" I can always make another one!" – Young musicians creating music with digital tools

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Music and creative music making in different forms is important in young peoples' lives. Children learn many things about music on their own by taking part in the growing production of musical cultures that media makes available. The media revolution has produced new tools for creative musical activities. Computer and synthesiser have become important tools for young people to express themselves through music.

The purpose of this chapter is to present some of the findings of my doctoral study on the creativity of children without formal musical training and the way digital tools enhance their expression of musical ideas (Nilsson, 2002a). (For a summary in English, see Nilsson and Folkestad, 2003). The theoretical framework upon which this research is based forms what I call an *ecocultural perspective*; this will be described in this chapter.

Children creating music

In order to provide a general context for the discussion of my empirical study, I wish to outline some of the aspects of the field of research in children's creative music making that I find especially important.

An increasing interest in children's spontaneous creative musical activities has taken place during the last decades. It must now be regarded as fully accepted by music teachers and researchers in music education that children are able to, and want to, create music spontaneously in many ways, by singing or using musical instruments. Musical creativity, just like creativity in other fields, should thus be looked upon as a basic human function rather than as a special gift granted to only a few (Vygotsky, 1998).

Barrett (1998a) presents a critical-historical overview of the research on children's compositional processes and products in English-speaking countries. She draws the conclusion that there is still much to learn from studying children's compositional processes and products. Of special concern to Barrett is the further investigation of how children create music with meaning, form and structure.

The growing interest in what music means to children and in what they have to say about it, is documented by the research on children's spontaneous musical creativity, carried out as early as in the 1930s by Pond (1981). Pond gave no instructions, but answered questions from the children during the work. He participated in the musical activities when the children asked him to. Pond says that:

although I knew there were many things I wanted to learn, I could only learn them from the children, from their spontaneous behaviors; because had I created any kind of artificial situation to inveigle them into telling me something, what they told me would itself had been artificial, and therefore useless. (pp. 6-7)

One of the main conclusions Pond made from his research was that "the practice of improvisation (vocal as well as instrumental) is the heart of the matter in the development of the innate musicality they evidently possess" (p. 11). Pond's research was unknown to Bertil Sundin when in the 1960s he studied Swedish children's spontaneous singing at two day-care centres in Stockholm. He describes his research project in retrospect (Sundin, 1998) as aiming:

to find out what children did musically when they were not directly influenced by adult authorities, what they came up with when they were asked to invent their own songs, and what music meant to children. (p. 35)

Sundin was interested in both spontaneous and constructive creative music making. He used a method that was influenced by ethnography and observed speech, singing and other musical activities. Sundin's study shows how pre-school children create songs in different ways. He drew the conclusion that creative music making in early childhood seems to be a way to "express an attitude towards the world and a way to approach different problems" (Sundin, 1963, p. 141, my translation). Sundin later published his results in several books (1989, 1995, 1998). Similar studies have been carried out by Bjørkvold (1979) and Whiteman (2001).

One interesting result of Sundin's study was that children's creative ability showed no relationship to singing ability, intelligence or to their parents' musical interest. These results are similar to the findings later obtained by Webster (1990) using his method *Measure of Creative Thinking in Music*. Webster's method for measuring children's musical creativity is now revised with children using MIDI instruments for some of the tasks (Webster, 2001).

Like Sundin, Margaret Barrett (1996) listened to the children, as she studied pre-school children composing with musical instruments. She argues that children's compositions could be regarded as participation in a dialogue. To access children's understanding of music the researcher can examine their musical rather than verbal responses. Barrett (1996) collected compositions from 137 children aged 6-12 and found that even the youngest were able to create music with form and structure. The participants used various structural devises, such as repetition, sequences, inversion, achievement of closure, alternation between two or more ideas, abstraction of a musical idea from one context to another and large-scale structures or forms.

