and demonstrated through the research experiments I conducted in two different public schools in New York City in the fall of 2012 in a fourth grade dual language special education classroom and the spring of 2013 in a third grade general education classroom. In this time period I composed some songs that embedded mathematical concepts in the lyrics and used various VAKT approaches to convey this information and music to the students. Before I introduced the songs to the students, I conducted pre assessments to determine what the students already knew and post assessments to find out what they knew afterwards. In each case the students demonstrated that they acquired new knowledge and concepts. Furthermore, in one case where the class was split into two halves with one half only receiving traditional classroom lessons (the control group), and one half receiving both the traditional lessons and music lessons, the data showed that the students who received the music lessons retained more information and performed better on the post assessments.

This paper is arranged in three distinct sections. Section I is the rationale for conducting this research study and the theory that supports the use of music in general and special education classrooms. Section II is a focus on the development of the original material used for this research study and the application of pre assessment, songs/videos and post assessments in the classroom. Specifically, section II is divided into two sections: The Fraction Song and Polygon Song. Finally, section III contains the conclusion and recommendations for future use.

In 1998, the founding member of the Center for the Neurobiology of Learning and Memory, Norman M. Weinberger wrote, “Music offers great opportunities for communication
and expression, for creativity and group cooperation – plus, it’s good for the brain and can enhance learning and intellectual development. Instead of asking, ‘Why music’? Perhaps we might ask, ‘Why not music?’ and ‘How can I use music to my students’ advantage to further my goals as an educator?” (p.39).
Section 1: The Rationale

Music and Language

There are still many mysteries regarding the connection between music and language in the human brain, but this much is certain, they are closely linked. Throughout history there is common ground that unites the two. The words “rhyme” and “rhythm,” derived from the Greek language, both suggest similar aspects of measure, motion and stream. Rhythm and rhyme played a huge role in preliterate cultures because humans had to pass down stories, prayers, poetry, etc. through oral traditions. Granted, it is difficult to pull apart the process of memorizing long stories and determine how much of it depends on linguistic rhyming versus musical rhythm, but one thing is certain; this process allows humans to retain a huge amount of information. In exploring these ideas in the book *Musicophilia*, Oliver Sacks (2007) says, “The embedding of words, skills, or sequences in melody and meter is uniquely human. The usefulness of such an ability to recall large amounts of information, especially in a preliterate culture, is surely one reason why musical abilities have flourished in our species (p.260).” This begs the question: if music and language have played such an integral role in our history and there is a historical and natural inclination towards memorization through embedding language in melody and rhythm, why not employ this idea more often in our nation’s schools? Granted, learning should be so much more than rote memorization. This is why the Rockin School approach is combined with visuals, manipulative play, movements and discussions to create a more experiential and conceptual experience. Never the less, don’t students have to remember a ton of information in school? If so, why not give them a hand by employing the oldest technique in human history to aid in memorization?

The connection between music and language goes even deeper. As newborns, a type of language imprinting happens within a few hours after birth as soon as the newborn hears others
speak. However, it’s not just the words that a newborn hears, but the emotional nuance, tone and stress patterns that give the “words” so much more meaning. This is where music and language hold such a common thread; spoken expression and music expression are practically one in the same. In fact, this is probably why certain languages, for instance, Italian, sound like “music.” Anthropologist Robert Garfias (1990) said, “I have come to the belief that the roots of each different music structure are inherent and inseparably linked to the structure of spoken language and that the two are, in fact, a single system which is acquired from the earliest stages of infancy throughout the infant’s constant processing of the sounds of human voices around him (p.1).” Additionally, music has been shown to improve reading skills due to the strong connection between pitch discrimination and the “sounding out” or phonemic stage of reading development (Weinberger, 1998).

Furthermore, oral language is the foundation of literacy and plays an integral role in comprehension, problem solving, and self-monitoring (Mather et al, 2001, para. 5). Students with language production challenges, whether it is due to inherent physiological characteristics or external factors such as those learning a second language, need to be exposed to as many expressive language experiences as possible. These students benefit from singing, chanting, drama and other methods of oral language practice. The rehearsal and repetition of song lyrics, whether chanted atonally or sung with melody, allows for a kind of language production practice that is not available in the traditional classroom. Stephen Krashen, an expert in the field of bilingual education and language acquisition, said, “language acquisition proceeds best when the input is not just comprehensible, but really interesting, even compelling; so interesting that you forget you are listening to or reading another language” (Rodriguez & Ramos, 2009). I believe that reading, singing or chanting music lyrics, as is done in the Rockin School approach, achieves this goal. Additionally, this type of language practice is part of what creates a language-rich environment in the classroom and is extremely helpful for English language learners (L.
Costa, personal communication, June 10th, 2013). This fact and all of the previously mentioned connections between language and music suggests that music should play a larger role in the education of our youth. It should certainly play a larger role than the shrinking music programs in our school system.

**Music and Memory**

Much of human history and the famous books from antiquity that the world has come to know, such as the *Old Testament* and *Homer’s Odyssey*, were passed down through what is know as the oral tradition: cultural material and traditions passed down to successive generations orally. As mentioned previously, humans have used rhythm, meter, rhyme and music for eons as a tool for memorization. For reasons still somewhat mysterious to brain scientists, when language is coordinated with these musical attributes an immense amount of information can be memorized. Indeed, the originator of the School House Rock songs and animation series that appeared on television in the 1970’s and 80’s, David McCall, began this venture because he noticed that his sons could memorize an impressive amount of song lyrics.

