Musical Composition

and creativity in an advanced software environment

This paper serves as a brief description of research into the use of professional level music software as a learning tool for creativity and composition by primary school children. The research formed the basis of a Master of Information Technology in Education degree at the University of Melbourne. The paper examines the physical environment, the thinking behind the research, and the connections between art and computing. Finally, the article presents a portrait of one of the participants, which includes an analysis of one of her compositions.

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Introduction

The use of computers in the generation, creation and editing of music in schools, especially primary schools, seems to be a largely untouched area of educational computing. Children in today's rich computer environments are exposed to programs that allow the creation of pictures, text, sound, video – all areas of multimedia, as well as simulations and games that explore many varied curriculum areas. If one is to look into the sound aspect of multimedia, it is more than likely restricted to single track waves recorded at very low quality frequency (11khz), pre-recorded sound clips (midi, wave or mpeg) or use of teacher generated files.

Questions about this situation need to be asked. Why do we place children in a rich computer environment with state of the art equipment and software and deprive them of the creative aspect of music? Why do programs that can be used for multimedia development to a very high level, such as HyperStudio, MicroWorlds and PowerPoint, fail to provide adequate audio editing? Perhaps the most important questions are "what can be done about it?" and "can children and teachers be taught to use high-end, professional level music programs in a task appropriate manner and in consideration of age, computer literacy and musical ability?"

A ten week study at an outer Melbourne primary school placed eight children from grades three to six (approximate ages 9 to 12 years old) in an advanced music software environment. The study sought to investigate ways in which professional level music software could be used as an effective learning tool for creativity and composition by primary school children.

This paper presents some of the data from that study and addresses some of the questions raised above.

The software

The use of the term 'professional' was important to the context of the study. Since this study focused on creativity and composition, not on learning music, it was not appropriate to use 'teaching' software that was designed to follow strict compositional and musical guidelines. Inherent to the design of this study was the exposure of children to content free software that placed no restrictions on their creative potential. The study required a rich musical software environment; an environment that provided a full set of features to allow complete creative and compositional freedom.

The study used two commercially available products, Cool Edit 2000 and Cakewalk Pro Audio 9, both of which were provided by the companies, free of charge, to conduct the research. Neither company placed restrictions on the use of the software nor did they set, or seek to set, any outcomes from the research.

Cool Edit 2000 is a four track recorder that provides advanced filtering, effects and mixing. It is restricted to four tracks but allows for recording of tracks within tracks and mixing of tracks to create additional space. It can play and record in many wave formats including .wav and .mp3. Multi-track recording allows composers to build layers within their compositions (see figure 1). It is possible to record the drums on one track, bass on another, voice on a third and accompaniment on the fourth. The main difficulty experienced by the participants in using this program was in file management.

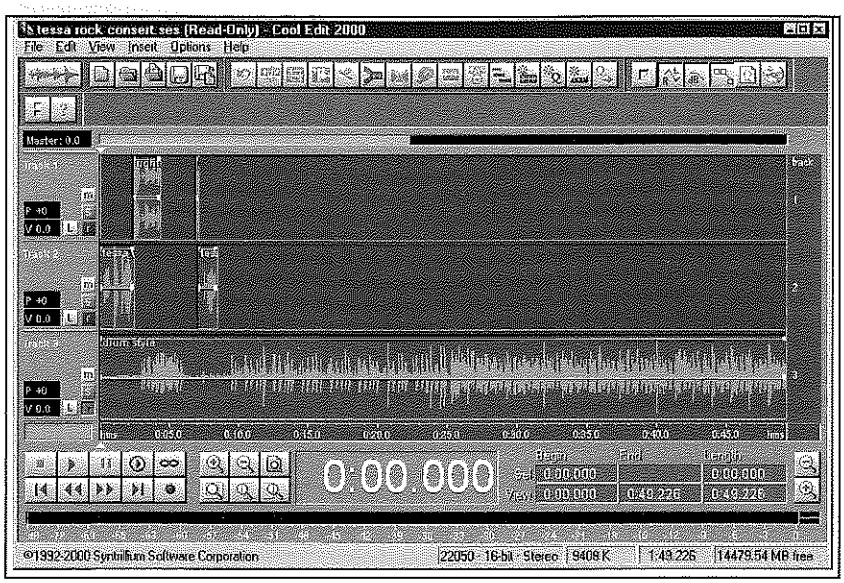
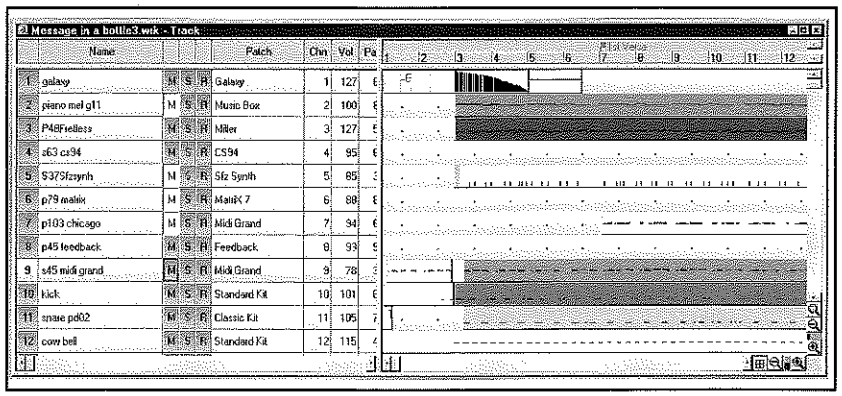


