

Using Music to Increase Math Skill Retention

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Abstract

Discussions with math teachers, of various grade levels, brought out one consistent observation. Each year, students need to be retaught math concepts that they have been previously taught but have forgotten. With the ever-expanding curriculum of material that teachers need to cover over the course of a school year continually growing, it becomes plausible that not enough time is spent on material for it to be internalized and truly learned, for the long term. The amount of material to be covered will not likely decrease, so what can be done to help the instruction that does take place be more effective? What can be done to help students retain information and be able to recall and use it when needed? My Action Research project evolved to answer the question: *Would using music improve math skill acquisition and retention?*

Review of Literature Review

Introduction

A common complaint among math teachers is that students do not know, remember or have sufficient mastery of material they have previously been taught. The solution to the lack of skill, knowledge and retention becomes time consuming due to re-teaching or remedial teaching that needs to take place before the current curricular material can be taught. Traditional instructional methods of reading a textbook and solving problems solely through paper and pencil prove insufficient for many students to learn and retain mathematical concepts. As Gardner (2004) states, “for the auditory or kinesthetic learner, the textbook explanation does not match their learning style” (p. 26). The need for alternative instructional methods and learning strategies is necessary to increase the learning of those students who have not been successful when previous instructional methodologies have been used. Traditionally, students are taught in a more mathematically linguistic fashion that overlooks other types of intelligences in which they may be stronger (Özdemir, Güneysu, & Tekkaya, 2006). This literature review examines research regarding math skill levels, the need for instruction to match learning styles, how music impacts learning, and using music in the math classroom.

Math Skill Levels

Witzel (2007) states that according to the National Assessment of Educational Progress (NAEP National Center for Education Statistics, 2005), only 2% of US students reached the advanced achievement level in mathematics by 12th grade. In the 2003 report, almost one third of 8th grade students scored below the basic level. This information indicates there is a problem in learning retention in the area of mathematics. “It is clear that there is a need to develop more effective mathematics instructional procedures, curricula and materials for low performing students with and without disabilities” (Witzel, 2007, p.14). Students receive instruction and assessment in mathematics; however, the internalization of the material is questionable (Singer, 2008). Internalization is what enables the continuum of growth to continue, building upon prior knowledge. Özdemir (2006) notes

that students prefer math in the early elementary grades, but skills decline after 4th grade. There is a need to find ways to improve mathematical retention. Lock (2006) found that music strengthens connections among neurons because it is processed in both hemispheres of the brain and it stimulates cognitive functioning. According to Moreno (2009), scientists have found that music can change the brain physically and how it performs.

Instruction and Learning Styles

Traditionally, as stated by Özdemir et al (2006) verbal-linguistic and logical-mathematical intelligences were the primary intelligences addressed in education. Multiple Intelligence theory used to develop instruction to match teaching methodology to student learning styles encouraged development of multiple intelligences and embraced student diversity. The utilization of only one or two intelligences in teaching disadvantaged the students whose strengths were in other intelligences. The learning needs of all students in the classroom and the utilization of approaches, which enabled diversification, needed to be addressed by the teacher. However, Olson (2006) stated that students taught by a preferred learning style became overconfident in their ability and performed at a lower level on assessments taught in a format they didn't prefer. When the format was perceived as easier, less effort was used to try and learn the material. When the format was perceived as more difficult, the students put forth more effort to learn the material and there was a higher degree of success on assessments.

Moroye (2009) pointed out that teachers should try to create the best classroom learning experiences they can in order to provide the best type of education. The utilization of multiple senses may increase engagement in the classroom. He also continued the discussion with conclusions that when students cared about their education, they learned more. This was accomplished by connections developed between the material taught and students' life experiences. The connections built meaning. Constructivist teachers "create an environment in which learners can construct, develop, and extend students' mathematical view of the world" (Duartepe-Paksa, 2009, p.272). The author continued to explain that students, who learned mathematics with an infusion approach, utilized a variety of methods and mediums and went on to have better achievement scores immediately after instruction in delayed assessments than those in groups who had participated in more traditional instruction.

Using Music to Support Instruction

Evidence is clear that there are many benefits of using music as well as many means of incorporating it into instruction. In a Curriculum Review article (2007) "A Little Bit of Rhythm & 'Rithmetic", references are made to studies of music education on a variety of areas including math skills and spatial sense, among others. Results are not concrete but do indicate music helps memory. According to Singer (2008) music increased the chance students had to learn, with music having been a strategy to assist in the recall of information. In early grades, especial kindergarten, music was an integral part of the