It’s quite shocking to learn that even people who have experienced severe memory loss due to traumatic brain damage, Alzheimer’s disease, and dementia have the ability to remember childhood events and other life experiences when exposed to music. Again, Oliver Sacks (2007) explains that, “musical perception, musical sensibility, musical emotion and musical memory can survive long after other forms of memory have disappeared (p. 373).” This amazing fact should be used to the benefit of those students in special education who have challenges with short term, long term and active working memory. Furthermore, this information is more evidence that music pervades the human brain in mysterious and powerful ways and all of humanity benefits from exposure to it.
Music and the Human Brain

Music, in particular, has the ability to embed itself in the brain in mysterious ways. Whereas in the past, scientists thought that music and art were the domain of those with special processing abilities in the right hemisphere of the brain, now they are discovering that music embeds itself in all parts of the brain. In fact, brain scientists now wonder where, if any, music doesn’t exist in the brain (Levitin, 2006, p. 9). Indeed, this is one reason why those with severe brain damage can access memories with the aid of music when all else fails. For children, music is the key to the development of synaptic strength, which in turn helps develop major functional systems in the body such as sensory and perceptual systems (auditory, visual, tactile and kinesthetic), cognitive systems (symbolic, linguistic) and fine and gross motor muscle movement and coordination (Weinberger, 1998; Summa-Chadwick, 2009). The current belief among brain scientists is that music “increases the brains capacity by increasing the strengths of connections among neurons” (p. 38). With this knowledge in mind, how can our society justify so many cuts to music programs in our school system?

The VAKT Approach and Multiple Intelligences

The V-A-K-T Approach stands for visual, audio, kinesthetic and tactile. This approach was first developed by Grace Fernald in 1943 to help children learn how to read by employing these four senses in literacy education. This type of multi-sensory teaching enhances memory and learning by employing all learning pathways in the brain (Multisensory Teaching Approach, 2013). Educators have long suspected that children learn in different ways depending on the modality that best suites them. Some children have strong receptive language abilities and don’t need visual aids as much, whereas other students need visual representations of information to help make what they learn more concrete. Some students are more active and need a chance to move while learning while others are spatial learners; easily understanding maps and having a
strong memory for the location of things in space, recognizing patterns, etc. Indeed, most children and adults favor multiple modalities when faced with the task of learning new information. In the book *Frames of Mind: The theory of multiple intelligences*, Howard Gardner (1983) argues that there is no simple definition of ‘intelligence’ and that there are, in fact, seven different types of intelligence: logical mathematical, musical, bodily-kinesthetic, spatial, interpersonal and intrapersonal (multiple intelligences and education, 2013). The Rockin School approach described in this paper engages these multiple intelligences with the goal of finding more entry points into a child’s ability to learn.

While there is some controversy regarding the idea that a specific type of learner needs to learn only in that modality which he or she is suited for, it is widely accepted among progressive educators that the use of all of the previously mentioned modalities in education can be helpful to all children. It was with this idea in mind that the Rockin School approach was designed. In this approach the students are using audio (music), visual (videos, pictures, lyrics, shapes), kinesthetic (movement to rhythm) and tactile (manipulative play).

**The Use of Visual Aids in Education**

Teachers have used visual aids for generations to help clarify or intensify the learner’s mental images of what is being learned (Kinder, 1942; Clarke, Flaherty and Yankey, 2006; Wellington & Stackhouse, 2011). Over the years, and especially recently, the variation of visual aids has increased dramatically. As technology has evolved, the use of video and animation has grown in the classroom. Especially in this digital age when there are more choices at our fingertips, one has only to look to the Internet to find all manner of videos on YouTube and sites such as BrainPop.com. However, it is hard to find accessible videos that combine the use of music with content embedded in the lyrics that address specific learning objectives in math, science, history, social studies, etc. This is unfortunate due to the fact that several studies (Rosen,
2009; Park, 1994; Tversky, 2002) have shown that integrating animations into the classroom result in higher motivation among students and positive learning outcomes in general. These studies show that this is especially true when compared to traditional classrooms that rely on verbal explanations only. Adding music to these animations and/or videos is yet another way to increase student motivation and, as mentioned previously, promotes other positive learning outcomes such as memory and language expression.

Due to a lack of expertise in the area of animation, the use of static pictures was used for this project. The illusion of movement was created by using effects in iMovie such as the “Ken Burns effect.” The use of static pictures has been shown to be as effective as animation. Rosen (2009) said, “Studies that examined the effectiveness of animation-based learning environments, compared with static pictures produced mixed and even contradictory results. Several studies showed that, by and large, animation-based learning has no significant advantage over static pictures” (p. 4). Either way, it is clear that students become particularly engaged and interested when there is a chance for some screen time. Is there any reason why educators and school systems as a whole shouldn’t figure out how to integrate more uses for technology in the classroom? The key is to make sure that students make authentic connections between what they see on screen and what they are learning. For this reason it is imperative that teachers follow up the use of technology with meaningful conversation, exercises, etc. that relate to and expand on the visual content being viewed. As Charney (2002) said, “children don’t learn by being entertained. They learn by doing, and by finding success in doing” (p. 17). This project, which uses music, movement, visuals and manipulative play, takes advantage of the fact that there is an inherent strength in using auditory and visual channels of working memory to deliver information (Rosen, 2009) because it increases the amount of information that the brain can process.
The Use of Music in General Education

The following examples below are just a small sample of the many ways in which music has been used to benefit general education whether inside or outside of the classroom.

