

CHILDREN WITH SPECIAL NEEDS COMPOSE USING MUSIC TECHNOLOGY

Kimberly A. McCord
Illinois State University

In this study, elementary school children with special needs participated in an after school program using music technology to compose music. The purpose of this study was to help music educators discover more efficient methods of adapting for special needs children in the music classroom. The children in the study were observed over one semester in weekly sessions. Multiple sources were used for the gathering of data, including: (a) videotapes of students as they composed, (b) student interviews and reflections, (c) the students' compositions, and (d) on and off task behavior as observed and noted by the researcher. Observations were triangulated with parents, special educators, and the music teachers in the school. Children with learning disabilities were able to do their best when presented with learning and creating music in a multisensory learning environment. Often the better functioning modes of learning helped the child compensate for the dysfunctioning modes.

The Individuals with Disabilities Education Act (IDEA) of 1990 (PL 101-476) is the current law educators refer to in designing inclusive classrooms. Under this law all children with special needs shall have an individualized education plan (IEP) which means that all educators must make adaptations which will include the student with special needs in classroom experiences. In addition, children with special needs, when placed in the least restrictive environment will access good quality education and have opportunities to associate with nondisabled students.

School administrators, parents, and special educators often view the music classroom as a place where children with all types of disabilities can easily be integrated with nondisabled students. Music educators are, for the most part, able to adapt their classrooms to meet the needs of students who are visually impaired, educable mentally handicapped, emotionally disturbed, physically disabled, or hearing impaired. However, a review of research literature revealed few articles related to children with special needs in music. Several publications from the past twenty years have been helpful to music educators with suggestions of methods to adapt for these children with special needs (Atterbury, 1990; Clark & Chadwick, 1980; Humpal & Dimmick, 1995; McCoy, 1982; Schaberg, 1988; Scripp & Meyaard, 1991; White, 1982). In general, adaptations that work in academic classrooms apply equally to music classrooms. For example, children with developmental delays benefit from repetition and established routines. It is not clear if adaptations are necessary and applicable for children with learning disabilities in music. It is not known if some types of learning disabilities cross

over into music. For example, do children with dyslexia have difficulty reading music notation as they do words?

Adaptations for children with learning disabilities have been addressed by researchers (Atterbury, 1986; Frisque, Niebur, & Humphreys, 1994; Gfeller & Hedden, 1987; Gilbert & Asmus, 1984; McCord, 1999/2000; White, 1984). However, children with learning disabilities cannot be viewed as a group when applying adaptations. Although these researchers made some recommendations for various types of children with learning disabilities, a void still exists in our understanding of how children with learning disabilities function in music. No two students with learning disabilities are alike in type and degree of disability. Each child must have custom adaptations to ensure the best possible learning environment.

By observing children with learning disabilities compose, McCord (1999/2000) found that learning disabilities did interfere with music learning. Four children with different learning disabilities were observed as they composed. In some cases the child was able to compensate for a dysfunctioning method of learning and use a different mode of learning. In a multisensory learning environment afforded by music technology, children used visual, aural, and kinesthetic modes almost simultaneously. In some cases the learning disability interfered to the extent that the child was unable to understand certain musical concepts.

Surveys of music teachers regarding their readiness to teach children with special needs indicate that they consider their training to be inadequate (Atterbury, 1986; Frisque, Niebur, & Humphreys, 1994; Gfeller & Hedden, 1987; Gilbert & Asmus, 1981, White, 1984). The most recent of the surveys reported that 94% of the music educators who responded to the survey had been asked to teach special learners but only 40% had received any specific training (Frisque, Niebur & Humphreys, 1994). Eighty-nine percent of the teachers lacked sufficient time and 69% lacked resources to create individualized instruction for students mainstreamed into their music classes. Seventy-two percent were not involved in the decision making process of placing these students in the music classroom. In addition, teachers complained of lack of support from school administrators.