The conception of what musical creativity is has changed during the last decades. Sundin (1995) points out that ability and aptitude often have been stressed in the discussion about musicality and musicianship. He argues that this reflects our culture's interest in achievement and that many so-called musicality tests are built on measurable differences in children's performance. This leads to a conception of musicality as a property that some individuals possess, while others do not. Sundin (1998) criticises what he calls researchers' "instrumental attitude towards children" (p. 53). An adult-oriented focus on children's abilities and skills should, according to Sundin, be "properly balanced by a respect for and interest in what the children hear and do as they observe the world in which they find themselves" (p. 53).

The conclusion made by Kratus (1989), that only children aged 9 and older are able to compose with form and structure, and that this has developmental grounds, has been criticised by Barrett (1996, 1998a) and Nilsson (2002a). Barrett and Kratus, on the other

hand, seem to share the view that the meaning of children's creative music making is mainly to be found in the music's form and structure and that this is correlated to a higher degree of product orientation. The view that improvisation represents a less meaningful form of creative music making conflicts with Burnard's findings (2000) from her study of 12-year-old children. She found that children in different ways included improvisation in the composition process.

Swedish research on children's musical activities has been directed toward pre-school children (Sundin, 1963, 1998), teenagers (Folkestad, 1996; Saar, 1999; Ericsson, 2002), and high school students or adolescents (Lilliestam, 2001; Vesterlund, 2001; Gullberg, 2002). In his study of computer-based compositions by children aged 15 to 16, Folkestad (1996) describes the compositional strategies in two main categories: *Horizontal* and *Vertical* composition. In *Horizontal compositions,* each part is completed from beginning to end. In *Vertical compositions,* each section of the composition is completed before moving on to the next phase.

Folkestad (1996) identified in his study three qualitatively different descriptions of how musical ideas arose:

(1)   The starting point for the creation is an image of a musical idea

(2)   Work starts by defining a musical style

(3)   The musical idea arises while playing an instrument, in this case the synthesiser at the computer station (p. 188).

Particularly the third description relates to the discussion above concerning the relation of improvisation to the composition process. Folkestad (1998) describes improvisation as "instant composition" performed by its creator. A composition on the other hand is "a product which can be separated from its creator and performed without its composer" (p. 109).

In spite of the growing interest in children's creative musical activities, many questions concerning creativity in childhood still remain to be answered. McPherson (1998) highlights the need for a broadly based research in order to explore children's musical creativity.

A discussion of music education

Sundin (1995) maintains that education should not aim at training children toward standards from the world of grown-ups, but should rather strive to develop into an exchange of experiences between children and adults. Sandberg (1996) describes two basic views: A *communicative view,* stressing children's personal and social development together with musical communication and experience, and a *normative aesthetic view*, stressing preservation and enforcement of lasting values and ideals together with developing musical knowledge and skill.

Bennett Reimer's and David J. Elliott's positions, as expressed on the international scene in their debate in several books and articles during the nineties, are in some ways compatible with the conceptions of a *communicative view* and a *normative aesthetic view*, described above. Reimer (1996) criticises Elliott as having a "narrow and elitist view of creativity" (p. 84) and argues that "creativity, like skill, or understanding, or health, and so on, exists not as an absolute but as a continuum of possibilities" (p. 84). Reimer gives the example of a child who has learned to play a few notes on a musical instrument and improvises an expressive phrase. This should, according to Reimer, immediately be recognised by a music educator as an act of musical creativity. Elliott (1997) replied that Reimer did not understand creativity in the right way and that

"musical creativity requires at least a competent level of musicianship and listenership" and an "awareness (tacit and/or verbal) of what counts as poor, good and excellent music in that musical practice, and why" (p. 26).

Sundin (2000) comments on the debate between Reimer and Elliott, in which several other writers participated or even intervened, and describes it as an "example of the bigger debate concerning modernism/ postmodernism" (p. 10). It would seem though, as if this dispute does not really relate to the matter of what music means to children.