Throughout the years there have been teachers, such as Clivetta Johnson, a music teacher who was reassigned to teach a fifth grade classroom, who have attempted to integrate music into the mainstream classroom. There are many ways in which music can be used to promote positive outcomes in learning in subject areas such as math, science, social studies and language arts.

Regarding language arts, Clivetta Johnson (2004) says, “Language arts and music both belong to that area called the “creative arts” and bear a close relationship to one another. They overlap, contribute to, and strengthen each other” (p. 1). For instance, one can choose the lyrics of a song and present it as poetry first. After analyzing the lyrics, the class can listen to the song and discuss how the music affects the lyrics and vice versa. Regarding math, she wrote, “Music is based on sound in time. Time is expressed in mathematical terms. With that in mind, it is easy to see how musical analysis will underscore certain mathematical or number concepts” (p. 4). For instance, rhythm can be counted in various ways and the amount of eighth notes versus quarter notes in a single bar of music can be written as fractions and/or ratios. Additionally, she used traditional songs from various cultures in social studies to discover new ideas about people from different places in the world and the exploration of sound waves, sound energy and acoustics in science class.

In the world of online resources, *Flocabulary* is an online platform that provides educational hip-hop songs and videos to teachers and students. Founded in 2004, *Flocabulary* aims to reach all students in grades K-12, but specifically, students from disadvantaged neighborhoods, English language learners and special education students. The website cites the studies in 2008 and 2009 of Dr. Roger Farr, former president of the International Reading Association, which determined that *The Word Up Project, Flocabulary's* multisensory
vocabulary program, raised state test scores for middle school students. “These results suggest strongly that *The Word Up Project* can play a significant role in raising state language arts/reading scores” (Farr, 2009, Research results).

Currently, there is a program running in 10 New York City public schools called *Science Genius* that allows inner-city high school kids to compose and perform hip-hop raps centered around science topics, such as the elements of DNA. This program was featured on PBS and shows how the students, who otherwise would have been sleeping in class, are now engaged in learning science vocabulary and core concepts in order to include them in their ‘rhymes’. Christopher Emdin, professor at Teachers College and the creator of the program says, “We will not except nursery rhymes. The students must delve into their science books and create rhymes that reflect an in-depth knowledge of the topics” (Emdin, 2013). Additionally, he is emphatic about the need for new innovative ways to reach young students and engage them in learning. If young people love and gravitate towards music, why not use this interest as a vehicle towards learning?

Most Americans that were of school age during the 1970’s, 1980’s, and 1990’s are very familiar with *School House Rock*, the animated educational series that attempted to teach various content area topics through the use of music with content embedded in the lyrics. Songs such as *I’m Just A Bill* (Frishburg, 1975) and *Conjunction Junction* (Dorough, 1973) are readily recalled by those who grew up watching them. Unfortunately, the series was cancelled in 1985, with reruns and some new editions airing from 1993 to 1999. However, it seems that no one took the lead in developing the concept further. This is a shame due to the fact that many fans will attest to the fact that these songs and videos helped them learn basic information from various content areas. The way in which the approach described in this paper differs from the *School House Rock* series is that it is designed for use in the classroom to supplement lessons. Additionally, the use
of images, movement, discussions and experiential play with manipulatives helps to further concretize the concepts being learned in the songs.
Section II: Original Material and Experiments

Early on in my fieldwork class for Bank Street School of Education in 2012 I was talking to a teacher about the challenges of teaching young students content and she said, “I wish we had more tools as teachers to engage the interest of our students and help them solidify hard-to-learn concepts like fractions, the water cycle, etc.” My response was that music could be a great vehicle for both learning new information and as a supporting role, helping to reinforce information already learned. She said that it would be a dream come true if she had a resident composer/musician who could write songs targeting content areas that her students struggled with. It was at this moment that I decided that I would try to compose music that would help students in content areas like math, history, science and literature. For the purposes of this research study, two songs were chosen and were written to enhance understanding in the area of mathematics. The following materials and experiments were used in two separate public schools in New York City. The first one was conducted in a fourth grade dual language CTT special education classroom. This classroom contained twenty four students in which eleven had Individual Education Protocols (IEPs) and eighteen were considered English language learners (ELLs). The second experiment was conducted in a third grade general education classroom in which two students had IEPs and six students were ELLs.
The Songwriting Process – The Fraction Songs

I decided to begin with one of the hardest concepts young students struggle with: fractions. Specifically, not just the understanding of what a fraction is but the idea of equivalent fractions. First, I consulted the book *Math Matters* (Chapin & Johnson, 2006) on mathematics to identify exactly what concepts, words, phrases and ideas I needed to convey through song. Additionally, I made sure that the content was aligned with the Common Core State Standards for fourth grade. Finally, I decided to center the whole song around the concept of sharing. Then I started mapping out how I would arrange the information. I decided that the introduction would represent the basic characteristics of a fraction (See figure 1).

**Figure 1: Fraction Song Verse One**

| Fractions are easy, simple and fun, **greater than zero, less than one**. A fraction is just a **portion** of the whole, learning is our goal.  
The top number is called **numerator**, the bottom number is called **denominator**. Stack’em on top with a line between, you’ll see what I mean. |

Then I decided to write several verses that would tell the story of equivalent fractions. I decided to compose the verses so that the first verse discussed the conversion from eighths to larger quantities such as quarters, halves and the whole (See figure 2).

