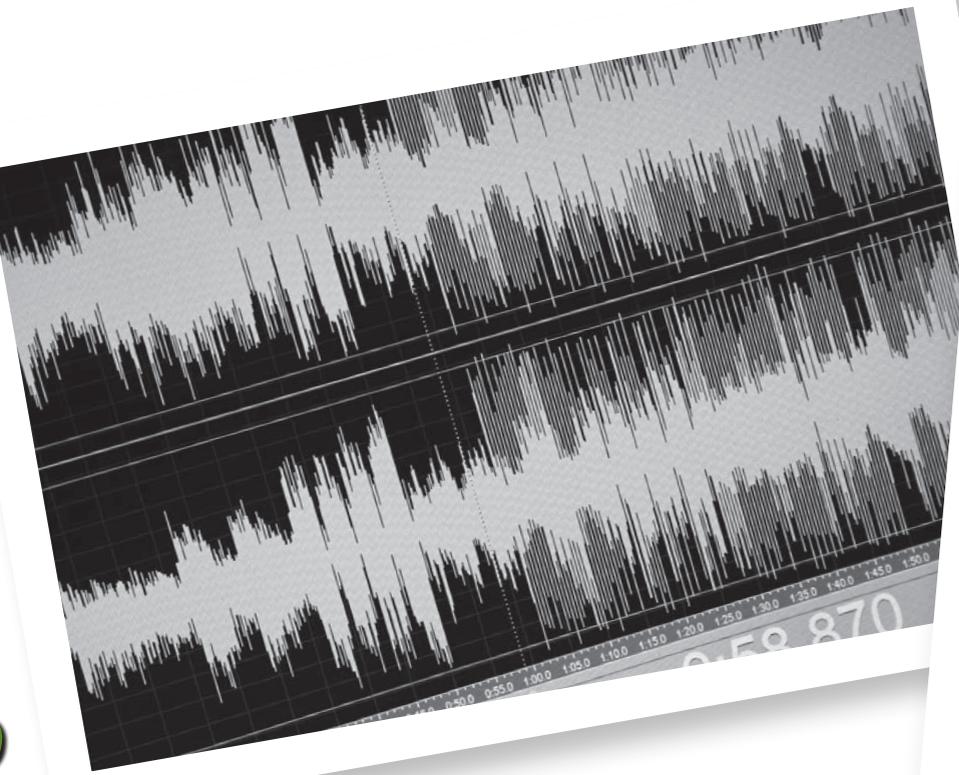


Using
Technology
to Assist
Gifted Children's
Musical
Development

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GIFTED CHILDREN benefit, as do all students, from music instruction (Helfer & Schroth, 2008a; Kay & Subotnik, 1994; Smutny & von Fremd, 2004). Many teachers and parents, although not musical themselves, are comfortable teaching gifted students about music appreciation and perhaps even beginning instruction with regard to various instruments (Baum, Owen, & Oreck, 1996; Helfer & Schroth, 2008a). More problematic, however, is how to teach gifted students about musical composition when the teacher or parent does not possess composition skills. Manipulating sounds provides an excellent initial entry into the world of music for children who demonstrate precocity in musical performance as well as gifted children showing an affinity to particular musical genres. Young composers' work can be supported in many ways, including through the use of computer hardware and software. Using musical technology allows students to revise and revisit their work over time and in formats that are both visual and aural. Technology also allows a far greater number of entry points to students, teachers, and parents, including those with little musical expertise. Teachers and parents who lack composition skills, however, typically have many questions about how to proceed. How can I help my child when I am not comfortable with musical concepts and terminology? Will composition instruction help or hinder my child's development as a performer? Can children who are not especially good at performing compose? When should composition activities be introduced to gifted children?



Questions of this nature are important. For gifted children's musical abilities to emerge and for musical talents to develop fully, students' musical potentiality must be recognized, lessons and other services provided, and learning assessed (Johnsen, 2003; Schroth, 2007). Recent software developments have greatly increased and enhanced the compositional opportunities available to gifted students. Even children who are gifted performers may have difficulty notating those sounds and forms that are pleasing to them. Optimally, instruction of all kinds should be matched to a student's readiness level, interests, and learning profile (see Smutny & von Fremd, 2004; Tomlinson, 1999, 2001). *Readiness level* refers to a student's knowledge, understanding, and skill related to a specific sequence of learning, factors that are the result of cognitive proficiency and prior experiences (Tomlinson, 1999). *Interests* include those topics or pursuits that evoke curiosity and passion in a learner (Tomlinson, 2001). *Learning profile* references factors influencing how students learn best, including learning styles, intelligence preferences, culture, and gender (Tomlinson, 1999, 2001).