During the twentieth century, music education in Sweden has developed toward a focus on children's own interest in music (Sundin, 1988; Gustafsson, 2000). Modern Swedish curricula (1969, 1989 and 1994) emphasise music making, improvisation and composition, when earlier curricula had stressed singing, listening and musical theory (Folkestad, 1996). The generalists in Sweden, who often teach music in school years 1-5, were not satisfied with the music education in their own teacher education (Skolverket, 1993, 1994). Music education is regarded as important by Scandinavian school authorities, but assessment is one of the main complications, which limits modern curricula (Olsson, 2001). According to Olsson, Western art music still predominates in Scandinavian teacher education. It seems as if there still might be a lot to be done as regards creative musical activities in Swedish schools as well as in Swedish teacher education.

Theoretical framework: an ecocultural perspective

The theoretical framework of my thesis is built on four different perspectives of the research problem. These perspectives together form what I have called an *ecocultural perspective* (Nilsson, 2002).

The first perspective concerns learning and creative activities in informal and everyday situations, where physical and psychological tools, artefacts, mediate the world to individuals engaged in practical activities (Vygotsky, 1978). The tool and the individual together constitute a system that is able to think, act and learn. Language could be regarded as the most powerful of our psychological tools. Learning takes place through participating in an activity and is integrated between mind, body, activity and culturally organised settings (Lave, 1988).

In Vygotsky's model (1978) *Zone of Proximal Development* (ZPD) the learner develops in a zone where he/she with guidance can achieve a little more than what is possible alone. Wells (1999) emphasises the dynamic side of the ZPD and points out that artefacts such as books, maps, diagrams and works of art can provide guidance in ZPD. He also includes "various modes of artistic expression, such as dance, drama and musical performance" (p. 320).

An interesting contribution to the socio-cultural theories is Gibson's (1979) concept *affordances*, which concludes the *suggestions of meaning* the individual perceives as offered in a certain situation. His ecological approach to perception includes memory, expectation, knowledge and meaning.

The second perspective is based on orality and oral practice as tools for understanding music, musical practice and musical creativity. Music and speech are sounding transient phenomena, which do not exist in parts, but only as a whole (Ong, 1982). I understand the concept of orality in an extended sense, where orality means a certain practice of language, acting and thinking, as a way to think and as a psychological tool linked to creativity and improvisation. An oral perspective can also be regarded as an important part of a situated perspective.

In the third perspective *play* is considered as a way to understand improvisation and creativity and as a way to create meaning in new activities. Caillois (1961) makes no distinction between play and games and extends Huizinga's (1955) definition of play to include games of chance and games played for money. According to Caillois (1961), play is free, separate, uncertain, unproductive, 'make-believe' and governed by rules. The participants decide when and how the play will start and end. Play is something we do for its own sake, according to Huizinga (1955) and Caillois (1961). These kinds of actions are called *autotelian* by Csikszenmihalyi (1990) who associates them with the experience of *flow*.

Caillois (1961) proposes a classification of play and games into four categories, depending on whether the role of competition, chance, simulation or vertigo is dominant. Different play and games have different degrees of order: *Paidia* is associated with diversion, turbulence and improvisation, while *ludus* is associated with effort, patience, skill and ingenuity.

The fourth perspective links play and creativity with chance and unpredictable events. Both Huizinga (1955) and Caillois (1961) stress the uncertainty of play. As Caillois expresses it:

> An outcome known in advance, with no possibility of error or surprise, clearly leading to an inescapable result is incompatible with the nature of play. Constant and unpredictable definitions of the situation are necessary. (p. 7)

Calvin's (1996) *darwinmachine* is an example of a coherent theoretical model that explains learning and creativity from an evolutionist theoretical perspective. In his *darwinmachine* patterns are copied, patterns that randomly change and then compete for survival through natural selection. These patterns can be thoughts, ideas, but also be cultural patterns like a melody or the like. Such cultural patterns have come to be called *memes*, a concept coined by Dawkins (1989).

Bateson (1979) is convinced that creative thinking always includes an element of chance. It seems reasonable to assume that unpredictable and casual events assume an important role in creative processes such as performing music, composing or improvisation.