**Figure 2: Fraction Song Verse Two**

| One eighth **equals** one of eight pieces, two eighths is one quarter of a pie.  
Three eighths **is** three **out of** eight pieces, four eighths **is** a half pie, oh my.  
Five eighths **equals** five of eight pieces, six eighths **is** three quarters of a pie.  
Seven eighths **is** seven out of eight pieces, eight eighths **is** one pie, oh my! |
Then the second verse discusses the conversion of quarters back into eighths (See Figure 3).

<table>
<thead>
<tr>
<th>Figure 3: Fraction Song Verse Three</th>
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<tr>
<td>One quarter is equivalent to, two eighths don’t you know it’s true?</td>
</tr>
<tr>
<td>Two quarters and four eighths are the same, both one-half in the fractions game.</td>
</tr>
<tr>
<td>Three quarters are equivalent to, six eighths don’t you know it’s true?</td>
</tr>
<tr>
<td>Four quarters and 8/8ths are the same, both equal one in the factions game.</td>
</tr>
</tbody>
</table>

Usually the chorus (the refrain) contains the “hook” of the song: the most memorable section. This is the section that is usually repeated three to four times throughout a popular song. In the case of the fraction song, I decided that I wanted to give the listener a break from the content information and instead, write a catchy melody that focuses on the idea of sharing (See figure 4).

<table>
<thead>
<tr>
<th>Figure 4: Fraction Song Chorus</th>
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<tbody>
<tr>
<td>Oh me oh my, we love our pizza pie.</td>
</tr>
<tr>
<td>And if we want to share, fractions get us there.</td>
</tr>
</tbody>
</table>

One may feel that the chorus section should be taken advantage of due to the fact that it repeats the most compared to other sections, and usually contains the most memorable melodies. However, one should consider the idea that music should still be music and provide a fun and engaging time. If the Rockin School concept uses music blatantly to convey information from content areas, it is my view that there should still be some fun lyrics, in this case, a reference to sharing pizza, that allow a child to engage in other ideas besides the content lesson at hand.

In figure 5 below, you will find the lyrics and arrangement for the whole song.
Fractions are easy, simple and fun, greater than zero, less than one.
A fraction is just a portion of the whole, learning is our goal.

The top number is called numerator, the bottom number is called denominator.
Stack ’em on top with a line between, you’ll see what I mean.

Dialog: Let’s pretend that we have a large pizza cut into 8 pieces

Verse 1
One eighth equals one of eight pieces, two eighths is one quarter of a pie.
Three eighths is three out of eight pieces, four eighths is a half pie, oh my.

Five eighths equals five of eight pieces, six eighths is three quarters of a pie.
Seven eighths is seven out of eight pieces, eight eighths is one pie, oh my!

Chorus
Oh me oh my, we love our pizza pie.
And if we want to share, fractions get us there.

Verse 2
One quarter is equivalent to, two eighths don’t you know it’s true?
Two quarters and four eighths are the same, both one-half in the fractions game.

Three quarters are equivalent to, six eighths don’t you know it’s true?
Four quarters and 8/8ths are the same, both equal one in the factions game.

Chorus 2x

Outro
Fractions are easy, simple and fun, greater than zero, less than one.
A fraction is just a portion of the whole, learning is our goal.

The top number is called numerator, the bottom number is called denominator.
Stack them up with a line between, you know what I mean.

One will immediately notice that some of the vocabulary is purposefully
highlighted in bold font. This lyric sheet was passed out to each student with a copy of
the music. The intent of putting some of the target vocabulary in bold font was to help the
students become more comfortable with this kind of language. For instance, many 3rd
grade students are familiar with the phrase “equal to” but not the phrase “is equivalent
to.” After singing the song even just a few times, the students were very comfortable
using this new phrase instead of “equals.” This goes the same for the words “numerator” and “denominator.” According to the pre assessments that were conducted before introducing the students to the fraction song, only a small portion (20%) of the students knew these terms and were aware of what they meant. After exposure to the song, the students scored a hundred percent on this question on the post assessment test (more analysis is included later). This brings up the issue of rote memorization. There can be no doubt that music is a very effective tool for memorization. However, the process can go so much deeper when combined with visual, tactile and kinesthetic exercises. The results of this research study will show that the students also successfully learned and retained conceptual information about equivalent fractions and shapes, too.

Since this song was composed for an English/Spanish dual language classroom, I knew that I needed to tackle a Spanish version too (See Figure 6). Translations don’t always transfer very smoothly to rhythm and rhyme, therefore, I had to spend some time reworking the lyrics. However, it breaks down to just about the same thing.

<table>
<thead>
<tr>
<th>Figure 6: Spanish Fraction Song</th>
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<tr>
<td><strong>Intro</strong></td>
</tr>
<tr>
<td>Una fracción simplemente es <strong>una porción</strong> del entero, <strong>un número entre uno y cero</strong>. Arriba <strong>numerador</strong>, abajo <strong>denominador</strong>, que seas solucionador.</td>
</tr>
<tr>
<td><strong>Verso</strong></td>
</tr>
<tr>
<td><strong>Coro</strong></td>
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I also composed a more basic version that could be used for 2nd or 3rd grade (It is acknowledged that fractions have been removed from the second grade curriculum in New York City). Aside from these two verses below (See figure 7), the rest of the song is the same.