Current software packages feature a flexibility and ease of use that allows students, parents, and teachers numerous opportunities to differentiate the child's musical experiences. Many composition software options exist that allow teachers and parents to differentiate instruction in these ways. This article provides teachers and parents support in three areas. First, the importance of composition as a means to strengthen gifted children's involvement with and opportunities in music will be examined. Second, brief cases will be provided that give answers to the questions asked at the outset of this article. Finally, specific software packages will be examined, including

hardware and software requirements for those packages, so that parents and teachers may better assess equipment needed for compositional activities.

Composition With Gifted Children

Approaching musical study with gifted children presents an interesting challenge. Instruments used to identify students as gifted may or may not identify whether a student is musically gifted (see Baum et al., 1996; McKay, 1983; Oreck, Owen, & Baum, 2003). Even when students are viewed as being musically gifted, they may not be gifted in all three of the primary engagements of music: *creating/composing*, *listening*, and *performing*. As a result, in any given group of gifted students, a wide range of musical skills and abilities will almost certainly be present. Teachers and parents who work with groups of gifted students, especially those teachers and parents who lack an extensive musical background themselves, often feel underprepared by the challenge presented. Because most public school music instruction, as well as private individual instruction, focuses upon developing a child's technical facility and musicality, considering composition as a tool that supports that child's overall musical development is important (Music Educators National Conference [MENC], 1994).

Composition provides an effective way to address the range of abilities and experiences found in most classrooms. Composition instruction allows students active engagement with music in small groups or individually according to their skills and interests. Although performing and listening often are taught in schools, composing frequently is ignored (Elliot, 1995; Reimer, 2003). Compositional study

in a gifted classroom or with individual students therefore will supplement and support ongoing musical activities in the traditional music classroom (Swanwick, 1988, 1994). The instructional flexibility composition allows teachers to address a wide range of learning objectives with a diverse group of students.

Teachers using composition, for example, may ask students to invent notation as a means to show what they are thinking in terms of musical concepts (Bamberger, 1991/1995; Uptis, 1992). This invented notation can occur with or without computers, with or without special tools, or with or without specific software. Additionally, music instruction within the schools or opportunities at home may include access to software programs that will provide an easel upon which students can notate their work, where the child or group has the opportunity to hear the composition in real time, and, when necessary, revise the work. Depending on the students' readiness levels, interests, and learning profiles, teachers and parents can design and deliver instruction that provides active engagement with musical materials (Schafer, 1967). Given the wide variety of technical support available, students may begin to compose based upon their musical intuitions first, often with very rewarding results. After this beginning, teachers and parents will find that planning out compositional experiences will contribute to increased student understanding and engagement.

Planning Musical Composition Instruction

All good instruction focuses on the concepts and principles important to the particular subject as a discipline (Bruner, Goodnow, & Austin, 1977; Callahan, 2001; Renzulli &

Reis, 1997; Sternberg & Grigorenko, 2000; Tomlinson, 2003; Tomlinson & Callahan, 1992). This axiom extends to quality musical composition instruction (Smutny & von Fremd, 2004; Uptis, 1992). The design of a composition project for a student should start with his or her musical background and abilities. Although there are assessment tools focused primarily on aural discernment and performance skills that may help assess some of a student's musical abilities, an informal assessment of students' musical experience and ability generally is adequate and perhaps more revealing. Teachers or parents can begin working with their child to structure a guided investigation by considering questions such as:

- Does the student play an instrument or sing?
- If so, for how long, how well, and what has been the nature of his or her study?
- Does the child like to create? Does he or she like to write stories, draw and paint pictures, or engage in similar activities?
- How familiar is the student with musical concepts such as *timbre*, *rhythm*, *melody*, and other such terms?
- Has the child had exposure to music, be it classical, jazz, popular, or world music? How much and in what context?
- Has the student ever created a musical composition?
- Does the student read standard musical notation?
- For what purpose is the child composing (e.g., to demonstrate specific musical concepts, to express an idea through sound)?

Using these questions, teachers and parents will be able to create a musical profile of each child. This profile assists the child and his teacher in selecting the most appropriate instructional

approach to beginning composition, which may well include a specific software environment. Teachers and parents will at some point want to memorialize the child's compositions. To do so the child generally will use either standard musical notation or graphic notation (Cage & Knowles, 1969; Rudolph & Leonard, 2002; Stone, 1980; Uptis, 1992). *Standard musical notation* uses a five-line staff, with pitch shown by the placement of notes on the staff and duration indicated by use of various note values (Bamberger, 1991/1995; Cage & Knowles, 1969; Rudolph & Leonard, 2002; Stone, 1980). Standard musical notation is, of course, what most of us envision when we think of written music. *Graphic notation* focuses on using nontraditional symbols and text to indicate how a piece of music should be performed (Bamberger, 1991/1995; Cage & Knowles, 1969; Uptis, 1992). Graphic notation is commonly used in experimental music.