Figure 1: The Multitrack View - Cool Edit 2000

Cakewalk Pro Audio 9 is a midi sequencer and an audio recorder. In this study, It was used as a midi sequencer only; this was done in an attempt to avoid possible confusion about the use of two formats in one application. As a midi sequencer, Cakewalk allows for the recording of up to 256 midi tracks on sixteen different channels. All midi data can be viewed as traditional notation. This study used the General Midi sound set, which avoided the need for defining different instruments. Technical set up considerations were not part of the study, therefore the researcher made all the necessary connections and definitions. Cakewalk operates in multiple windows that provide graphical representations of different aspects of midi and wave data (see Figure 2). Each window allows editing of data at a fine level. The main difficulty faced by the participants was that of assigning tracks and channels to allow for multiple midi track recording.

Figure 2: The Track View - Cakewalk Pro Audio 9



This problem was relieved to a degree by the creation of a specific template for participant use.

Equipment and setting

The physical environment for this study was far from ideal. The study was conducted in the school's computer lab, a relocated classroom that used tables of different heights as computer benches. No provision had been made to accommodate music technology. The four midi keyboards were borrowed and only two were the same. The computers used were between one and four years old and varied in capacity from 133Mhz with 32 mb of RAM to 733Mhz with 256 mb of RAM. These computers are typical of the type found in Victorian primary schools. The obvious shortcomings of the physical environment as well as the age and variety of computers help to illustrate that music based computing need not be restricted to state of art labs. This work can be undertaken in almost any modern school setting. The richness of this environment comes not from the physical but from the software, its use, and the teaching that accompanied its introduction.

The software environment, as described above, provided the basis of the study. Over the ten weeks of the study, the participants were supported through the introduction of a series of tasks that were designed to develop the skills necessary to complete a final four week task. The participants were encouraged to experiment, to make choices about content, to collaborate, and to have fun. The small size of the group allowed the researcher to work closely with each individual as the need arose.

Composition and creativity – some definitions and explanations

There is a need to provide contextual definitions rather then complex definition of these two terms. For this study, composition was viewed as the construction and organisation of sounds, either original or borrowed, into a musical whole. Adherence to established or accepted musical form was of no relevance. The emphasis is on the deliberate ordering of the participants' ideas into a product. Swanwick (1989, p.43) defines composition as, 'the act of making a musical object by assembling sound materials in an expressive way.' He is referring here to 'all forms of musical invention, not merely works that are written down in any form of notation.' The scope of these definitions is deliberately broad and allows for all manner of artistic endeavours from the children in the study.

Creativity is, of course, a much bigger concept; a concept that applies to art, to science, to mathematics and all walks of life. (Gardner 1982,

1999; Hargreaves 1989). To bring creativity into the realms of reality for this work, creativity was defined as 'a process of mind and action, which results in the creation of a product that did not exist prior to that process.' (Reynolds 2001, p.7). A more detailed and perhaps more valid definition comes from Amabile (1983).

'A product or response will be judged as creative to the extent that (a) it is both a novel and appropriate, useful, correct or valuable response to the task at hand, and (b) the task is heuristic rather than algorithmic.' (p. 33)

Art education and computers

Art, by its very nature, is based on individual perception, experience, interpretation and, of course, creation (Renk 1993) and (Jonassen et al. 1999). The teaching of art and its assessment have to have a basis in experience and interpretation. McMillan (1993) believes that 'arts teaching and creativity should be synonymous terms.' (p.117). She sees composition and improvisation as integral parts of music education. Amabile (1989) talks of a 'Creativity Intersection' as the place where children's interests and skills overlap. It is the teacher's role to help children identify those places. If computers and advanced music software are tools that assist in this process then the opportunity for their use needs to be widespread.