**Figure 7: Fraction Song – Rudimentary Verses**

<table>
<thead>
<tr>
<th>Verse 1</th>
</tr>
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| Take a whole pizza and cut it in two, both one half you know it’s true.  
A half plus a half is equally to the whole, now we’re on a roll.    
Take a whole pizza and cut it in four, each one-quarter and no more.  
Add them all together, give it a try, it equals one whole pie, oh my! |
Verse 2

Take one half and cut it in two, we get two quarters you know it’s true. One half and two quarters are the same, both one-half in the fraction game.

Take one quarter and cut it in two, we get two eighths you know it’s true. Four quarters and eight eighths are the same, both equal one in the fraction game.

Additionally, I composed some verses that form the basis for a more advanced 4th grade classroom or a remedial 5th grade classroom.

**Figure 8: Fraction Song – Advanced Verses**

<table>
<thead>
<tr>
<th>Verse 1</th>
</tr>
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<tbody>
<tr>
<td>1/6&lt;sup&gt;th&lt;/sup&gt; equals one of six pieces, 2/6ths is one third of a pie.</td>
</tr>
<tr>
<td>3/6ths is equivalent to, one half of a pie, oh my!</td>
</tr>
<tr>
<td>4/6ths is two thirds of a pizza, 5/6ths equals five of six pieces.</td>
</tr>
<tr>
<td>6/6ths is equivalent to, one whole pizza pie, oh my!</td>
</tr>
</tbody>
</table>

Verse 2

1/3<sup>rd</sup> is equivalent to, 2/6ths, don’t you know it’s true? One half and 3/6ths are the same, yup, both the same in the fractions game.

2/3rds is equivalent to, 4/6ths, don’t you know it’s true? 3/3rds and 6/6ths are the same, both equal 1 in the factions game.

**The Fraction Song: Pre Assessment**

Before introducing the first fraction song to the 4<sup>th</sup> grade dual-language special education classroom, I designed a short assessment to determine what the students knew about fractions (See Figure 9). This test was given just before Christmas break. Then the students were introduced to the song, given the CDs and lyric sheets and went home.
This pre assessment asks one question about vocabulary (numerator and denominator), two questions about equivalent fractions and one question that addresses simple fraction subtraction. The class as a whole scored 18 out of a possible 88 points. Eighty percent of the students could not convert eighths into quarters or quarters into eighths. Additionally, only 20% of them knew the names ‘numerator’ and ‘denominator.’
Fraction Song: Learning Period

I informed the students that I wrote a song about fractions and made a video to go along with it. The students eyes lit up and they were very excited. I played the English version for them while they were looking at the lyric sheet (you can watch the video here https://www.youtube.com/edit?video_id=ar8h1jSeHUw&ns=1&feature=vm). During the first playback of the video the students were able to sing the chorus easily and pieces of the verses, too. As the students are singing, they are seeing images such as the two in figure 10 below. These two images are timed with the lyrics that say “four quarters is a half pie, oh my” and “two eighths is one quarter of a pie.”

![Fraction Song Pictures](image)

After the song finished playing we talked about the lyrics for about 10 minutes. We discussed some of the basic ideas such as what it means to be a ‘portion of the whole’ or ‘a number between one and zero.’ Then I played them the Spanish version (You can watch the video here http://youtu.be/DH8VulYuKZs). Again, the students were able to
sing along with the chorus during the first playback and sang pieces of the verse. After
the video I gave all of the students a copy of the song on CD and the lyric sheet. I told
them that their homework for Christmas break was to listen to the song as many times as
they wanted, but enough times so that they didn’t need the lyric sheets to sing along.

After the Christmas break the students watched the video one more time. This
time I paused the video in various locations to ask the students some questions. For
instance, if I paused at this screen (see figure 11) I would ask a student to explain what
we are looking at.

In this case I would fish for answers that describe the relationship between the
numerical fraction on the right and the picture of pizza on the left. What is the
relationship? How much is the missing piece worth? If we cut one of those pieces in half,
what would we get (eighths)?

Additionally, this time I provided the students with some fraction tablets and
asked them to form examples that accurately portray the song lyrics. For instance, in
figure 12 below the students are working on forming the equivalent relationships between
quarters and eighths. I paused at the lyric that says, “three quarters are equivalent to, six eighths don’t you know it’s true?”

Finally, as a kinesthetic exercise I would have four students stand in a tight group and tell the class that the four students make up a ‘whole.’ Then I would have a student that was sitting to go up to the standing group and invite three quarters of the students to sit down. Additionally, I would have eight students stand in a group and have the students do exercises where the eight students were grouped into quarters (four groups of two), or figure out how many students (eighths) were equivalent to two quarters (four).

**Fraction Song Post Assessment**

A few weeks after the Christmas break I designed a simple post assessment to find out what the students had learned. The following example (see figure 13) is from the same student’s work from the pre assessment.
The post assessment is very similar to the pre assessment with a few changes. The first question about the numerator and denominator is reversed, there are two questions that address equivalent fractions and one question that deals with fraction subtraction.
The class as a whole scored 44 correct answers out of a possible 88 or 50% correct. (The pre assessment was 18 out of a possible 88 or 20% correct). This represents an improvement of 30%. This improvement occurred without any traditional classroom lessons or homework targeting fractions.