It is not necessarily the case that students who demonstrate advanced musical skills and aptitude will necessarily demonstrate comparable skills and aptitude in composition. Put differently, even if the child is a proficient performer, he or she may very well be a novice or insecure composer. Depending upon the task complexity and the intended use of the composition, a child may wish to use graphic notation even if he or she is somewhat familiar with standard musical notation. Indeed, children benefit from understanding that many composers create compositions using nontraditional musical notation. The child also may possess technical facility on his or her instrument, including the ability to read standard musical notation, but not have a sense of how to move beyond the replication of what is on the page the teacher assigned. Thinking about musical concepts in

different ways thus affords novice composers the opportunity to construct compositions that may serve a variety of purposes. Even children who sight read standard notation can benefit from having the option of graphic notation as it allows a more personalized means of recording their compositions. Michael, a 12-year-old who had experimented with standard notation, found graphic notation more expressive when creating jazz compositions. Graphic composition also had the advantage of allowing Michael to share his composition with friends who did not read standard notation and allowing that composition to be performed by a potentially larger group.

Once a profile is constructed, teachers and parents must assist the child in understanding the concepts that will be manipulated in order to create a composition. Specific musical concepts, such as *timbre*, *rhythm*, and *tone* must be reviewed and, if necessary, taught to students. Using the student's musical profile and a sense of what musical concepts will be focused upon, musical learning experiences can be readily designed for gifted students. In addition to considering the child's readiness level, interests, and learning profile, determining the type of software that will best support the child's musical development is useful.

Software programs generally can be grouped into two categories, standard notation and graphic notation. Standard notation programs may be appropriate for students who already perform and read music, and programs that use graphic representations are helpful for students who do not read notation or are not comfortable manipulating sounds using standard notation. The way in which the child's ideas are made into sound that can be played and refined using the software is dependent upon the interface used by the computer. If a student has piano key-

board skills, it may be helpful to select a program that can take input from a Musical Instrument Digital Interface (MIDI) keyboard or controller.

Musical Composition in Action

Children with different readiness levels, interests, and learning profiles require and benefit from differentiated instruction (Smutny & von Fremd, 2004; Tomlinson, 1999, 2001, 2003; Ward, 1980). Tying the differentiated instruction to learning outcomes speeds instruction, expedites mastery, and hastens assimilation (Gagné, 1985; Tomlinson, 2003; Ward, 1980). Because an important purpose of supporting a child's development through composition is conceptual development and refinement, the examples provided below are grounded in Gagné's and his colleagues' outcomes of learning, which include *intellectual skill*, *discrimination*, *concrete concepts*, *defined concepts*, *rules*, and *higher order rules*. These five outcomes are premised upon a novice-to-expert continuum. They are useful to consider because of the asynchrony in an individual's musical development that may occur between the performer and composer.

Although Gagné's outcomes of learning traditionally have been illustrated with examples from reading or mathematics instruction, they also are applicable to music education (C. A. Tomlinson, personal communication, May 24, 2008). *Intellectual skill* involves knowing how to do something, such as learning that symbols can represent sounds or tempo (see Gagné, 1985; Gagné & Medsker, 1996). *Discrimination* involves the ability to distinguish one feature of an object from another, such as being able to distinguish one sound from another, or understand that a melody may be

constructed of sounds that move by step, skip, or stay the same (see Gagné, 1985). *Concrete concepts* focuses upon being able to classify objects and events according to their distinguishing features, such as timbre (the difference between a trumpet and an oboe), articulation (the relative length of an individual sound), and dynamics (the relative loudness or softness of specific sounds or groups of sounds; see Gagné & Medsker, 1996). *Defined concepts* revolve around classifying objects, events, or ideas according to definitions, such as distinguishing between examples of baroque and classical compositions (see Gagné, Wager, Golas, & Keller, 2004). Using *rules* entails doing something using symbols or concepts, such as using basic notation to record a melody (see Gagné, 1985; Gagné & Medsker, 1996). Finally, *higher order rules* involves combining several simple rules into a complex rule to do something, such as using notation systems to denote the parts for various instruments in a concerto (see Gagné, 1985; Gagné et al., 2004).