Several writers regard creativity as an outstanding feature of our way of living. Sacks (1998) points out that creativity and imaginativeness are available to all of us. Vygotsky (1998) maintains that creativity should be looked upon as a basic human function and not only as a special gift that can produce great artwork. Thus, improvisation and creativity can be regarded as taking place within everyday activities.

The four theoretical perspectives described above together constitute an *ecocultural perspective* of learning and creativity.

Method

The methodological approach used in my study could be described as an attempt to study children's musical creativity with the aspiration of showing respect for and interest in the children's musical worlds, as mentioned above. The study is also in some ways inspired by ethnographical methods.

The synthesiser and computer introduce a solution to the problem with instrumental expertise. The music keyboard offers a simple way for young untrained children to express their musical ideas. Therefore, I decided to undertake my study using digital tools and a professional sequencer program (Cubase Score).

The use of synthesisers and computers in creative musical activities makes it possible not only to achieve completely new things, but also to achieve old things in new ways (Folkestad, 1996; Folkestad, Hargreaves & Lindström, 1998; Nilsson, 1998, 2002a). Digital tools, synthesiser and computer, at the same time become tools for creative music making and powerful tools for the researcher.

Different aspects of children's creative music making were investigated by collecting different types of data over a period of eighteen months. The collected data included step-by-step computer MIDI files from the compositions of the children, that were collected using the 'Save-As' method (Folkestad, 1996) together with participant observations and interviews that were conducted throughout the project.

The children were asked to create music to pictures that became starting points, or *prompts*, for creative music making. The participants were only given instructions related to the use of the synthesiser and the computer software. The invitations grew more and more open-ended as the researcher introduced an invitation to create music along with a self-portrait and to an art painting by Kandinsky.

Balancing the musical creative process and product becomes a question of the researcher's approach. When the product is studied separately, the music is separated from the creator, while studying the process puts the creator in focus. Accordingly, the product cannot be left out from the analysis of the process (Folkestad, 1996; Nilsson, 2002a, Nilsson & Folkestad, 2003).

The unit of analysis is the creative processes, analysed through participant observations, interviews and the collected pieces of music (data files). By interpreting the saved computer files together with the participants' observations and interviews, five variations of the children's creative processes were identified. These variations will be described briefly in the following section.

Results – The practice of composing

In this section I shall discuss some of the results from the two-year study I have undertaken with children aged 7-9 in Sweden who created music with digital tools (Nilsson, 2002a). An interactive multimedia presentation in English of the main results from my study is included in the thesis and can be reached from the internet (Nilsson, 2002b).

The results of the study can be summarised:

- all participants were able to create music. This is, as described in the first section of this chapter, although not surprising, not an unimportant finding. There is still a need for research that enhances knowledge about children's ability to create music.

- the participants created music with form and structure and could not be regarded as beginners.

- the children's compositional processes could be described in five variations of the *practice of composing*, each with a different object in the foreground of the activity:

  a) putting the synthesiser and computer in the foreground of the activity,

  b) using creative music making as a means to express personal fantasies and emotions,

  c) putting the playing of the instrument in the foreground of the activity,

d) placing the music itself in the foreground of the activity, and

e) putting the task in the foreground.

When the *synthesiser and computer* were put in the foreground of the activity, the equipment turned into tools and devices that were to be examined and controlled, the limits of which were to be explored. The process might include extensive experiments with sounds and tracks.

Deliberate, as well as non-deliberate, use of memories and various techniques for generating musical ideas were facilitated when *fantasies and emotions* came into the foreground for creative music making. Many things could serve to inspire the children during the creative music activities, such as playing with dolls, invented stories, memories and emotions.

Putting *the playing of the instrument in the foreground* often resulted in long compositions where improvising and composing were integrated. These pieces were recorded in one succession on one single track where musical formulas and motifs were repeated and varied. In the playing, the motor activity with its pulse and rhythm came into focus. Sometimes accidental mistakes were converted into new ideas and motifs.