**Second Fraction Experiment**

The same experiment was conducted in a third grade general education classroom. This classroom was made up of 27 students. Two students had IEPs and there were six English language learners who are pulled out for special literacy instruction. The same methods as the previous example were used. On the pre assessment the class as a whole scored 48 correct answers out of a possible 108 or 44% correct. On the post assessment the class scored 75 correct answers out of a possible 108 or 69% correct. This represents a 25% improvement.
The Polygon Song

This study was conducted in a 3rd grade general education classroom. I asked the head teacher what she thought was a vexing topic that confused the students. We agreed upon the need for reinforcement in the area of polygons. This time, the class of 27 students was split into two halves in order to form a control group that didn’t receive music support. Careful attention was paid to how the class was split up so that both halves had an equal amount of similar-leveled math students. The class was split into three different tiers according to their math assessments (tests, quizzes, homework, class observation) up to that point: above average, below average and average. These three tiers were then split in half and assigned to either the class without music or the class with music. The six English language learners (ELLs) were split in half so that each group had three ELLs. Finally, to give my experiment more of a challenge, and since the below average students didn’t split up evenly, I took one extra below-average student in my class. Additionally, I included the three lowest-performing students in the whole class in my music group, which included the two students with IEPs.

The Songwriting Process: The Polygon Song

After determining that my next song would deal with polygons, I consulted Math Matters (Chapin & Johnson, 2006) to figure out what important words and concepts I would include in the song. The chorus emphasizes the fact that polygons are two-dimensional shapes (see figure 15). Again, you will notice that all of the important aspects of the lesson are in bold font. Again, this is meant to highlight the important aspects of the lesson and are to be discussed in class.
The idea of dimensions is very confusing for eight-year-old children. It was necessary for the students to look at concrete objects, such as a piece of paper and a cube and talk about the properties they had in common (length and width) and the property that was different (height or depth). Additionally, the chorus promotes the idea that polygons all have three or more sides.

The pre chorus sections simply deal with the Greek prefixes for the numbers three through ten (see figure 16).

| Figure 15: Polygon Song Chorus |
| Get this party on, get it started with **polygons**  |
| **Two dimensional, three or more sides** in total |

| Figure 16: Polygon Song Pre Chorus |
| **Tri** means three say *triangle*, **quad** means four say *quadrangle*  |
| **Penta** means five say *pentagon*, **hexa** means six say *hexagon*  |
| **Hepta** means seven say *heptagon*, **octa** means eight say *octagon*  |
| **Nona** means nine say *nonagon*, **deca** means ten say *decagon*  |
| All of these shapes are **polygons**! |

This information is not crucial to the understanding of polygons but very helpful when describing the number of sides of a polygon. In terms of cross-curricular pedagogy, it is also helpful for the development of vocabulary and understanding other words. For instance, as a class we discussed these prefixes and I asked the students to think of other words that contain them. They came up with tricycle, triathlon, quadriceps (four muscles
in the upper leg), pentagon (the military headquarters), octopus, and many others.

Additionally, we made the connection that if you didn’t know the meaning of a word, such as heptachromic, we would still know that it meant ‘seven of something’ (a reference to that which exhibits seven colors).

The verses get into the main attributes of the different shapes. The first verse is important because it deals with the very rudimentary building blocks of polygons (line segments, angles, vertices, parallel lines, intersections)(see figure 17).

**Figure 17: Polygon Song First Verse**

| We’re going to sing about **polygons**, like **squares** and **kites** and even **decagons** |
| Made from **line segments** you will see, also **right angles** and **vertices** |
| Also **parallel lines**, it’s an art, **never intersect**, **same distance** apart |

The second verse is designed to help students classify the family of shapes called quadrangles (see figure 18).

**Figure 18: Polygon Song Second Verse**

| We need to talk about **quadrangles**, you can also call them **quadrilaterals** |
| I’m a four-sided **polygon**, many different shapes, different kinds, come on! |
| **Square**, **trapezoid**, **rectangle** among us, don’t forget the shape we call a **rhombus** |
| Looks like a **diamond** or a drunken square, it’s a **parallelogram**, please be aware |

Finally, the third verse looks at the characteristics of a parallelogram and gives the counterexample of the trapezoid not being a parallelogram (see figure 19).

**Figure 19: Polygon Song Third Verse**

| Now, what the heck is a **parallelogram**, **not a trapezoid** not a piece of ham |
| With **two pairs of parallel sides**, **equal length opposite facing sides** |
| **Square**, **rectangle**, and **rhombus** too, even a **rhomboid**, yes it’s true |
In this case, the class focused on exactly what it means when a shape has ‘two pairs of parallel sides’ and ‘equal length opposite facing sides.’ A common misunderstanding that students this age have is the idea that two pairs means two sides, instead of four total. This is something that had to be reviewed many times. Additionally, ‘opposite facing sides’ is something that perplexed the students. In this case, I drew a profile view of a face with the noses facing each other on either side of a shape to clarify the meaning.

Finally, see figure 20 for a look at the entirety of the lyrics and the arrangement of the song. Notice the polygon shapes that were added to the sheet as a reference support. Also notice that most of the shapes have multiple names. It is important to clarify this idea with young students. For instance, pointing to myself I would say that I am a teacher, but I am also a man, a father, and a musician to clarify the idea that everything can be classified in many different ways. To solidify this idea, I asked some students to clarify themselves in different ways (“I am a boy, a son, a grandson and a cousin”).
Figure 20: The Polygon Song Lyrics

The Polygon Song By Tobias Gebb
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Verse 1
We’re going to sing about polygons
Like squares and kites and even decagons
Made from line segments you see
Also right angles and vertices
Also parallel lines, it’s an art
Never intersects, same distance apart

Prechorus
Named after the number of their sides
Go ahead and try

Tri means three say triangle
Quad means four say quadrangle
Penta means five say pentagon
Hexa means six say hexagon
All of these shapes are polygons!