Weidenbach (1998) supports McMillan's (1993) desire for composition in music education and believes that computers can 'facilitate the creative act of composing.' As well as allowing students to manipulate and play with sound, computers allow access to a range of sounds 'unlikely ever to be present in a classroom.' (p.2)

Computers promise the musician control over the entire sequence of composition, performance and presentation (Livermore 1993). Livermore sees the immediacy of feedback and the lack of need for other musicians as placing computers at the forefront of music making for the individual. The 'liberating experience' (Alvarez 1989) of using computers in music making, is the way a computer allows composers to question their material immediately and to perceive their work aurally. This changes the focus of composition from writing – as in notation and correct form – to building and hearing.

Interesting analogies can be drawn between the use of word processors for writing and expressing ideas, and the use of music software for composing and expressing musical ideas. The view of Armstrong and Casement (2001) is that it is unrealistic to expect that students will become competent writers 'simply by using a computer.' They go on to say that, 'no amount of technology can replace a teacher's guidance.' (p.103). In this paper the researcher does not attempt to argue that the software causes the creative process, more that the software allows a level of composition to occur that would not ordinarily exist. There is no suggestion that the participants could have operated without the guidance of a well qualified, well resourced teacher – in this case; the researcher.

Outcomes

It is appropriate to provide a sample of the kind of work undertaken by the children in this study. It is possible and reasonable to conclude that each child managed to use the software appropriately and that each child was successful in composing works that could not have been produced without the software. Detailed analysis of each child's approach to the software and to composition is available in Reynolds (2001). In an attempt to illustrate the results, a brief version of one child's story is included.

"Natalie"

"Natalie" is in Grade 6. At school, she uses 'heaps of programs' and considers herself good at Word, MicroWorlds, PowerPoint, Ixla Photo Easy and Paint Shop Pro. Natalie has not received formal music lessons except for school recorder. She does not have any musical instruments at home.

"Natalie's" work throughout the project was not consistent. She started enthusiastically, produced a very good first piece and then nothing for Session 2, apart from combining different drum tracks so that they fitted; she managed to achieve very little in the first four weeks. She found herself easily distracted by other participants and found it difficult to work if she didn't have the sounds that she thought she needed. When Cakewalk was introduced in Session 5, "Natalie" responded well but seemed only to be playing with the software: experimenting with sounds. She was completing set tasks but seemed more interested in experimentation. Perhaps what was being demonstrated here is what Weir (1987) calls 'messing about': playing or experimenting as a method of learning. Swanwick (1988) sees play as 'a vital human characteristic, (that) is intrinsically bound up with all artistic activity' (p.55).

It appeared that "Natalie" was learning through her play and experimentation. Any misgivings the researcher had about the works, or lack of works, she had produced to this point were allayed when the final project task was set in Session 7. This task required the participants to create a multitrack work that used both programs. The subject matter was not indicated, nor was the

style of the work. It could be an advertisement, a song, a story, or any other work. This task appealed to "Natalie" and she set about composing with great enthusiasm. By the end of the set project, she had produced a remarkably complex and complete piece.

"Natalie" had little trouble using either program. She used each program appropriately, was able to utilise the required components and managed to save nearly all her files correctly. With Cool Edit, she liked the idea of being able to 'play around with all different sounds' and if she didn't like them, being able to change them. She had a good understanding of mixing down and demonstrated an organised approach to using the program. "Natalie" was one of only two participants who preferred Cakewalk to Cool Edit. She said:

> I think I liked it better, it was better because you could see the whole thing, and you could get more sounds, all at the same time and have like all different sounds playing at the same time. Without having to just do four at a time without having to mix down and everything.

She liked 'having all the sounds' and the ability to 'have other sounds being louder than other ones.'

Her composition – 'Tinkerbell'

The idea for her main piece, titled 'Tinkerbell', came from a desire to be a singer. She wanted to create a band using Cakewalk. This was in her mind all along; she just needed to find the right basis for the music. Cakewalk exposed her to a great range of drum tracks that she could use. Initially she tried to make her own drums but found that very hard. She said:

> ... I couldn't get the right sound and um how to do the big drum rolls and everything. It was just harder doing it on the keyboard because you couldn't find the right sounds.