In this research study, children with special needs in a suburban elementary school in Connecticut participated in an after school program using music technology to compose music. Participants in this study included children with various types of special needs (including learning disabilities). The purpose of this study was to help music educators discover more efficient methods of adapting for special needs children in the music classroom. By observing children composing music with music technology, the researcher was afforded a window into the children's minds.

Procedures

With knowledge of the children's abilities and disabilities, I documented when and if learning problems interfered with music understanding and learning. The special education team in the elementary school identified

children with special needs. Parents attended a debriefing meeting on the project and those who wanted their children to participate signed a release form. The children in the study were observed over one semester in weekly sessions.

Multiple sources were used for the gathering of data, including (a) videotapes of six students as they composed, (b) student interviews and reflections, (c) the students' compositions, and (d) on and off task behavior as observed and noted by the researcher. Videotaped sessions were used to check for periods of silence and sudden changes in compositional style (e.g., pounding on keys or exclusively using black or white keys). Silence in a student's composition (MIDI file) could be intentional or could be a sign of distraction or frustration. I used the videotape to check for possible reasons for silence and to determine if adaptations had been used to refocus the child after the silence.

After their session each child reflected on their compositions from the session. Occasionally students described frustration with the software or hardware. This was noted and adaptations were tried in the next session. The student compositions revealed a great deal about how the child understands music. For example, some student compositions included periods of physical playing such as playing clusters of keys very loudly or alternating between the lowest key and the highest key on the keyboard. Often there were signs of frustration in attempts at composing music that related to the task suggested by the software. Different learning problems made it difficult to compose as a function of integrating ideas from the current unit.

Children with special needs frequently are distracted, particularly when they become frustrated. Distractions were noted by length of time on task and how the student was brought back to task. Often there were points when adaptations were implemented, or decisions when the appropriateness of particular software programs were ascertained. Data were triangulated through discussion with parents, special educators, regular educators, and music educators at the school.

Materials

The following CD-ROM and software programs had integrated components that allowed students to compose music: *Music Mania* (1999), *MusicShop* (1997), *MusicAce* (1996), *Making Music* (1997), and *Rock, Rap' n Roll* (1995). At the time this research was conducted, these programs were the primary programs available on the Macintosh platform that allowed children to compose music. The programs were designed for use by elementary-aged children. None of the software was designed specifically for children with special needs. During the study I evaluated how well these programs could be used by children with special needs.

Music Mania is a program created in HyperCard that guides children through five areas: melody, rhythm, timbre, texture, and dynamics. The program does not require that the students read music notation or play a keyboard well. Integrated within the program are guided compositional tasks

related to information the child learns in the unit. The program records all MIDI information and saves it in a separate MIDI file. The program directs children to write reflections on their experiences while composing. Hickey (1999) has programmed buttons that speak all of the text on the screen, and many musical concepts are explained via text, graphics, and animations.

Music Shop is a MIDI sequencing program. The program uses General MIDI sounds and is capable of displaying recorded music in either graphic notation or standard music notation. Children with some types of learning disabilities such as auditory processing problems may benefit from looking at music displayed graphically. Tempos can be adjusted and recorded music can be played back repeatedly. Children with memory problems benefit from having control over the number of times they hear the music. All the programs in this study allow children to listen to music repeated as many times as they wish.

Music Ace is a CD-ROM program with a guided tutorial that provides instruction in reading music notation. Games are integrated into the program to make it interactive. Students who have worked through the program can save their scores. Text is spoken by an on-screen cartoon character. Within *Music Ace* is a composition program called the *Doodle Pad*. In *Doodle Pad* children may choose notes and drag them to a music staff. The student can hear the pitches of the notes as they place notes of different durations on the staff.

The *Making Music* CD-ROM program has a variety of interactive games and musical exploration sections. In one area the child can re-arrange segments of well-known childrens' songs with segments of other songs. The child may paint a graphic display of sounds onto the screen in the composing section. The child can select instruments using a palette that displays pictures of instrument or sounds. The program functions similarly to art programs but the painted sounds can be played back.

