COMPARING TWO APPROACHES FOR TEACHING RHYTHM READING SKILLS TO FIRST-GRADE CHILDREN: A PILOT STUDY

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Introduction

The long-term goal of many music programs is to help students become proficient, at least at an elementary level, with reading, writing and performing musical notation.   Jacques-Dalcroze (1921) believed that the primary function of rhythmic education is to make it possible for children to play, create symbols for, and perform rhythms from those symbols. The National Standards for Music Education, adopted by MENC in the 1990s (MENC, 1994), includes Content Standard 5: Reading and Notating Music. The K-4 achievement recommendations state that students should be able to "read whole, half, dotted half, quarter and eighth notes and rests in 2/4, 3/4 and 4/4 meter signatures" (standard 5a, p. 14), and "use standard symbols to notate meter and rhythm . . . in simple patterns presented by the teacher" (standard 5d, p. 14).

First grade appears to be an appropriate place to begin experiences with reading some form of rhythmic notation. Davidson and Colley (1987) found that while pre-kindergarten and kindergarten children were more likely to be able to attend to either pulse or pattern, most first graders were able to recollect both. Gembris' (2002) review of rhythm studies found that children age five and older are able to handle rhythms within a steady meter. Anderson and Lawrence (2001) found that children in grades one and two can read and create simple music notation. Campbell and Scott-Kassner (1995) concluded that a child in first grade is capable of distinguishing

between long and short, and can perform, read and write rhythms using quarter, eighth and half notes. So how does one begin?

Given that it is appropriate to perform, read and write simple rhythms in first grade, how should the process begin? In learning any aspect of music, the musical sound/concept must be experienced and internalized before it is labeled and children begin to manipulate it symbolically (Petzold, 1966). Though many approaches and methods books (e.g., Choksy, 1999; Frazee & Kreuter, 1987, Campbell & Scott Kassner, 1995) may agree that sound comes before symbol, there is a wide variance of how, and how quickly, one gets from "rote" to "note."

Persellin (1992), found that first graders performed rhythm patterns more effectively when visual icons were linked with auditory sounds or kinesthetic motions. Some approaches use verbal syllables, including counting numbers (one two three and four), or syllables (ta ta ti ti ta) or words that fall into simple rhythms (pear pear ap-ple pear, or walk walk run-ning walk). (e.g., Choksy, 1999; Frazee & Kreuter, 1987, Campbell and Scott Kassner, 1995). Hand movements or body movements are sometimes employed to show notes of different durations. The musical symbols are linked with these activities. Many pedagogical approaches recommend such multi-modal learning approaches (hear, see, move and say) for more effective learning, among then Kodaly and Orff (e.g., Choksy, 1999; Frazee & Kreuter, 1987).

One commonality these approaches share is beginning with the quarter note as the basis of the beat. The eighth note is approached as an equal subdivision of the beat.   Both of the researchers taught beginning rhythmic and notation skills in the public schools for many years based on this approach, labeled from here forward as the Subdivision Approach, not questioning its validity as the most effective method. Most approaches continue to do so.

As musical rhythms have an aspect of mathematical proportionality, it may be instructive to compare the learning rhythms and math. Cognitively, one would not begin with division or subdivision in teaching basic math. Rather, math instruction begins in the preschool and early grades with addition. Division, as a mathematical concept, is not approached until third grade in many school curricula (National Council of Teachers of Mathematics, 2000). Following this math parallel, why should the understanding of rhythmic relationships begin with (sub)division, a relatively complex concept?   Might a more effective method of rhythmic reading begin with simple addition as well?

As part of her "Generative Theory of Music Learning," Eunice Boardman (1988a, 1988b) proposed an approach to music learning and literacy from an addition-based approach. In her "Additive Approach" to learning rhythmic reading, she proposed that learning rhythm should be based on the underlying shortest sound. This is not a new concept. Records of Greek music-making talk about "chronos prontos," the smallest unit of musical time "by which all other lengths were measured" (Warner, 1991, p. 15). Adding shorter sounds together becomes the basis for all longer durational values.

For example, if we were working with a simple chant made of quarter notes and eighth notes in 4/4 time, the eighth note becomes the shortest sound, the building block for the rest of the example. In this case, the eighth note and the quarter note represent a relationship of 2:1 (two short sounds to the long sound, or two eighth notes to one quarter note). Longer durations are based on the shorter sound as well. In this example, the half note would be 4:1. If a quarter note is the shortest sound in a rhythmic example, it then becomes the basis of the durational relationship with the longer notes: the quarter note would be 1:1, the half note would be 2:1, and the whole note would be 4:1.