Chorus
Get this party on, get it started with polygons
Two dimensional, three or more sides in total

Verse 2
We need to talk about quadrangles
You can also call them quadrilaterals
I’m a four sided polygon
Many different names and kinds, come on!
Square, trapezoid, rectangle among us
Don’t forget the shape we call a rhombus
Looks like a diamond or a drunken square
It’s a parallelogram please be aware

Prechorus

Chorus

Verse 3
What the heck is a parallelogram?
Not a trapezoid not a piece of ham
With two pairs of parallel sides
Equal length opposite facing sides
Square, rectangle, and rhombus too
Even a rhomboid, yes it’s true

Prechorus

Chorus

Two dimensional, three or more sides in total
Polygon Pre Assessment

Below is an example of the polygon pre assessment taken by one of the students.

Figure 18: Polygon Song Pre Assessment

This student obtained a 3 out of 10 or 30%. The class as a whole scored 164 out of 270 (27 students multiplied by 10) or 60%.
**Polygon Learning Period**

The whole class received the regular verbal teaching of polygon lessons from the 3rd grade *Everyday Math* book (McGraw Hill, 2013) over a period of one week by the head teacher. However, one half of the class was pulled from the room 15 minutes early and received 3 fifteen-minute music lessons in which the students listened to and sang “The Polygon Song,” discussed the lyrics and looked at shapes to discuss the different attributes of each shape. The discussion of lyrics involved connecting what the students were singing about to the shapes on screen and how they could prove that the lyrics were true or not. For example, in verse I it says, “Parallel lines, never intersect same distance apart.” I would ask the students to prove it or show it. Do you see any parallel lines in this room? How about outside the classroom? Let’s talk about train tracks.

You can watch the video here [http://youtu.be/kCpUQr_uE-0](http://youtu.be/kCpUQr_uE-0)

In order to understand geometric shapes, it is necessary to use examples and counterexamples (Chapin & Johnson, 2006, p.233). For this reason, I drew various examples and counter examples on the smart board for discussion. Additionally, they practiced drawing pictures to construct various shapes according to the attributes they remembered and engaged in musical movements while listening and singing along. This time around the students were not given the music to take home. It was determined that it was too hard to find out exactly how much each student listened to the music at home and learned the lyrics. Doing this experiment in school meant that I would know how much time each student spent listening, singing, discussing and experimenting with polygons.
This polygon assessment shows this student improved with a score of 9 out of 18 possible points or 50% (on the pre assessment this student’s score was 3 out of 9 or 30%). Overall, the class scored 228 out of a possible score of 486 or 46%. This score is lower
than the pre-assessment results (60%). At first glance, it looks like the students did worse on the post assessment but this can be explained. Since the class was split into two groups – music and non-music – we have to look at the numbers separately. The non-music group scored 98 out of a possible 234 points or 42%. The music group scored 126 out of a possible 252 points or 50.8%. This means the music group scored 9% better as a group, even though it was more heavily weighted with four students from the lowest class percentile in mathematics, including the two students with IEPs.

Regardless, the results are positive in many respects. For example, in the post assessment (figure 19) question eight asks for a written description of why a rhombus is a parallelogram. When comparing the two group’s answers, the music group gave answers that were much more clear and coherent than the non-music group. This fact indicates that the music group has a better understanding of the characteristics of a rhombus and why it is grouped in the family of shapes called parallelograms.
Section III: Conclusion, Recommendations and Implementation

In summary, it is clear that there is a wealth of evidence pointing to a connection between the existence of music in schools and positive learning outcomes. Furthermore, and going deeper into the human experience in general, there is a clear connection between the way humans process and use language and the ubiquity of music in human culture. Therefore, it is completely illogical to remove or severely limit this natural human inclination from the world of education. Additionally, the scientific evidence from new brain imaging technology showing a clear connection between synaptic growth and music studies should be enough to convince all parents, educators and politicians that it is high time to reverse the sad decline of music in our country’s school system. Finally, it should be clear from this study and the many others that were cited in this paper that the positive benefits of music shouldn’t simply be relegated to the music room or private instrument instruction, but pushed into the general and special education classroom as well.

“I don’t sing because I am happy, I am happy because I sing.” This is a quote from the American philosopher William James, who lived in the early half of the 20th century. Little did he know, but almost a hundred years later, brain scientists would have the proof to explain why. It turns out that when people sing together, it releases a neurotransmitter associated with social bonding called oxytocin, creating a sense of trust and wellbeing (Levitan, 2006). Additionally, coordinating actions with others requires one to step out of oneself and merge with the whole, creating a sense of belonging. Finally, behavioral scientists believe that another reason why people have a sense of
peace and joy from listening to and participating in music is because it is highly structured and orderly, possibly giving rise to a sense of order in an otherwise chaotic world. This is the power of music.

