Research on education in electroacoustic composition with children - future challenges

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Introduction

In order to develop useful suggestions as to how research on education in electronic music can be developed in the future, it is necessary with an overview of the current situation for research on music education, and in particular the situation for sound-based music. The ambitions for, and results from ICT in education in general are well described in several sources, and need not be discussed here. The principal topic in this short presentation is the education in electroacoustic techniques and music, and how they diverge from traditional music education and note-based education with electronic means. Following a short overview, the presentation will point to four areas where future research is needed.

Electroacoustic techniques are at the core of sound-based music, and the technical skillset is well understood. However, the concrete competences children develop during composition projects such as *Composing with Sounds* might be difficult to evaluate in traditional musical terms. This poses a challenge for integration in the curriculum, which is normally based in traditional concepts of notated acoustic music. The challenge is clearly linked with the wider-reaching questions about the effect of ICT in education - how well suited is it for furthering meaning-making and knowledge-building. Research data confirm that ICT adds engagement in the education, and data referred in Cooper (2007) evidence that students on the whole were inclined to work harder in music technology classes than other classes, and this underpins the notion that use of ICT adds value. One might hypothesize that this has to do with the experience of flow – a seamless iteration of development of impulse and feedback, action and awareness to the degree that the sense of self 'disappears' such as described by Csikzentmihalyi (1992). However, research is sparse in ascertaining exactly **how** ICT works in music education – thus we must say that ICT-intensive music education is under-researched.

Use of ICT is generally perceived as positive in much education research, well expressed by for example Mills and Murray (2000, p. 149)[i], where they state that it is necessary for people to use ICT to fully participate in society, and that ICT in music education increases engagement and motivation for learning. They also continue on to say that there is a need for research on the exact type of value use of ICT brings to the arts education.

We are, in other words to some extent dealing with a "black box" – we are seeing some good results, but are not exactly sure what they are and what they mean. And for our purposes in Composing with Sound - are we on the right track with our project?

Existing research on ICT in education

Literature reviews such as Dunmill and Arslanagic (2006)[ii] point out that ICT positively impacts education, and that it gives positive results for core disciplines. They continue on to quote Loveless' (2002)[iii] findings that ICT in music and visual arts also enhance learning processes and outcomes for these topics. Arts education benefits from the use of ICT, and as we know from the PISA report, arts education positively supports results in core disciplines – students in countries where arts education is prioritized, do better in core disciplines such as math and physics.

Most of the findings Dunmill and Arslanagic refer to result from studies of the use of ICT In general, and they conclude that there is little robust research on the results of arts education specifically. Despite the meager data on how use of ICT influences the art practices, there is still a clear, positive correlation between clear learning goals and the use of ICT – clear goals gives better effect to the use of ICT. This does not necessarily come as a surprise, but it is possibly a challenge for proponents of non-linear learning, which is often found in the arts, and accentuated by the current trend of bringing children in direct contact with artists in workshop settings.

Furthermore, what little research that exists on ICT and music is mostly oriented towards note-based music and the tools that facilitate the approach; electronic keyboards, sequencers and sample-combination programs such as *Ejay*, for example. In sum: There is not much research on the use of ICT in music or the arts in general, and the particular lack of research on music and ICT might be traced back to the fact

that music education in general is not a highly prioritized area in the educational system, that the field itself is somewhat equipment intensive, and that integration of new tools often challenges the restrictions of school ICT systems, giving less favorable conditions for both the discipline itself and the research on it.

The implementation of ICT tools in music education is under-researched, and much groundwork remains to be done on the use of ICT in formalized and non-formal learning situations. This is an opportunity to define premises.

Ambitions and opportunities

Governmental ambitions for education are generally high, and the ICT components of these ambitions post no exception. The ICT potential for creative thinking and problem solving is lauded, and the use of ICT is considered pivotal to the development of future education. An example can be found in a report made for the New Zealand government in 2006, where the researchers state: "Integration of the arts and interactive technologies are essential to the future of quality arts education learning for students in the 21th century.[iv]

Politics is also knowledge-based, and factual information is key. So when the positive attitude and approach to ICT is present, the situation offers significant opportunities for both researchers and developers of technologies and education, and it is necessary that this is done before industry's products overwhelm decision-makers. The strongly academia-influenced field of sound-based music should easily be able to draw on this situation, research-savvy and competent as it is.

Now that we have briefly identified that there is much we don't know about the effects of technology and sound-based music in education, there are several questions that need further elaboration. 1) Which are the salient features in technology-based music instruction, and what does sound-based music have to offer in addition/difference to other types of music? 2) Which theoretical framings of learning are best suited for understanding these salient features and differences? 3) Do the criteria for understanding creativity need revision in order to capture the essence of sound-based music and focus the studies? 4) Practice-based research in

both software development and iterative educational development should be revisited, with an updated focus on critical design-issues in interface and workflow design.