Boardman's Additive Approach also incorporated Jerome Bruner's (1966) assertion that in order to learn a concept, one must engage a new concept through three modes in the following order: enactive, iconic and symbolic. The enactive mode involves experiencing the concept directly. The iconic mode involves manipulations of visual representations, "icons," that in some way look like or inherently represent some property of the concept. The final symbolic mode involves the use of generally agreed-upon symbols to represent the concept; symbols rarely have iconic properties to them. According to Bruner's theory, the iconic step is fundamental to understanding and retention. Its absence may be a reason that some children find difficulty in remembering and interpreting rhythmic notation.

Iconic learning in the Additive Approach is done with rhythm icons, bars that are constructed in durational proportion to one another. Using short and long sounds, the short sound will be the building block, and the long sound will be twice as long. Rhymes and songs with these two durational relationships can be experienced at the enactive level first. For the enactive mode, Boardman suggests that children verbalize the syllables "short" and "long," tipping the fingertips together for shorts, and sliding the palms past each other for the longs. Next, the icons can be used for recognition, recall, manipulation and composition. Finally, the symbols can be added above the icons as learning continues, helping to attach the iconic understanding to the symbol.

Boardman's additive method has been advocated as part of her larger Generative Theory of Music Learning, and its influence can be seen in the general music series textbooks she helped author. However, as Costanza and Russell (1992) noted, there is a need to build a "foundation of research that verifies the effectiveness" (or ineffectiveness) of Boardman's approach. It was the authors' desire to add to such research.

In this pilot study, we were concerned with finding a useful way to compare the Additive Approach to rhythmic learning with a more traditional Subdivision Approach with first grade children. Apart from a few studies (e.g., Shehan, 1987; Palmer, 1974), there has not been a great deal of study in the area of young children learning to read rhythms effectively, and most studies comparing different approaches have involved older students. Costanza and Russell (1992) surveyed research regarding different learning approaches, and concluded that studies that compared different methods found no significant differences, although some gain

score differences were noted. The overall conclusion often was that any method, employed effectively by an enthusiastic teacher, can be effective. While other aspects of rhythm reading have been explored, a study comparing the Additive Approach with the Subdivision Approach was not found, nor has the iconic level been explored in conjunction with learning to read rhythms.

In this section, we have seen that it is appropriate for first-grade students to be involved in beginning activities with reading, writing and performing simple rhythms. Teaching can involve rhythmic speech, songs, and movement. Many approaches involve sound before symbol, and most take a Subdivision Approach to rhythmic reading. An alternative approach has been suggested where rhythmic relationships are experienced through an Additive Approach, including the use of icons. The purpose of this study is to explore a method of comparing the effectiveness of the Additive Approach and the Subdivision Approach.

Purpose of the Study

This pilot study compared two approaches, the Subdivision Approach and Additive Approach, for teaching rhythm reading skills to first-grade children. Four research questions were explored: 1) Will within-group pretest and posttest scores indicate that learning took place with both approaches?   2) Will between-group posttest scores indicate a significant difference in the scores of the two groups? 3) Based on Research Questions 1 and 2, does it appear that one method may be more effective? 4) Is the research design effective for exploring the first three research questions? It was hoped that the answer to the last question will inform further research in this topic.

Subjects

Two intact classes of first-grade students from the same private school were used as subjects for the study. There were 28 students in Class 1 (13 girls, 15 boys), and 28 students in Class 2 (12 girls, 16 boys). The students had not received music instruction in school during Kindergarten other than singing songs with their regular classroom teachers.   The level of music instruction outside of class was not determined. While the classes were not matched through testing, the school itself tried to balance the two classes (the only first-grade classes in the school) as far as academic ability, gender and diversity, so we can assume some parity, although we cannot demonstrate it.

Method

Through a random process, Class 1 was assigned to the Additive Approach, and Class 2 was assigned to the Subdivision Approach. From this point on, the two classes will be referred to as Additive Approach and Subdivision Approach. The study took place during the first weeks of school and served as the first music experiences of the year for these students.