Musical ideas were deliberately brought forth to be used directly or to be revised when the child placed *the music itself in the foreground*. Spontaneous ideas were used in a deliberate way together with rehearsals and planning, which enhanced possibilities and options in the creative process. The actors were able to discuss their own compositional processes.

When the suggestions to create music were interpreted by the child as a task and not as an open invitation, the *task itself came into focus*. Focusing on an explicit task might delimit children who normally easily produced musical ideas on their own, while this, on the other hand, might make it easier for children who have difficulties creating musical ideas.

Music with form, structure and meaning

In this section, I will provide examples which demonstrate that the participants in the study could not be regarded as beginners in music.

The children included in the study listened to a lot of music in their homes or with friends. Most of them also had opportunity to try musical instruments at home or with relatives or friends. In interviews and conversation, the children shared significant episodes related to music, in the study called *musical memories*. Some of these musical memories relate to episodes where the children listened to music in public situations, like listening to street musicians or attending a concert. Another kind of musical memories relate to music taking place in their family. Some of the memories describe how the children played and learned music with others.

Gunborg, one of the girls in the study, had a very active relation to music. Her dream was to become a singer:

> My greatest dream is to be on stage, just like Michael Jackson, and there will be one thousand and a million. Then I will sing … I imagine … it is fun. Sing, just like Spice Girls.

Gunborg used to play a little keyboard at home and had tried to play the recorder. She also had a firm notion of how to rehearse and prepare:

Firstly, I will see which notes I really want some that are good. Then I will practise a lot and see if it works. Try with my fingers on the keyboard and if I can do it fast with my fingers, then it can sound good.

Gunborg preferred playing music by herself instead of attending lessons and claimed: "if you start to learn and have lessons all of the fantasy go away".

As we can see in Figure 1 Gunborg used a melodic idea that she repeated and varied. A simple diatonic bass line accompanies the melody. This musical idea contains form and structure at the same time and returned in different forms in Gunborg's compositions.
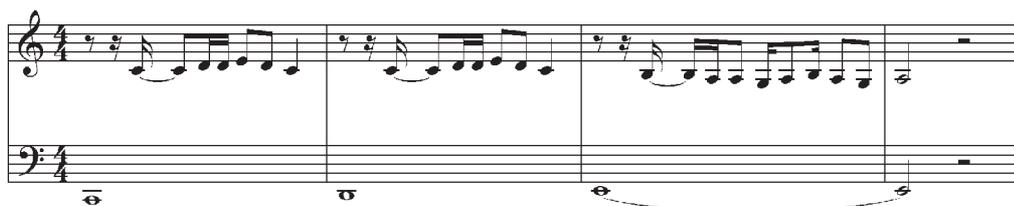

Figure 1. Gunborg's piece consists of a melodic formula that is repeated and varied, accompanied by a simple diatonic bass line.

The collected composition processes show that the participants were able to create music with *form*, like the use of a coda, different parts in a composition or call and response. *Structure,* such as repetition, rhythmic and melodical development, sequences, formulas, the use of drones and the like, was also evident in the children's pieces. The complexity of the music pieces varied from a single motif with only three notes to advanced combinations of form and structure developing through different compositions.

In Figure 2 we can see how Naim, an eight-year-old boy, ends his almost six-minute-long piece with a closure built on a variation of one of his rhythmic motifs. The accents were achieved by changing the number of notes in the chords.
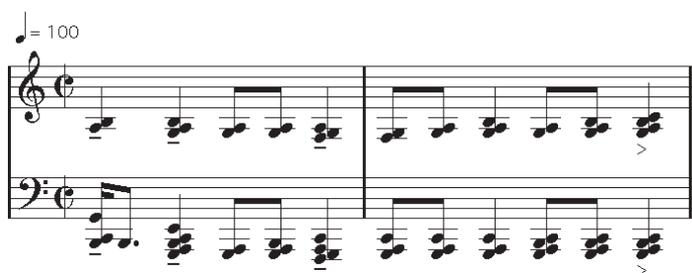
Figure 2. Naim changed the number of notes in his chords to create accents in his coda.