The majority of gifted children will have facility with the intellectual skills related to music, such as technical facility on instruments or the ability to read notation (Helfer & Schroth, 2008b; Schroth & Helfer, 2008). Some also will demonstrate discrimination, which may manifest itself in a highly developed "ear" by which a child can create stylistically appropriate additions to a musical context, such as a garage band playing a song in a funk style. The goal of teachers and parents must be to determine where children are and then move them along to more sophisticated outcomes of learning (Gagné et al., 2004; Schroth & Helfer, 2008). The Web sites and software programs referenced below were selected based upon their ability to facilitate such movement, as well as their ease of use, appropriateness for

the student projects, and cost. It is difficult to describe in detail, however, the nuances of each of the Web-based or software programs. Parents, students, and teachers are encouraged to visit the sites and experience how these programs do indeed assist a child in the development of his musicality. With rare exception, the hardware requirements of each program are standard equipment that is obtained with the purchase of almost any new computer.

Example 1: Discrimination and Concrete Concepts

Hannah is a second grader who has limited musical experiences. She has completed 6 months of piano lessons and enjoys listening to, and singing with, her favorite music. Her mother decided to have Hannah explore the differences and relationship between melody (music may move by step, skip, or stay the same; music may move up and down) and rhythm (individual sounds may be shorter or longer than the sounds that precede or follow) by composing short pieces using the sketch pad on Morton Subotnick's Creating Music Web site (<http://www.creatingmusic.com>). In order to use Creating Music, Hannah only needed to know how to use a mouse. Hannah could see how the music sounded because the site uses graphic notation. Hannah quickly grasped the ideas of melody and rhythm through the graphic notation used in the sketchpad. She also was able to learn about the difference between a limited palate of timbres. Hannah's ability to distinguish between timbres provided her with additional musical ideas. She enjoyed composing so much that her mother purchased the expanded *Making Music* and *Making More Music* CD-ROMs that allowed Hannah create her own notebook of original songs.

Technical requirements: Macintosh or PC (with sound card), monitor, keyboard, mouse, speakers, Internet access, *Making Music* CD-ROM (optional), *Making More Music* CD-ROM (optional).

Example 2: Defined Concepts

Jessica is a middle school student who is the first-chair flutist in her school band. She is a self-motivated learner and finds great satisfaction in creating her own music. Previously, Jessica spent time working with graphic notation. In fact, she has created an entire songbook of flute compositions using *Making Music* software. When she shared this work with her music teacher, Mr. Allan, he noticed that Jessica was very sensitive to articulation (the long, short, loud, or soft of individual notes). For Jessica, composing was a powerful experience, and Mr. Allan recognized that her numerous pieces were an attempt at expressing large musical ideas. Hoping that Jessica might develop a greater sensitivity toward timbre, such as the differences between a trumpet and an oboe, Mr. Allan challenged her to orchestrate her compositions for a chamber suite using an ensemble of flute, clarinet, saxophone, and trumpet. Mr. Allan also arranged for the finished composition to be performed at the school's annual spring concert, which greatly motivated Jessica. In order to assist her with her work, Mr. Allan provided her with Finale NotePad, which is the free version of the widely used Finale notation program (<http://www.makemusic.com>). Finale NotePad's

primary drawback is that, unlike Finale, it does not take input from a MIDI keyboard. Because Jessica is not a piano player, however, this is not an issue as she can use keyboard commands or the computer's mouse to input melody, rhythm, and expressive markings for each instrument part. Using Finale NotePad, Jessica was able to strengthen her skills in reading and manipulating notation



and distinguish between compositions that were “happy,” “sad,” and “jolly” through articulation and timbre.

Technical requirements: Macintosh or PC (with sound card), monitor, keyboard, mouse, speakers, Internet access, printer, Finale NotePad.

Example 3: Rules

Todd is a bright high school junior who has not studied music in school since his general music classes in elementary school. Todd is a gifted bass player in his garage band, which

meets thrice weekly after school. He has limited notation skills. He expressed an interest in exploring classical music to his European history seminar teacher. His teacher recommended that he use the timeline on the Classical Archives Web site (<http://www.classicalarchives.com>) to select a prominent composer from the time they were studying. Todd downloaded a MIDI file of a Bach Fugue from the archive. He opened the file in Intuem (<http://www.intuem.com>), sequencing software, and viewed the tracks in the graphic representation. Todd used this as a virtual score for his listening. Then, by cutting and pasting bits of the Bach, Todd created his own remixed version of the piece, maintaining the style of the period. He then burned an audio recording of his version to CD and played both versions for the seminar.