The CD-ROM program *Rock, Rap 'n Roll* opens with menu of various styles of music that the child may choose from (Latin, Reggae, Blues, etc.). Once a style is selected the child may listen to short pre-recorded sound clips or drag and place the clips in any order. The child can improvise with the sequence of clips by pressing keys on the computer keyboard or clicking visuals on the screen. The resulting performance (song) can be recorded and saved.

Data Collection

I used information from the IEP to select composition programs for individual children to use. As the children composed they were observed to discern how their disabilities interfered with understanding and creating music. When it appeared that a change was necessary, I chose a new program for each child based on the IEP and the observations of their work with other software programs. As changes were made most students settled into a program that suited their learning needs the best. None of the students requested to return to an earlier program after changes were made.

Most students began with Music Mania because the program seemed to be the most appropriate for use with this particular group of children with special needs. Music Mania integrated a multisensory approach and had buttons that the child could click on to read onscreen text. The program broke tasks down into smaller ordered sections before asking students to compose. Music Mania saved files that listed amount of time spent on each screen, reflections on compositions, and work completed that day. Each time the child played the keyboard synthesizer, Music Mania saved the performance in a MIDI file. In one case, Music Mania was not used at all because the student's intellectual ability was so low.

I began by asking each student what kind of music he/she listens to at home and whether anyone in their family plays an instrument. I also asked a series of questions to determine what types of computer and piano keyboard skills the students had. We spent the first session getting acquainted with *Music Mania*. In this introductory section, students experimented with different timbres and recorded short compositions. These sessions lasted 30-60 min depending on how well the student stayed on task.

At the end of each session the students were guided by *Music Mania* to reflect on their compositions and what they had learned that day. *Music Mania* also allowed the child to save favorite compositions to a scrapbook. When students were not using *Music Mania* I asked them to talk about what they did during the session, including their favorite parts and parts that they did not like. Students saved compositions they liked either to the computer hard drive or to cassette tape. The following data were used to determine how learning problems interfered with musical understanding: (a) time spent interfacing with the software, (b) amount of time spent on each screen, (c) student reflections, and (d) MIDI files.

When *Music Mania* became frustrating to the child, another program was substituted. Frustration was displayed in a number of ways, depending on the child: rubbing the eyes, distractibility, and in some cases, refusal to continue. Selecting a new program allowed a different approach to composing. For example, some of the children in the study benefited from the kinesthetic feedback of moving the mouse up and down to paint high and low pitches on the computer screen.

At the end of the research project students were asked what they had learned, and they composed a final piece that was meant to integrate all of the concepts they learned. The students often presented a concert of their music to parents, teachers, and other students; and they talked about how they created their song and which things they liked best about their song.

Both during and after the study, I triangulated my observations with parents, special educators, and the music teachers in the school. We discussed how information learned from observing the child composing could be used to adapt to the child in and outside the music classroom.

Results

Many of the special educators decided to allow students to compose music and talk about it in their special education classes. Many of the students had trouble writing. Often, writing about their own compositions served as a motivation for students to write. Several parents purchased MIDI equipment for the children to use at home to compose music. The music teachers had several MIDI stations in the classroom and allowed all students the option to compose music as a way to assess understanding of musical concepts.

Tracey

Tracey, a 3rd grader with multiple handicaps, experienced delays in visual motor skills, fine motor skills, and academics. She sustained brain damage resulting from a brain tumor and many surgeries. Her full-scale IQ score was 70, which is low average. The adaptations listed in her IEP were numerous and included the use of (a) multisensory strategies for learning, (b) manipulatives, (c) tasks broken down into sequential increments, (d) one-on-one instruction to eliminate distractions, (e) visual cues to help her to complete tasks, and (f) the visual modality more than auditory channels. She had been observed exhibiting avoidance behaviors when a task became difficult. The IEP listed a number of strategies to help refocus and motivate Tracey when she became frustrated. Her strengths included concrete, familiar material, and her weaknesses were in motor/graphomotor skills, reasoning skills, and additional conceptual areas.