classroom environment. It was a means for teaching, as with the alphabet, which welcomed students to the classroom, assisted with transitions between activities, and created an atmosphere of fun, relaxation, and readiness. Barker (2008) discussed how music brought more to learning. Lyrics make the lessons seem cool and fun. Lyrics were also able to deliver a positive message about doing well in school. According to Binkiewicz (2006) “Songs are powerful pedagogical tools that enliven a classroom and enhance student learning in an enjoyable manner” (p. 515). Binkiewicz (2006) continued discussing the idea that the creation of a positive and enjoyable atmosphere helped develop a feeling of inclusion for students and had learning value for them. The words and tunes the teachers used were a good way to assist students in the recollection of material they had been taught. When students utilized music in learning, positive results occurred in achievement. Music showed positive impacts on achievement. The connection between music and cognitive benefits, especially in math skills, was generally traced to the ancient Greek, Pythagoras, who in the fifth century B.C.E. suggested that mathematical relationships were integral to physical properties, including those in music (Southgate and Roscigno. 2009). Aside from a teaching tool, music benefitted students in other ways. Paquette and Rieg (2008) stated, “music can also improve listening and oral language development, improve attention and memory, and enhance abstract thinking” (p. 228). Increases in attention and listening brought the benefits of music to every subject, as well as helped improve classroom behavior. These authors also recognized the environmental transformation of classrooms, which supported students’ academic, social, and emotional success. There were many ways to incorporate music in math instruction. Singer (2008) suggested having students write songs and music for them to remember information. The author also suggested that students write math facts in poetry form. Facts written in poetry form made it easier to create a song with the words. Pariakian and Lerner (2010) observed that patterns could be practiced with music. Students built stronger life connections, increased knowledge retention and their understanding of numbers through pattern recognition.

Conclusion to Review of Literature

The literature showed the positive impact music had on student learning. There were also distinct findings, in which math skills were an area that needed fortification in order for achievement skills to be above the basic level for a greater number of students. The literature supported the use of music in math instruction to increase knowledge retention in order to have a positive impact on student achievement on immediate and future assessments. The findings provided encouragement for the creation of positive learning environments which utilize music in multiple ways to develop learners; actively engaged in their math instruction, having created lyrics and music, to make connections between the music, their learning and lives. Another insight the literature illustrated was the positive effect of music, increased attention and listening, that generalized into other areas of learning, which resulted in a more positive school experience for students. With these results, the use of music is a natural and welcoming medium in which to present and enhance mathematical instruction.

Methodology

My targeted audience is a class of 18 fourth graders. Included in this group are 7 students with specific learning disabilities and 2 students with a primary language of Spanish. Out of 4 fourth grade classes, the lowest students have been placed in this classroom. I am team-teaching math to these students with their regular education teacher. The math class is being taught during a one-hour period, right after a specials class (gym, music, art). It is the first core academic class of the day for the class and takes place from 8:50 -9:50 in the morning. When a new unit is being prepared for instruction, a few key concepts, definitions and/or formulas are chosen to be developed into a short, melodic song that will be taught to the students. It is important to choose a few items to teach with songs because of time constraints and with the understanding that students learn in different ways. Only utilizing music would exclude this understanding and possibly make learning more difficult for some students. The song(s) are taught to the students right after the concept, etc. are introduced. The students will practice the song(s) regularly, during the course of the unit. Prior to taking the assessment for the unit, the songs will be sung. Before the first math unit of the year began (Sept 8.), a survey was conducted to see if students liked math, felt they could use more help during math, and if their teachers had used music in the classroom. On a daily basis, the regular education classroom teacher and I reflect on the lesson previously taught, the lesson that is prepared for that day, and the receptivity the class and individuals are demonstrating with the material. The students sing the songs I have taught them 2-3 times a week. Several of the students regularly ask to sing the songs. It was a student suggestion to march around the classroom singing the first song that they were taught, "Math Rules!" When a new song is taught, I have the words displayed on the classroom SmartBoard. I sing it first (1-2 times) and then teach the students. The song is then practiced daily for about a week, as we progress through the unit. After the first week, the song is practiced, as a class, once a week. It is then reviewed and sung again before the unit test.

Results

Data was collected from observations, a pre-test and unit test. As the unit was taught during cycle 2, my team-teacher and I had daily conversations about how the class was progressing in their demonstration of understanding the material through assignments, class work and class activities. Only two new songs were taught because it was a shorter unit, but the previously learned songs continued to be utilized to reinforce the material. It made sense to follow this pattern due to the cyclical format that the math curriculum follows. The students in my class increased their assessment scores from an average of 21% on the unit pre-test to an average of 81% on the unit test. This showed an average increase of 57.7%. The comparison class scored an average of 40% on the pre-test and an average of 87% on the unit test, showing an increase of 47%. The gains of the students in my group were 10.7 percentage points higher than the comparison class. This is an increase from the 6 percentage points higher gain than was shown in cycle 1, showing a continuation of the trend.

Conclusion

My Action Research Project results showed positive results, reflecting what the literature showed, helping me to conclude that the use of music in math instruction produces greater gains than instruction without music. However, as my research has ended for this cycle, I have had to reflect on a distinct difference between the class I worked with and the comparison classroom. My group was taught using music to teach formulas and rules as a memory helper. Two teachers, as opposed to a single classroom teacher, also taught them. As much as we strove to act as a single teacher in methodology and style, there were still two teachers in the room at all times. So my results are inconclusive, to some extent, because of that difference, in addition to the music, when compared to other classrooms. I might try to conduct another cycle with instruction by one teacher so that I can more distinctly determine if it was the success factor, or the music.

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