Imagine the possibilities when general education is combined with the power of music. Now imagine the possibilities when one combines music with children’s fascination with visual technology and combine this with movement, manipulative play and teacher-directed discussions. Enthusiasm, motivation and participation are increased. Memory is enhanced for both typically developing children and those with diverse learning needs. Opportunities for language practice and use are increased for those with language production and acquisition challenges. The multiple intelligences of varying students are engaged and exam performance is enhanced. In summation, the Rockin School approach is a powerful tool for teaching, an effective experiential learning process for students and an effective way to boost test scores.
Recommendations for Teachers

I do not advocate for an approach like that of Rockin School to replace traditional teaching. Rather, it is a great reinforcement tool or a way to preview upcoming lessons. For instance, the 4th grade classroom where I conducted the first fraction study was introduced to the classroom in December but they were not scheduled to learn fractions until February. As a result, the students were more prepared when the actual lessons in fractions began. In contrast, the polygon study was conducted during the period that the traditional lessons were being given and split into a control group and a music group. Either way, positive and beneficial results can be obtained.

Make a Rhyming Poem

I recommend making the music process even more experiential by having the students attempt to write their own verses, chorus, etc. This is the same thing as writing poetry. This would be a great way to transform a lesson into a cross-curricular activity since literacy instruction (poetry, rhyming, meter) would play a role in the student’s composition of phrases and sentences, regardless of content area. This could be accomplished in several different ways. First, the students should have their usual lessons and compile a list of facts and rules about the subject they are learning (Ex. The Water Cycle – compile a list of terms, definitions, etc). This list will serve as an information sheet from which they would compose phrases with rhymes. Then the students should be supplied with a rhyming dictionary to help with finding rhymes since this is a challenging exercise, regardless of age. It might be best to split the class into groups of two to four students so they can collaborate together and strengthen their teamwork skills. When
students finish they can present their verses and the class as a whole could vote on which ones they want to include in an “official class song.” Or, to avoid exclusion of any kind, have the students combine their verses using different sentences or phrases that sound best to form a chant or melody that all students had some kind of input on.

**Practice as a chant, Rap, or Melody**

Understandably, composing a melody and playing instruments is something that may be a challenge to the classroom teacher or student if they don’t have musical experience. However, all humanity can enjoy a chant with accompanied body percussion. While patting, clapping or tapping feet, start to put the new poem into rhythm. There is no set way to do this. Most people regardless of musical background can naturally put syllables and words to rhythm. We have been doing it for millennia!

The next step would be to do the same thing to music. Do any of the students in your class play an instrument? If not, how about practicing the chant or melody over instrumental music? There are many ways to find repeating beat loops online. Some have a tonal center (key) and some are simply beats with no key center. Either way, chanting is something that comes very natural to students of all ages. Another option is to find a great instrumental recording and use this as an accompaniment for the class to sing over or use a well-know pop song and change the words to fit with the melody.

Finally, use a digital recording device to record the class chanting or singing the song. iPhones come with a Voice Memo recorder and many options to share and post the audio. There are many other options online for free and easy recording. The students will really get a kick out of hearing themselves sing the song.
Basic Outline for Implementation of the Videos

1) **Design a short assessment** to find out what the students know about equivalent fractions and/or polygons. Make sure that you tell the students that it doesn’t matter if they don’t know the answer to a question and that there will be no grading of the test.

2) **Play the Video.** Inform the students that they are going to learn a song about fractions or polygons and tell them that there is a video to go along with the song. **Play the video for them.** Encourage the students to tap their feet or hands along with the beat or come up with a simple dance to give the students a chance to move. Afterwards, have the students **turn and talk** and then share what they noticed or what they know about the content.

3) **Hand out the lyric sheet.** **Play the song a second time** and ask the students to try to sing the lyrics while watching.

4) **Have a discussion.** Pick any lyric from the verses or chorus and ask a student to try to explain it. For example, (The Fraction Song) “In the first verse it says that a fraction is just a portion of the whole. What does this mean?” Choose other lyrics and ask the students to explain in words.

5) **Use manipulatives.** When discussing the lyrics, hand the students some fraction manipulatives to prove a particular lyric. For example, “In the 3rd verse it says, ‘One quarter is equivalent to, two eighths don’t you know it’s true?’ Can someone prove this with the fraction shapes? Is it true?” In the case of the polygon song, have the students draw various shapes and describe with correct vocabulary what they drew.

6) **Play the video a third time.** This time, freeze the video at particular points of your choosing. For instance, you can freeze the video as it shows the visual of four eighths
being equivalent to two quarters (The Fraction Song) and ask the students to explain what they are looking at.

7) **Attempt a run through of the song without the video using the lyric sheet.** You can accompany yourselves with a simple beat tapped on your laps. Eventually you will want to take away the lyric sheet to encourage memorization of the lyrics.

8) **Make it kinesthetic.** In general, always have the students attempting to pat a steady beat on their laps or tapping their feet. For the fraction song, have four students stand together and call this bunch a ‘whole.’ Call a fifth student to come up and tap the correct amount of students to sit down according to the direction. For instance, “Tap the correct amount of students to make three fourths sit down.” For the polygon song you can make large shapes out of masking tape on the floor and have students walk to the beat as they are walking on the lines of a particular shape.
Web Addresses to the Rockin School Videos

Video 1: The Fraction Song

The Fraction Song  (http://youtu.be/ar8h1jSeHUw)

Video 2: The Spanish Fraction Song

Spanish Fraction Song  (http://youtu.be/DH8VuIYuKZs)

Video 3: The Polygon Song

The%20Polygon%20Song  (http://youtu.be/kCpUQr_uE-0)
References