1) Electroacoustic music – special instance or unique combination of qualities?

In the project *Composing with Sounds* we have proposed that composition of sound-based music is a valuable undertaking for young children. An important reason is found in the technology itself; that it is used for engaging with microphenomena in the sounds themselves, and that this leads to changes in the musical priorities towards thinking about sound's intrinsic value and place in wider musical structures (Theberge 1997, p. 186)[v]. However, primary and secondary level schoolteachers do not value those priorities as highly as they do traditional priorities from the western music tradition (J. Savage), and this represents a significant challenge for bringing change to the curriculum. The teachers need to be interested and positive.

However, several studies show that current musical signal processing technology, through simple interfaces, quickly empowers students and pupils to compose and manipulate the structure of sounds, and this is also found in observations outside the school-system, in the less formalized musical practices that exist there. These "pockets of exemplary practice", as Savage and Challis (2001)[vi] calls them, could be investigated in more detail, and especially focusing on the perception that students easier produce music of their own style when selecting and manipulating new sound sources. If this holds, it possibly helps students recognize what is personal and unique about themselves, at the same time as their links to their local sonic and social context is maintained, possibly also strengthened. The difference between this type of open recording, signal processing and composition and more commercial sample-combination programs that base themselves on use musical templates is clear from a technical point of view, but should be researched with regard to this possible variation in results, engagement and aesthetic negotiations. Further, electroacoustic composition blurs the distinctions between performing, composing and listening, and is in this manner much in keeping with the social development of music technology use that we se every day. Are there differences with this approach and note-based approach? The possible importance of this element should be ascertained with regards to creativity and reproduction.

However, manipulation of sounds in software does not necessarily mean that any learning of musical or ICT skills is taking place, regardless of how appealing the results might be. Observation data on workflow and aesthetic negotiations need to be analyzed in order to gain insight into the processes the students are involved in, clearly also from an artistic perspective. More hard-data focused assessments of both method and musical results will also be helpful. Mills and Murray (2000)[vii] are among the researchers that point to the lack of stringent data on which musical competences young people build with computer-based technologies, and in order to meet their reported concern about the lack of imagination in the educational use of ICT, research on the use of a focused curriculum will be necessary. So in order to reach conclusions on the suitability of sound-based music in the curriculum, listening modes, association, disassociation, as well as the type of engagement following use of personal, recorded sounds should be researched. We *believe* the music to be suitable, but we don't really know yet.

Most of the research on the use of music technology in education has been made with a focus on pitch-based music, keyboard- and notation-driven. Some of the challenges that are implicit in any technological framing, software scaffolding and production method are undoubtedly similar for the genres, but musically the genres are different, and detailed descriptions of what distinguishes electroacoustic music from pitch-based music is necessary. Precise delimitation is perhaps impossible to achieve, so the focus must be on core values of electroacoustic music – which core values are operative, and by extension – how are they influencing the meaning-making processes and benefiting a learning perspective? Are they different form those of pitch-based music, and if so, how? And are they different in how they connect students through negotiations, richer or less rich?

2) Learning

Behaviourism, cognitivism and constructivism are theoretic framings often used in studies of education and educational processes, and they are bundled here because they all focus on the individual processes. Siemens (2004, p. 2)[viii] however, points out that these theories were developed before technology became a major part of learning, and that the technology has changed how we live and interact, and how we learn. He states that "learning needs and theories that describe learning principles and processes, should be reflective of underlying social environments", and this social perspective reaches beyond the focus on the individual and over into learning as a

product of social interaction. A connectionist perspective must be added in order to capture this accentuated development. That learning is a culturally conditioned activity has also been proposed by other researchers, such as Barrett 1995; Folkestad 1998; MacDonald, Miell & Mitchell 2002.

The sociocultural, collaborative perspective suggested above has been elaborated by Littleton & Häkkinen (1999, p. 21), where they underline that collaboration becomes meaningful through the work towards an agreed, common goal. Negotiations between peers is key to developing shared meaning and understanding.

This framing is general – agreeing on goals and negotiating ways forward does not necessarily involve musical learning, but the perspective is necessary in order to deal with the huge social changes that new technology has brought into the music, and includes the rise of informal learning that happens away from fixed hierarchical organization of knowledge. Dillon (2004)[ix] notes that there is a distinct lack of research on the interaction-processes in semi-formal and non-formal learning settings where computer- and music technologies are involved, and this is another hugely interesting research area that ties in with the much broader issues of technologically-facilitated empowerment.