I chose *Music Mania* for Tracey's first program because of its multisensory approach. The program provided many visual cues to help her understand spoken directions.

Tracey had a difficult time reproducing steps and leaps on the keyboard (one of the first concepts taught in the melody section), because the task required fine motor skills. On the videotape Tracey was seen trying to coordinate her fingers to skip keys and she had difficulty producing leaps. Instead, she pounded with her hands on the keyboard and produced clusters. "Leaps are too hard!" She was also unable to coordinate soft and loud and fast and slow. She did enjoy experimenting with a variety of sounds and reflected on her favorite timbres, "I liked drums because there were more sounds," but had difficulty staying focused and completing recorded tasks suggested by the program. She seemed to not understand how to do the tasks and instead would do something totally different.

Tracey was not having success with *Music Mania* so *Making Music* was tried the following session. In the composition section Tracey seemed to enjoy painting the sounds but primarily she was interested in filling the entire screen with color and was unconcerned with how it sounded. She did not seem to understand that the painted screen represented sound. She used the program as an art program.

The next session she tried *Rock Rap 'n Roll*. Tracey was able to select and drag buttons into a new sequence. She remembered to use the play button to listen to her new sequence and she improvised on the computer

keyboard. She stayed focused and created a number of different songs in the program. She played her songs for her mother at the end of the session and left very pleased with the compositions she created that day. *Rock, Rap 'n Roll* was the most appropriate program for her.

Tracey's IEP had advised that "Her strengths were with concrete, familiar material and weaknesses in motor/graphomotor skills," and this did seem to translate to music composition. *Rock Rap 'n Roll* used a static screen with a minimum of things to do. There is no text to read or directions to follow. The sound clips are prerecorded and sound good. She could arrange them in an order she liked and play them back. In *Music Mania* she had difficulty playing the piano keyboard and following directions. She could not make connections between painted sounds in *Making Music* representing sound and instead focused on the concrete (colors and filling in the screen with color). "I like the way it sounds, it's all pink and green with some brown."

Mary

Mary was another third-grade child who was developmentally delayed. Her full scale IQ was 76 and she had trouble with verbal reasoning, auditory attention, concentration, and short-term memory. She also had a graphomotor weakness and difficulty processing visual motor tasks. Long term memory and use of language at a concrete level were her strengths. Mary needed tasks broken down into sequential steps with extended time to work. The IEP also advised that directions should be explained several times with constant checking for understanding.

Music Mania was used first because tasks in the program are broken down into smaller ones and the spoken directions can be repeated. She followed directions very literally and tried to duplicate screens where the piano keyboard keys highlighted as steps and leaps were played. She became frustrated when she had to remember what different buttons did. "I am done with this one! Let me go!" She also had trouble integrating previous ideas with new ones. Although she tried to duplicate playing high and low sounds, she had trouble understanding which direction high notes went and which direction low notes went. She was most successful remembering rhythms and had more trouble with melodies. She moved her body to the tempo and experimented with different tempos. "I can dance to that!" She stayed focused on the program and asked questions when she did not understand something. She frequently looked to me for approval and wanted to answer correctly and complete the tasks accurately. With help, she was successful in completing *Music Mania* and recorded songs with slow tempos using her favorite sound, the vibraphone. "I like the vibraphone best for my songs, I don't like any other sounds—just vibraphone."

Mary's IEP indicated she had strong long term memory and it appeared that slow tempos using the vibraphone sound were committed to long term memory, because she always stayed within those parameters. Because of her graphomotor weakness, she quickly learned that slow tempos were easi-

est for her to produce. The concepts she retained the best and used later were ones that were explained often and appeared each session. Using the sound “vibraphone” was a decision she made in almost every session. Tempo was another concept she had to consider each session.