One of the researchers met with the children a total of 8 times over a 4-week period. In the first and last meetings, the researcher met with individual students to administer the pre- and posttests, respectively. In between, the researcher (a former elementary general music teacher, presently a university elementary general music methods teacher) taught six lessons to the two classes. The lessons used the same songs, chants, listening and rhythm reading activities, varying only the approach—subdivision or additive.

A 10-item pretest was devised (see Figure 1). In 4/4, each item is a 4-beat rhythm. Items 1-6 and 8 are common rhythms used in first-grade songs and chants using combinations of eighth and quarter notes. The class activities that followed the pretest included these rhythms. The researchers also wanted to see what would happen when something more complex and not presented in class was included. Therefore, items 7, 9 and 10 split the usually paired eighth-note rhythms with a quarter note, creating syncopated rhythms, something not usually taught in first grade, and not approached in the researcher-presented lessons. Item 8 used paired eighth notes again. It was placed after the first syncopated rhythm to go back to something the children would likely find easier.

Figure 1. Pre/Posttest Rhythms

Once the ten rhythms were decided upon, a version of the pretest was created for each approach using corresponding rhythm icons. The Subdivision Approach used picture icons for each note, in this case, a big elephant for a quarter note, and a smaller elephant for each eighth note (see Figure 2). The use of picture icons for learning to read simple rhythms was introduced several decades ago in Mary Helen Richards' *Threshold to Music* (1964), and is still employed in some music series books. For example, *The Music Connection* (Grade 1, Silver-Burdett Ginn, 1995) uses big and little engines, big and little umbrellas, and big and little clouds to teach simple rhythm

reading (pp. 69-70). *Share the Music* (Grade 1, McGraw-Hill, 1995) uses big and little shoes (p. 25). Students in the Subdivision Approach used the picture icon version of the pretest. These same icons were used in the instruction that followed.

Figure 2. Pre/Posttest Phythm #5 in Picture Icons

The Additive Approach version of the pretest was written out using bar icons (see Figure 3). The length of the bar icons is proportional. The short sound is the basic unit, therefore the shortest icon (one shortest sound equals one note, or 1:1). The long sound is equivalent in duration to two shorts sounds (two shortest sounds equals one note, or 2:1), so the icon is twice as long as the one for the short sound. Students in the Additive Approach used the bar icon version of the pretest, and bar icons were used in their music classes.

Figure 3: Pre/Posttest Rhythm #5 in Rhythm Icon Bars

At the individual pretest session, each child was asked to say the rhythm syllables and do the hand movements for each item on the test. After the initial explanation of what to do for the Subdivision Approach subjects, the examiner said: "Do number 1 for me. One two read-y go [said in this rhythm to set up the quarter note beat: ♩ ♩ ♪ ♪ ♩]. Do number two. One two read-y go", and so on. For the Additive Approach subjects, the examiner said "One and two and read-y go and" (said in this rhythm to establish the eighth note as the pulse: ♪ ♪ ♪ ♪ ♪ ♪ ♪ ♪) for each test item.

The same testing procedure was followed for the posttest as well. The pretest was used as the posttest for the respective groups with the respective icons.

The students' performances on the pretest and posttest were videotaped. The first two items on the tests (#1 - four quarter notes, #2 - eight eighth notes) served as "warm ups" and were excluded from scoring since they did not include durations of different lengths. Each of the 8 remaining items (#2-10) was rated for accuracy of durational relationships on a scale ranging from zero to 3, zero meaning a student's performance did not demonstrate correct durational relationships, and 3 meaning that the subject performed the durational relationships without error. Rhythms 7, 9 and 10 involved syncopated rhythms. Syncopated rhythms were not taught nor seen in the class sessions

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The two researchers worked together to standardize their evaluations using the 4-point judgment scale (0-3), then independently judged the 56 subjects' responses to the pre- and posttests. They met thereafter to identify scoring differences and clarify standards, after which each judge reviewed scores once more. Once scores were tabulated, inter-judge reliability was computed, and descriptive statistics were examined. Since the n was small, it was decided to use a t-test for correlated means (two-tailed test of significance), as recommended by Borg and Gall (1989). To allay any concerns about the score distributions in the data, the nonparametric counterpart to the t-test was also calculated. If the results of the two tests do not differ substantially from one another, greater confidence can be given that the more stringent assumptions of the t-test have been met. The p level was set at $<.05$.