The question about which musical competence the pupils develop and are left with is clearly quite complex, and we must assume that the competence is constructed both from qualities that emerge from musical listening and from practical work understood as socially framed interaction, in and out of school. An investigation of these complex competences across diverse arenas poses methodological challenges, but must involve children's own creative activity and musicking, in addition to rigorous studies of dialogue and musical results, seen as both musical production and as elements in the social negotiation and interaction in meaning-making processes.

Knowledge of both informal and formal learning is an important input to the further development of a holistic, connectivist perspective in education, and what that can bring of change to national curricula.

3) Creativity

At the base of creativity are critical thinking and the ability to discern, which again rests on reflection. This focus on process encompasses creativity as both an individual

and social activity, and includes executors and appreciators – in effect it describes meaning-making in a general sense.

Webster (2001, p.1)[x] defines musical creativity like this, and arrives at much the same conclusion:

> "..a dynamic mental process, alternating between divergent (imaginative) and convergent (factual) thinking, that moves in stages over time and is enabled by internal musical skills and outside conditions, which result in a final musical product, which is new for the creator."

This definition is general, and the important point is that it acknowledges the individual character of creativity, and that it does not depend on predetermined criteria for success. What is creative for one person does not have to be so for the next person. The definition also opens up for a wide range of approaches and tools. This poses methodological challenges for assessment in the educational situations, and might also make it problematic to distinguish between widely different software and materials, such as the relatively open software *Compose with Sounds* and the more limited *Ejay*, a software package for combination of ready-made samples and pre-composed material into electronic dance music. Reported frustrations from for example Cooper (2009)[xi] about students' experienced problems of arriving at personal musical expressions with these types of limitations in place, might be an interesting point of departure for closer descriptions of different types of creativity.

It seems that qualitative analysis of observation data is best suited for ascertaining the amount and type of creativity different educational models and types of software will generate. The focus will be on the negotiations in the creative process, and numerical methods could be useful should the type and amount of data be consistent and large enough to allow for robust conclusions.

4) Design of scaffolding, workflow and software

Practice-based research in education and software design can be valuable for developing an understanding of how design issues influence how tools are used – the perceived affordance of the specific tutorial tools. Any tool lends itself to particular ways of working, so this type of research is highly topic-dependent. This however does not reduce the opportunities for forming conclusions on levels of principle, and it allows for iterative processes of adjustment of both educational principles and minor parameter changes as the research progresses, which facilitates meaningful

harvesting of user data in a process-perspective. For example Brown (2007)[xii] maintains that software development can externalize ideas, stimulate action and reflection, at the same time as observation and user activity produces research data. His case was the development of a network software *Jam2jam*.

Software and other tools always suggest how they should be used, and design issues are at the core of how affordance is perceived; what a tool is good for and good at. Questions of design and steering of workflow in teaching methods and tools must find their focus in the learning objectives, with the purpose of documenting how development and student activity works as a cohesive pair. This necessarily iterative process will shed light on whether the activity and software development is mutually reinforcing, on how/whether the software can be improved, or on whether progress should be sought in for example the further development of didactic material or teaching methods. Further, It should analyze the differences between expected and actual student behavior, and most importantly, whether the students are reaching their learning goals. One would be able to get data on how different teaching templates and learning approaches gives different results in the specific domain.

Type and amount of teacher intervention is another important topic in this research area. Since approximately 2000, huge amounts of funding has become available for bringing musicians and artists in direct contact with young people across Europe, and they bring another type of intervention into schools. The influence this has on the education should speak for the relevance of considering the intervention itself. Different types of teacher/instructor intervention should be investigated – from the curriculum-bound, instructional approach for securing basic curricular standards, to the facilitating approach, where supporting student creativity happens in a more open fashion. Which intervention approach yields the best results? And which evaluation method is most relevant - teacher grading or peer evaluation through observable and measurable activity? A question that follows in the wake of this is which degree of diversification in curricular activities should be encouraged and accepted.

Conclusion

Projects where integration of ICT is focused has been studied by several researchers, among them Avril Loveless, and she finds that students engaged in art projects with involvement of technology

> "were able to work creatively, use higher-order thinking, utilize multimodality, develop multiliteracies, and transform and make artistic meaning from digital data. The creative processes of imagination, fashioning and 'flow' were supported by the immediacy of the presentation, the ease of manipulation and development of ideas, or revisit them in order to explore other possible routes." (Loveless, 2002, pg.11) [xiii]

The project *Compose with Sounds* is first and foremost a music project, although it also teaches computer skills and extends a general creative approach of the type Loveless describes above, rather than a consumer approach. At the closing of this project, it is easy to observe that a future development of this and similar projects would do well in crafting a more explicit interaction loop, with closer integration of software development and composition workshops, drawing the user response into the (re)-design of the software, the surrounding tutorial methods and didactic materials.

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