Technical requirements: Macintosh or PC (sound card), monitor, keyboard, mouse, speakers, Internet access, CD burner, Intuem.

Example 4: Higher Order Rules

Bill is a high school student who has studied piano from a young age. Although classically trained, he also plays keyboard in a rock band with several classmates. His teacher decided to reinvigorate his classical study by presenting the challenge of writing his own piano sonata. His teacher framed his work by asking Bill to answer the

question, “How do I make a sonata?” This project started with extensive listening to and analysis of piano sonatas by Mozart and Beethoven. Bill first sketched out a broad plan for the form, concentrating on the organization of the larger sections of the musical composition. Bill next began to play with ideas on his piano at home. He used his computer, equipped with a USB microphone and Audacity, the free recording software (<http://audacity.sourceforge.net>), to record his explorations. After reviewing his audio notebook, Bill refined the themes for each of the movements of the sonata and began to settle on a final version, which he then notated using a MIDI controller and Sibelius, the notation software. Bill then submitted his printed score and his Audacity recording to a local composition contest where he was awarded a prize.

Technical requirements: Macintosh or PC (sound card), monitor, keyboard, mouse, speakers, USB microphone, printer, CD burner, MIDI controller keyboard Internet access, Sibelius (or Finale).

Conclusion

Many gifted children are exposed to music as listeners or performers or both. Children who are sophisticated listeners recognize the importance of and differences between the various works they hear and are knowledgeable about a sometimes large and significant repertoire. Children who are gifted performers are able to make a musical composition come alive by translating the various markings on a musical score into expressive sound. Although encyclopedic knowledge or technical facility are both important ways of demonstrating a child's developing musicality, gifted children also benefit from investigating musical con-

cepts through the medium of composition. Considering a child's interests, readiness levels, and learning profile and then designing or supporting the design of composition opportunities so that learning outcomes progress to the next level is one important way a well-rounded musician can develop. The challenges of parents, teachers, and students who are unsure of their ability as musicians in general or composers specifically can be lessened by the use of Web-based and software composition tools. Table 1 contains a list of some additional technology resources that teachers and parents have found useful in assisting children who are learning to compose. The wealth of resources available today for little or no cost can revolutionize the use of this instructional strategy with gifted children. **GCT**

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Table 1
Technology Resources for Composing

Type	Description	Choices
Notation Programs	Two standard notation programs dominate the market, Finale and Sibelius. Both programs allow the user to notate, play back, and print their compositions. Children must be able to read traditional notation in order to use the programs. Finale and Sibelius also include a variety of templates for instrumentation, as well as a great deal of flexibility so the composer can choose instrumentation, meter, and expression markings.	Finale (Mac/PC): http://www.makemusic.com Sibelius (Mac/PC): http://www.sibelius.com
Recording Software	Audacity is an audio editor and recording software. Audacity can be used free of charge and works on a variety of platforms. Audacity allows children to import a wide variety of audio files (.mpeg, .wav, .aiff) and manipulate them using an easy-to-understand interface. Audacity also allows users to create CD recordings of their work.	Audacity (Mac/PC): http://audacity.sourceforge.net
Sequencing Programs	A sequencing program allows the user to create individual tracks (individual instrument lines) that can be “stacked” upon other tracks (e.g., one can create an oboe track and also a percussion section track that play concurrently). GarageBand, Intuem, and Cakewalk are among the more popular and useful sequencing programs available. Each of the programs contains some form of graphic notation so children can see their different tracks in “real” time. All of the programs also have an export feature in which compositions can be exported as .midi or .mp3 files.	GarageBand (Mac): http://www.apple.com/ilife/garageband Intuem (Mac): http://www.intuem.com Cakewalk (PC): http://www.cakewalk.com
Beginning Composition Programs	Both Making Music and TuneBlocks are free programs that encourage and enable beginning composition. TuneBlocks has more instruments from which to choose than does Making Music. Making Music, however, is Web-based, whereas TuneBlocks needs to be downloaded to the user’s desktop. Each program focuses on graphic notation. These programs may be conceptualized as sketchpads in which composers can play with sound.	Making Music (Mac/PC): http://www.creatingmusic.com TuneBlocks (Mac/PC): http://www.tuneblocks.com
Web Resources	The Vermont MIDI Project is a consortium of public and private schools (mostly in the Eastern United States) and a small number of universities and colleges. Schools or individuals who register (at no cost) with the project are provided a space where they can upload their compositions for others to hear and critique. There also are many resources for teachers and parents who wish to support their charges in the act and art of composition.	Vermont MIDI Project: http://www.vtmidi.org

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