Results

Inter-judge reliability ranged from .87 to 1.0 (average .91) on the pretest items, and from .92 to 1.0 (average .97) on the posttest items. Overall inter-judge reliability for both tests was .94.

Table 1 presents descriptive statistics for the Additive Approach Group. The reader is reminded that the maximum average score possible is 3.0. Table 2 presents the same data for the Subdivision Approach group. Average scores were rounded up to the nearest hundredth. Pre- and posttest information is given first. The next two items split the 8-item posttest into two parts: the 5 items using only eighth- and quarter-note rhythms (pre- and posttest item numbers 3-6 and 9; and the three items that presented syncopated rhythms (items 7, 9 and 10).

Table 1. Average Scores for Additive Approach Group (maximum possible score = 3.0)

	N	Minimum Score	Maximum Score	Mean	Standard Deviation
Additive Pretest Scores	28	.00	1.06	.20	.34
	28	.75	2.94	2.04	.61
Additive Posttest Scores	28	.60	3.00	2.43	.67

	N	Minimum Ave. Score	Maximum Ave. Score	Mean	Standard Deviation
Additive 5-Item Scores	28	.00	3.00	1.36	.83
Additive Syncopation Scores					

Table 2. Average Scores for Subdivision Approach Group (maximum possible score = 3.0)

	N	Minimum Ave. Score	Maximum Ave. Score	Mean	Standard Deviation
Subdivision Pretest Scores Subdivision	29	.00	1.19	.16	.32
Posttest Scores	29	.00	2.13	1.18	.69
Subdivision 5-Item Scores	29	.00	3.00	1.71	.96
Subdiv. Syncopation Scores	29	.00	.67	.33	.27

The results of a series of paired-samples *t*-tests (two-tailed) are presented in Table 3, and the results of the Wilcoxon Signed Ranks Test are presented in Table 4. The results of the two statistical tests are essentially the same: the pretest differences between the groups are not significant, while the other pairings are statistically significant.

Table 3. *t*-test results for Additive Approach and Subdivision Approach

	t	df	Significance (2-tailed)
Add. Pretest – Sub. Pretest	.451	27	.655
Add. Pretest – Add. Posttest	-15.191	27	.000
Sub. Pretest – Sub. Posttest	-7.767	27	.000
Add. Posttest – Sub. Posttest	5.204	27	.000
Add. 5-Item Scores – Sub. 5-Item Scores	3.336	27	.002
Add. Syncop. Scores – Sub. Syncop. Scores	6.205	27	.000

Table 4. Wilcoxon Signed Ranks Test results for Additive Approach and Subdivision Approach

	Z	Significance (2-tailed)
Add. Pretest – Sub. Pretest	-.850	.395
Add. Pretest – Add. Posttest	-4.623	.000
Sub. Pretest – Sub. Posttest	-4.320	.000
Add. Posttest – Sub. Pretest	-3.860	.000
Add. 5-Item – Sub. 5-Item Scores	-2.969	.003
Add. Syncopation Scores – Sub. Syncopation Scores	-4.182	.000

Discussion

Although efforts were made by the school to balance the two classes, as stated earlier, it cannot be assumed that the two intact first-grade classes are equivalent for the purposes of this study. The researchers concede that generalization beyond sample cannot be made with confidence. With that caveat, the research questions will be treated in order.

Question 1 *Will within-group pretest and posttest scores indicate that learning took place in both approaches?*

Converting scores into percentages, the gain of 23 percentage points from the pretest to the posttest for the Subdivision Approach was shown to be significant, as was the gain of 61 percentage points for the Additive Approach. The posttest scores for the non-syncopated items showed that students were able to decipher the rhythms 57% and 81% of the time respectively. Indeed, it appears that learning did take place with both approaches.

Question 2 *Will between-group posttest scores indicate a significant difference in the scores of the two groups?*

Both the *t*-tests and the Wilcoxon Signed Ranks Test confirmed that there were significant differences between the scores of the two groups. In every case, the Additive Approach students scored significantly better than the Subdivision Approach students. Table 5 presents comparisons of percent correct on the different aspects of the study for each group.