Ferhad's family comes from the Middle East. Like Gunborg, he listens to a lot of music. He likes musical instruments that "you can use your hands on" and "everything that has to do with drums". Sometimes he plays on the table while listening to a CD:

I have played drums with my hands many times. In our country, you know, we also play like this [shows his finger technique on the table].

Ferhad believes that everybody can create music and explains how he and a friend (who did not participate in the study) made music together:

You think, then you test all the songs to see if it fits in … You test all sorts of sounds and music. Then you can say that this is the best, better than everything. That's how you do it!

Ferhad liked to sit and play at the synthesiser for a long time and once recorded a piece that was more than 19 minutes long! Sometimes he played his motifs with both hands, like in *call and response*, where one hand 'answers' the other. In Figure 3 we can see one of Ferhad's motifs that was repeated, developed, varied and alternated with other motifs throughout his 13-minute-long piece.

Figure 3. Ferhad's short motif was developed through his 13-minute-long piece.

The children's creative musical activities took place in one succession without interruption: choice of instrument sound, warming up, playing, recording and saving. If a recording was not satisfying it was deleted and replaced by a new. Through the 'Save-As' method these steps were saved in computer files before they were deleted. These different processes can be described by grouping them into three scenarios: a) the music consists of the first recording, b) the recording was deleted and replaced by a new, and c) the piece was edited by adding a new recording.

Ferhad's long compositions give good examples of how the music is created in one succession, thus *putting the playing of the instrument in the foreground*. He did not edit his music, but let the composition develop as it progressed, sometimes for a considerable amount of time.

Gunborg usually practised "a lot" as she puts it. She talked much about music and had many ideas about music, thus *putting the music itself in the foreground*. If a recording was not satisfying, she simply deleted it and began a new piece. Her pieces were often the result of several recordings and she only wanted to save the ones she approved.

The examples described above give evidence that the children in the study were not beginners in music. They already had experience of many different kinds of music and had many musical ideas of their own.

" I can always make another one!"

All participants quickly learned how to use the basic functions of the system synthesiser-computer. After a few occasions, they were able to independently choose instrument sound, record, stop, rewind, listen and to delete. All these above-mentioned functions also include *aesthetic decision-making* (Barrett, 1996, 1998b): like the choice of sound for the composition, to decide when to start the recording or whether to save the music, revise it or to delete it.

The notion of saving your work might be important from the adult researcher perspective, but did not seem as crucial to the children. When I saved one of Gunborg's songs before she deleted it she claimed: "I could have a hundred songs if you had saved them all!" This conversation inspired me to the title of my thesis.

It seemed that the children felt convinced that they at any time could produce a new piece. They experienced their compositions as ephemeral, something that in the next moment could be replaced by something new and different. Even when observations showed that the child had made preparations during a period of time (choosing instruments for the tracks or playing and testing) he or she had problems explaining how they got started. Their descriptions were often imprecise: "I just made it up" or the like.

Linus, an eight-year-old boy, answered my question about how he knew what to do when he begun: "I just pressed some buttons and then I knew."

When Ferhad wanted to delete one of his pieces, he did not consider revising it or in any way changing it. Instead, it was all about creating a totally new piece: "you know I might make up another one, much better!"

The children had many different ways to get inspiration for new pieces of music and were in many cases able to communicate their imaginative ideas. In the following, I will give a few examples.

One of the girls, Hannah, is a refugee who lives in Sweden with her sister and mother. She longed for her father to arrive from a refugee camp in Jordan. By deliberately thinking of her father, Hannah got musical ideas that she used in her creative activities. Hannah told me that she used to play what it would feel like when her Daddy arrived in Sweden. In one of her compositions she embedded a rhythm from an Arabic song, a fact that she proudly drew my attention to when we listened together. When I asked Hannah, she sang the song for me and translated the words into Swedish. In Hannah's music, *fantasies and strong emotions* came to the foreground.