Becky

Becky was a second-grader with a full scale IQ of 49 that placed her in the mild/moderately-retarded range. Her IEP advised using a multisensory learning approach with established routines that incorporated motor learning.

Becky started with *Making Music* rather than *Music Mania* because of her intellectual level and the need to repeat tasks many times. Moving the mouse to paint music in *Making Music* to create high and low would integrate motor learning. She preferred to imitate whatever I played rather than coming up with something unique of her own. She was fascinated with bird sounds and repeatedly clicked the button to play the bird sounds she painted on the screen, each time looking at me and laughing. *Making Music* has a palette of sounds, each represented by a picture from which children can choose. She did not know most of the instruments, but knew what a bird was and how it sounded; thus she consistently chose the bird sound. She was disappointed that there were no other animals in the palette. “I would like to make a cat sound like my cat Puffy.” Becky focused for extended periods on the visual compositions she created in *Making Music*. When she became bored she would announce “no more” and stop. My goal with her was to get her to recognize high and low pitches and make the connection of high and low sounds to what she was drawing. Most of the time she could recognize high pitches correctly but had trouble recognizing low pitches. She would guess “high” or say, “I don’t know.” Becky’s intellectual abilities made it difficult for her to compose music using the computer programs.

Thomas

Thomas was a second-grader with a full scale IQ of 78. The psychologist who tested him mentioned that because of his inability to focus, his scores were lower than his actual ability. He also had a diagnosis of Attention Deficit Disorder and was taking Ritalin. He had processing weakness, difficulties with visual motor integration, and relating parts to a whole. The IEP advised that tasks should be broken down into small sequential steps and presented in a multisensory method. Thomas responded best to adults in a one-to-one situation but exhibited some attention-seeking behavior when he became frustrated.

Music Ace was chosen because the screen was animated and changed quickly, which I thought might help Thomas stay focused. He was able to follow the directions and complete most of the exercises initially but after five minutes in the session, he began to exhibit impulsive behavior and clicked on responses before the directions were finished. In the videotape he was observed rubbing his eyes frequently and engaging in off-task behavior such as clicking the mouse in various places around the screen.

The next session, *Making Music* was tried in hopes that Thomas might be able to focus for a longer period of time. *Making Music* is more static and the student has more control over what happens in the program. He did not want adult help and instead insisted on doing things himself. He proceeded to explore all of the buttons and try everything without really focusing on creating a song. When I would try to focus him on completing tasks within the program he became agitated and yelled “No! I am doing this!”

Thomas’ parents related that he focuses best at home on fast moving computer games. It appeared during the sessions at school that Thomas was most interested in using the computer like he did at home, playing with interactive games. He did not seem responsive to using sounds or creating anything. He tried a number of programs but he never was able to compose a song. Although he was taking Ritalin, he did not seem to be able to focus and quickly became bored when the computer did not respond like a computer game. The parents and special educators mentioned that they were having the same issues with focusing Thomas: He was unable to stay on task except when he was playing his favorite computer games. The special educators expressed frustration with the parents—who were insisting that Thomas was ADHD. The Special Education team believed his inability to focus was oppositional/defiant behavior and that Thomas probably was emotionally disturbed.

Adam

Adam was a second-grader with a full scale IQ of 87. He was identified in his IEP as being learning disabled with weaknesses in auditory processing. He was also placed in developmental gym classes because of delayed motor skills. He was weak in expressive and receptive language skills and had difficulty following directions. His strengths were in nonverbal visual tasks. The IEP recommended a multisensory approach to learning with concrete familiar verbal tasks. Links between concrete and abstract concepts needed to be made for him. His long-term memory skills were weak but would improve with frequent repetitions. Short-term memory was also weak.