Table 5. Comparison of Percent Correct for The Two Approaches

	Pretest	Posttest	5 Non-syncopated Items	Syncopated Items
Additive Approach	7%	68%	81%	45%

Subdivision Approach	5%	39%	57%	11%

The answer to question 2 is that the posttest scores indeed show that there were significant differences in the posttest scores of the two groups. Considering syncopated rhythms are not usually introduced until later grades (e.g., third grade in some books), the high scores for the syncopated items for the Additive method is encouraging. The generative aspect of the Additive Approach referred to by Boardman (1988a, 1988b), which fosters future learning by giving students the understanding necessary to decode new problems, appears to be confirmed in this group. It is interesting to note that the combined posttest score for the Additive Approach is higher than the non-syncopated posttest score for the Subdivision Approach.

Question 3 *Based on Research Questions 1 and 2, does it appear that one method may be more effective?*

Given that we cannot show that the two groups were equivalent, we can only say that the Additive Approach appeared quite effective for this group. The Subdivision Approach was also able to move children forward in rhythmical understanding but not as far as the Additive Approach.

Since the school tried to balance the two classes as far as academic ability, gender and diversity, it is possible that we can assume some parity although we cannot demonstrate it. It may be, therefore, that the significant differences can be attributed more to the teaching approach than the differences that may exist in the children. The teaching experiences themselves may also have had an influence on the differences in achievement, although every care was taken, as explained earlier, to use the same concepts, musical materials, and order, varying only the rhythm syllables and the approach to the beat.

If indeed the Additive Approach was more successful than the Subdivision Approach, one must wonder why. In some way, the combination of rhythm bar icons, and the words "long" and "short" in the Additive Approach were more effective than the combination of different-sized picture icons, and the words "walk" and "running", in the Subdivision Approach. Because they were combined in each approach, it is not possible to determine with certainty whether the icons, syllables or approach to the beat were more important. However, in agreement with Boardman (1988), it appears that the rhythm bars were more successful than the picture icons. This may be because the bars visually represent more accurately the durational relationships of eighth notes (1:1) and quarter notes (2:1). The big elephants and little elephants may be less effective because they encode small and large, more than short and long. In the researchers' experience, children are more likely to clap the small and large elephants interpreting them to represent soft and loud on first exposure. Perhaps if the picture icons were the same height, but wider or narrower, they would be more effective in conveying duration.

Also, the words *short* and *long* appeared to be more successful than *walk* and *running*. This was especially true when the eighth note was split into syncopated rhythms in test items 7, 9 and 10. Students in the Additive Approach scored much higher on these three rhythms than the Subdivision Approach students. This may be because each word "short" belonged to one rhythm bar, and, although the students were exposed to 2 shorts next to each other in every case, each was a complete word and a single unit, whereas "run-ning," though it has two syllables, is only a complete word when you put both syllables together. The Additive Approach, by its nature, views the shortest sound as the basic building block, so when students encountered the syncopated rhythm, they were able to more successfully generate a correct response. It may be that an approach that uses addition is more easily understood because children employ basic addition from a very young age. Subdivision of the beat involves a more complex mathematical process; division is not usually explored in depth until the third grade.

The differences between mean scores for the two groups were sizeable and encouraging. The results show that further study of the effectiveness of the Additive Approach is merited.

Question 4   *Is the research design in this pilot study effective for exploring the first three research questions?*

The major weakness in this particular study was that the two classes could not be shown to be equivalent groups. In a future study, a measure of musical aptitude such as Gordon's (1982) *Primary Measures of Music Audiation* might be employed. In order to strengthen the effectiveness of the design, a larger sample that can be randomized should be used. The pretest and posttest design was able to provide a great deal of data for analysis. In a larger study, ANOVA would provide a more appropriate measure of statistically significant differences. Paralleling the teaching experiences in every possible way while employing the Additive Approach or Subdivision Approach seemed to work well. It would be good for an outside authority to observe videotapes of lessons for the two approaches to certify that there were not significant differences in the teaching that caused differences in the results.

Using the assessment scale of 0-3 seemed to work well with the statistical tests. The calibration of the two judges and the high interjudge reliability scores indicate that this method was useful.

Conclusion

The results of this study indicate that, for this particular set of subjects, the Additive Approach was more successful than the Subdivision Approach in this rhythm reading task. Of particular interest was the fact that the Additive Approach prepared students to more successfully decode and perform syncopated rhythms seen only in the pre- and posttest. The research approach that was employed appears, with modification, to be a useful one that may successfully be employed in a larger project. Although the results of this particular study cannot be generalized to a larger population, the positive results indicate that further study is merited.

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