Another example of how fantasies came to the foreground comes from another girl, Ninna, who used to act, imitate and make up stories. When she made a composition to a painting of Kandinsky, she imagined that the picture was filled with lots of animals and different beings. When we together listened to her music, she told me many stories about the creatures. The music illustrated the way the animals talked and communicated in her imagination.

Musical ideas could also arise directly in action, during *playing itself*. Linus, one of the boys, explained how he got his musical ideas: "You just do it". Even when old ideas were tested and rehearsed, the element of improvisation and chance was present. The balance between planning and improvising thus seemed to be natural to the participants. In some cases creative musical activity resulted in recordings lasting several minutes.

Discussion

The traditional view where music educators teach music to children who are complete beginners must now be abandoned since today's children learn many things about music without formal musical training.

This study shows how music and creative music making in different forms are of importance in young peoples' lives. The media revolution has brought the digital technique into our homes: the music CD, the computer, the internet, digital video, the synthesiser and other techniques. In our Western society even very young children, aged between 3 and 6 years, have their own tape recorders and are thus able to play recorded music on their own, as shown in a study by Nilsson (1992). Today, a decade later, the CD player and the computer have replaced the tape recorder. Music software makes it possible to create music in your own home and it is even possible to create music on the internet without any other software than your browser. Today's children should not be regarded as beginners in music, since they learn a lot about music on their own, by taking part in media's increasing offer of musical products (Folkestad, 1996, Nilsson, 2002). Children develop knowledge and competence by taking part in activities that are provided in all environments where they spend their time: at home, in school, after school and in the 'third environment' without adults controlling them.

Sundin (1995) stresses the way music has become a part of our environment and imagines that a child starting school today probably already has heard more music than

his/her elder relatives have heard during their whole life-times. Music from different epochs, from different geographical parts of our world, from different social or ethnic contexts, together constitutes a cultural ground for musical learning.

Music teachers and music researchers need to ask themselves if uniqueness and replication are significant or important criteria when children (or anyone) create music. The definition of a composition provided by Kratus (1989) as "a unique sequence of pitches and durations that its composer can replicate" (p. 8) can, in the light of several studies conducted during the last decade (Barrett, 1996; Folkestad, 1996; Saar, 1999; Nilsson, 2002), now be challenged. Webster (1992) considers a piece to be more compositional in nature if the creator is given the opportunity to revise it. Based on results from my own study and from the work of others, I conclude that a composition can be defined as *a piece of music that its creator experiences as meaningful.*

The notion of replicating a creative product might be something that music educators and researchers alone expect from a creative product. It seems unlikely that an art teacher would tell a child that his or her piece of art was beautiful and then ask them to replicate it to test if it qualified as a work of art. This study shows how children's belief that they at any time are able to create a new piece of music fits well with a cultural practice defined by orality, play and imagination.

The results concerning form and structure in children's compositions described in this chapter show resemblance to the results reported by Barrett (1996, 1998b). The present study demonstrates, in the same way as Barrett's study does, that variations in children's creative music making can be explained by other factors than developmental factors. The manner in which society has looked upon creative products is clearly illustrated by the difference between the two concepts *children's songs* and *children's drawings*. The former refers to songs made by adults for children, while the latter refers to drawings made by children for themselves or anyone that enjoys them. This fascinating difference has also been observed by Sundin (1998).