Adam began with *Music Mania*. He did not seem to understand written or spoken text and looked at pictures on the computer screen for cues for what he was to do. He was not able to discern high, middle, and low sounds and had great difficulty creating the tasks in the melody section. He frequently looked at me for praise or feedback. He tried his best but seemed baffled about what to do and often resorted to guessing.

The next session the rhythm unit was tried. As he heard different rhythms played by the computer in his headphones, he was easily able to imitate the rhythms on his own keyboard. He both played and clapped the rhythms and he was able to play rhythms in groups of twos and threes. He did not seem to understand the directions but was able to repeat the rhythms accurately. During the composition section he played randomly, since he did not have a rhythm cue to imitate.

He continued to struggle with concepts presented in the timbre, dynamics, and texture areas. On reviewing the MIDI files I noted that he was most successful when he could repeat non-pitched examples. He had the most difficulty repeating pitched examples and did not seem to be able to create anything but random notes during the composing section.

I eventually changed Adam's program to *Making Music* because I thought he might be more successful with a more visual interface. A game was used that focused on identifying sounds that were the same and different. He was not able to identify same and different and guessed each time.

In the composing area of *Making Music* he was able to paint high sounds and low sounds correctly. When asked how he knew which were high and low sounds, he explained, "high is here" (he showed me the mouse was at the top of the mouse pad) "and low is here" (at the bottom of the mouse pad). He both felt and looked at the mouse pad to identify high and low. He also could identify on the screen high and low by pointing at the high sounds at the top of the screen and the low sounds at the bottom.

Adam's IEP said that he had problems with any kind of auditory information. In consulting with the special education teachers they related that they thought he might hear auditory information in a monotone. If that were true it would explain his inability to hear high from low. He was unable to identify high and low pitches until he discovered another method of identification based upon how they felt and looked.

Discussion

In each case, knowing information from the IEP was very helpful in selecting programs for each child to use. Often suggestions for adaptations that classroom teachers should use also worked for the same children in music. It is critical that music educators have the information available from the IEPs when adapting for the child with special needs. There also needs to be discussion with the special educators and parents about behavior observed in music and if it is the same or different than behavior seen at home or in other classrooms at school.

As discussed in previous literature on adapting for children with developmental delays (Atterbury, 1986, 1990; Schaberg, 1988), these children seemed to do best with programs that required a minimum amount of things to remember and do. They had more difficulty completing the more complex tasks that *Music Mania* required, but could manage a program like *Rock Rap 'n Roll*. There is a real need for programs that better suit developmentally delayed children and for published adaptations to existing programs with information about how they can be used in the classroom.

Children with attention problems were impulsive and distracted from creating music on computers. Students with high frustration levels seem to do best with very short sessions that have high extrinsic rewards, such as scores or getting to play a computer game for on-task behavior.

Children with learning disabilities were able to do their best when presented with learning and creating music in a multisensory learning environ-

ment. Often the better functioning modes of learning helped the child compensate for the dysfunctioning modes. *Music Mania* worked very well for children with learning disabilities, which supports previous research (McCord, 1999/2000).

Observing children with learning disabilities compose music can be diagnostic. With knowledge from the IEP, the music educator can often determine if learning disabilities impact music learning by observing how the child navigates through a program like *Music Mania*. It is valuable to have other programs if *Music Mania* becomes too frustrating for the child. Adam had more success with *Making Music* because he was able to compensate by using kinesthetic and visual modes to place pitches.

Using videotape to check for the reasons for silence in MIDI files and to note sounds that occurred from frustration was very important. When listening to many of Adam's MIDI files, I noticed long periods of silence at the beginning and at various places between periods of sound. The videotape showed that when Adam was focused on what he was doing; he appeared to be thinking as he looked at the keyboard synthesizer before playing. He was never distracted or frustrated; instead, it was clear he was thinking about what he would play next. He would play short, random sounds and then pause as he thought what to do next. In his reflections after completing the composition he always expressed satisfaction with his composition and did not want to do it over.