When she found the 'right sound' the rest fell into place. Her use of form and her considerations of style and melodic structure were influenced by the drum track. This does not diminish the composition; it serves to demonstrate that she could work creatively and appropriately within a formalised structure.

Quite clearly, "Natalie" was making creative decisions in advance of making sounds. She wanted rock band-type instrumentation and she wanted a tune to go with the beat. She became a little stuck after she had the drums and melody. It was difficult for her to take the next step. At the suggestion of the researcher, she included a bass part. Knowing which notes to play was a problem; it was suggested that she could try a one-note bass playing four to the bar. The choice of note (E) was explained, the idea was demonstrated for her and she was left to it. She liked the suggestion and began recording her bass line. She chose to stay with the one-note line but added rhythmic variation in the chorus.

She was very excited by what she had created but until the last session, was reluctant to add any more. During Session 10, she managed to add a guitar, a harp and a tinkerbell sound. As well as recording the whole thing into Cool Edit, adding a vocal introduction and mixing down. Her clear understanding of what she wanted and her desire to keep it simple shows a remarkable intuitive maturity. The clearly defined four bar phrasing, the obvious A A B structure, and an acceptable use of both harmony and counterpoint, further demonstrate the complexity of her composition. Figures 3 and 4 are notated versions of "Natalie's" 'Tinkerbell' piece. They were taken from Cakewalk's Staff View; the notes are generated automatically by the software, not written intentionally by the composer. The instruments are: Secco Acco – Harp, Secco Melo – Guitar, Alte 2 – Bass, Alte 3 – Piano. The four-bar phrasing and the harmonic and melodic structure are clear in these two examples.

"Natalie's" choices in her 'Tinkerbell' piece show an understanding of the software. It can be argued here that the software had enabled "Natalie" to achieve far more in her composition than she could possibly achieve without it: for her to compose to a level beyond her musical skill.

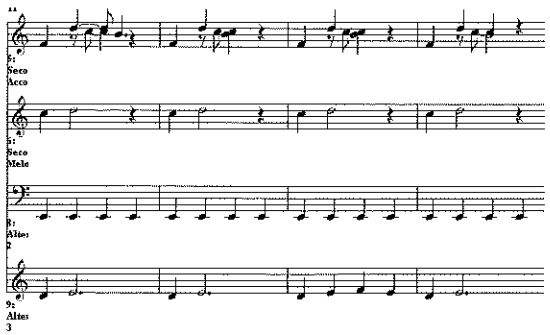


Figure 3: Tinkerbell - A Section

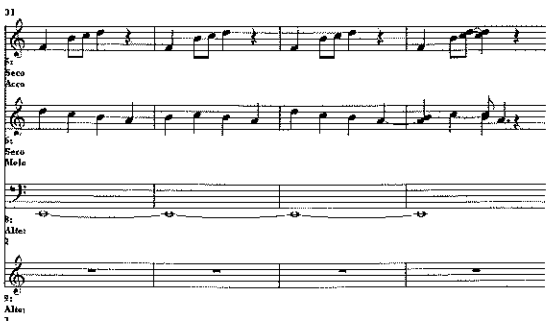


Figure 4: Tinkerbell - B Section

Conclusion

The children in this study used the software to produce works that they could not have produced without it. The project offered them a new and stimulating environment in which to develop a creative potential. It can be argued that the teaching ratio of one to eight in this study could not be sustained in a normal school setting, but maybe the quality of work produced and the enjoyment and excitement of producing it may demand that attempts be made to accommodate it.

An important aim in music education is to develop understanding through creativity and expression. As children become more adept at composing and more familiar with working in a creative and improvisational environment, they begin to confront the problem of their own lack of skills (Upitis 1990). How can they communicate a musical idea? How do they instruct another to play that idea? How do they best notate a piece? How do they develop their own playing technique? How do they work within an ensemble? The use of computers in this process frees them of the restrictions of lack of skill and technique, allowing them to concentrate on the formalisation of ideas and on the completion of specific compositions.

What this paper asks, and it is a question the researcher asks frequently, is not what can we do with computers, but what can be done with computers that cannot be done without them? The levels of composition and creativity in this study indicate that here is an area where computing excels. Of course, the role of the teacher in this process must not be forgotten. It is not only the tool that defines the outcome, it is how and why that tool is used.

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