Vygotsky (1995) claims that creativity is a basic human function and not only a special gift that can produce inventions and masterpieces. He compares creativity to electricity: just as electricity works, not only in great thunder storms, but also in the little bulb of a torch, creativity exists not only in great artworks, but everywhere when a human fantasises, combines, changes or creates something new, no matter how small. It is hard to imagine a culture without music of any kind. We do not know much about the musical life of our ancestors, who lived at the dawn of human history. We have no recordings, nor have any musical instruments been preserved. We can, however, assume that music played just as vital a roll in their lives as we know art and decorated artefacts did. The Bradshaw Paintings in the Northwest corner of Australia, generally considered to be between 17,000 and as much as 40,000 years old (Bradshaw Foundation, 2003) demonstrate this clearly. The Bradshaw Coordinator, sculptor John Robinson, maintains that these paintings "compare to anything that has been created in the past" (Robinson, 2003). The famous cave paintings in France, among them Lascaux and Chauvet, were created in about the same time span. We can only guess what the songs and instruments might have sounded like in the caves, inhabited by our ancestors, over 30,000 years ago, but we can be certain that there was music.

Children have been performing and creating music throughout the history of mankind, whether or not their parents or teachers noticed it. This study provides insight into how children create music in many everyday situations. What is new is that the tools for performing and creating music have changed radically.

New tools, such as synthesisers and computers, enhance the possibilities for young children to express their musical ideas, diminishing the effects of instrumental skills. By

using a music keyboard and sequencer software, important properties of music are preserved. The keyboard represents a reasonably easy way to compensate for lack of instrumental skills and takes advantage of motor activity, as shown in this study. In sequencer software, the music is represented together with a timeline, thus preserving the temporal aspects of music. Thus, modern music technology has decreased the gap between the creator of music and the consumer. Folkestad (1996) maintains that this has lead to a change in attitudes towards musical creativity, with the result that the distinction between professional and amateur music makers has become less sharp.

The examples given in this chapter demonstrate how young children without formal teaching gained musical competence and creativity by using digital tools. Folkestad (1998b) discusses the way the synthesiser and computer turn *transparent* in the creative process and become tools for realising musical ideas. Digital tools constitute a medium where planning, improvising and elements of chance are able to coexist. The computer simultaneously opens up for the different kinds of mediation represented by orality and literacy. There is reason to point out how powerful these tools really are. Earlier studies of children's creative music making were conducted with Orff instruments (Barrett, 1996) or with a simple keyboard (Kratus, 1989). Synthesisers and computer software can be compared to a huge box of paint colours together with unlimited access to paper. Digital tools thus represent a rich variation of *affordances* (Gibson, 1979) and *suggestions of meaning*.

The concept of *memes* (Dawkins, 1989), mentioned earlier, deserves further discussion. According to Dawkins (1989), a *meme* is an idea, a pattern, a behaviour or knowledge that is reproduced. A *meme* can be many things – a melody, an idea, a slogan, a way to manufacture a pot, the belief in Big Bang or in God. Interestingly the concept *meme* itself is a *meme* and thus defined by the *Oxford English Dictionary* as: "A self-replicating element of culture, passed on by imitation". This somewhat deterministic definition excludes the variation part of the Darwinian theory. Calvin (1996) suggests that a *meme* is some kind of brain pattern related to a thought. In his *darwinmachine*, patterns are not only copied but also randomly changed. This is important to stress: if humans can only copy patterns, it will be difficult to understand creativity or to explain how new ideas arise. Many musical *memes* replicate through different electronic media, such as radio and television, different kinds of audiograms, the internet and the like.

In the creative process there is often a movement between improvisation and composition, between chance and control, between *paidia* and *ludus* (Caillois, 1961). Creative processes that result in long pieces can be regarded as examples of how ideas in the shape of *memes* are generated, change, survive, replicate or disappear. By offering digital tools to children for creative music making the range of affordances are significantly enhanced. However, as Folkestad (1998) points out, the context is the music, not the computer. It is through children's musical discourse that their aesthetic decision-making can be understood best (Nilsson, 2002; Barrett, 1998b; Folkestad, 1996, 1998).

Children's musicianship is undergoing a revolutionary development at the same time as music educators' understanding of musicianship and musical creativity is changing. The results from my study illustrate how working with digital tools link elements of play, chance, planning, improvising and rehearsing. The examples of musical creativity in childhood provided in this chapter clearly demonstrate how listening to children's music and to what they have to say about it helps the music educator to understand what music means to them.

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