Implications for Music Education

It is important that music teachers know who the children with special needs are in their classrooms. The music educators also need to know information in the IEP, including suggested adaptations, strengths and weaknesses, and signs of frustration. By observing how the student understands and creates music, the music educator gains a more holistic idea of what the child is able to do. For example, by observing Adam work in *Music Mania*, it was apparent that he was able to work best with rhythms that stay on one pitch. The music teachers in the school changed how they assessed his learning and based his grade in music more on his ability to play nonpitched rhythm instruments than on his singing or Orff instrument playing. His classroom teachers and parents used rhythms on a single pitch to help him remember spelling words and other types of rote learning.

Many children with special needs are able to create music with music technology if given a program that can be adapted for their learning challenges. Music educators need to be flexible with how the student creates music. For example, it should not be necessary for special needs children to use traditional notation for their music compositions. They may need additional time to complete their compositions with the teacher explaining directions in a variety of ways.

There is a need for development of more music education software that relates to children with special needs. Children with graphomotor difficulties might benefit from touch sensitive screens or playing MIDI drum pads

instead of piano keyboards. Programs with a minimum amount of text and directions work best with children who have a variety of special learning problems. *Rock Rap 'n Roll*, *Making Music*, and *Music Shop* all have a minimum amount of text or no text at all.

Often a recommendation in IEPs for many types of special needs children is to use a multisensory approach to learning. Creating music on a MIDI computer station is a truly multisensory approach to learning available to students with special needs.

References

- Atterbury, B. W. (1986). A survey of present mainstreaming practices in the southern United States. *Journal of Music Therapy*, 202-207.
- Atterbury, B. W. (1990). *Mainstreaming exceptional learners in music*. Englewood Cliffs, N J: Prentice Hall.
- Clark, C., & Chadwick, D. (1980). *Clinically adapted instruments for the multiply handicapped*. St. Louis, MO: Magnamusic-Baton.
- Frisque, J., Niebur, L., & Humphreys, J. (1994). Music mainstreaming practices in Arizona. *Journal of Research in Music Education*, 42(2), 94-104.
- Gfeller, K., and Hedden, S.K. (1987). Mainstreaming in music education: The state of the state. *Iowa Music Educator*, 40, 24-27.
- Gilbert, J. P., & Asmus, E. P. (1981). Mainstreaming music educators' participation and professional needs. *Journal of Research in Music Education*, 29(1), 31-37.
- Hickey, M. (1999). *Music mania* [Computer software]. Evanston, IL: Maud Hickey.
- Humpal, M. E. & Dimmick, J. A. (1995). Special learners in the music classroom. *Music Educators Journal*, 81(5), 21-23.
- Subotnick, M. (1997). *Making Music* [Computer software]. New York: The Voyager Company.
- McCord, K.A. (1999/2000). Music composition using music technology by elementary children with learning disabilities: An exploratory case study. (Doctoral dissertation, University of Northern Colorado, 1999). *Dissertation Abstracts International*, 60/07, 2421.
- McCoy, M., (1982). In the mainstream, selected musical activities. *Music Educators Journal*, 68(8), 51.
- Music Ace [Computer Software]. (1996). Evanston, IL: Harmonic Vision, Inc.
- Music Shop 2.0 [Computer software]. (1997). Palo Alto, CA: Opcode Systems, Inc.
- Rock, Rap' n Roll [Computer Software]. (1995). Medior Inc.
- Scripp, L. & Meyaard, J. (1991). Encouraging musical risks for learning success. *Music Educators Journal*, 78(3), 36-41.
- Schaberg, G. (1988). *Tips: Teaching music to special learners*. Reston, VA: Music Educators National Conference.
- White, L.D. (1982). How to adapt for special students. *Music Educators Journal*, 68(8), 49-50, 63-67.