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Generative Futures

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Abstract

Children are now the main users of computing devices and children have different approaches to their use. Computers and digitally mediated content have been with children all their lives, computers and other devices such as mobile phones are not something they get used to in adulthood.

One transition that is important is the development of new genres of content which are only possible with computer power and knowledge based systems. The children in the study develop generative music [Eno 1996], which is rule based, and which creates subtly different versions of a piece or set of rules each time it plays.

Doubts are being expressed now [Spector 2001] about the claims for New Media Technologies [NMTs] to provide suitable educational experiences.

In this case study, which considers the role of computers for creativity, a school in the city of Brighton and Hove, UK is using NMTs across the curriculum to motivate and enhance general literacy of 11 -16 year old students from disadvantaged social conditions. In particular the work of Edmonds [2000] on how computers can enhance creativity is considered in the context of children acting as artists.

The project, called Some Old Bones, based on the discovery of the world's oldest musical instruments [Zhang et al 1999], is positive about the creative use of computers in the future. Children are asked to recreate 9,000-year-old sounds.

The role of intelligent use interfaces and how children construct a model and relationship to deal with them has been covered in previous work with children [Pettigrew 2002]. The assumptions behind much IT teaching and other experiences for children have been questioned [Pettigrew and Elliott 1999], since what needs to be learned is an approach, the reliance on teaching microskills is redundant and demotivates children.

The long term implications of these kinds of experiences and relationships are reviewed in the context of the Fourth Great Discontinuity [Mazlish 1994] - the co-evolution of humans and computers: carbonware and siliconware and their combinations. A new man-machine relationship is likely to develop, influenced by the changing nature of digital production, distribution and consumption of media content.

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Keywords

Generative Eno Fourth Discontinuity intelligent user interface media convergence

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Generative Futures

Children are now the main users of computing devices and children have different approaches to their use. This is as important a milestone as the technological milestone of more data being sent via the telecomms networks than voice messages. Computers and digitally mediated content have been with children all their lives, computers and other devices such as mobile phones are not something they get used to in adulthood. Future consumption of media and attitudes to its production and distribution are likely to change substantially for this reason

Doubts are being expressed now [Spector 2001] about the claims for New Media Technologies [NMTs] to provide suitable educational experiences. This is partly because the array of exciting technologies which are pushed out have restricted use. Spector refers to 'technification' whereby new educational technologies are 'only used by a scarce cadre of technocrats'. At least there is now more of an emphasis on the learners rather than the technology, but understanding how people use actually use computers and their attitudes to them is vital. 'Potential gains [from NMTs] have yet to be realized on a global scale'

There seem to have been few systematic attempts to review children's use of computers for general or creative purposes. There is at least one in-depth study of children using computers to develop ideas in the scientific domain [Scanlon 1999] but the learning outcomes in this instance are very specific and very measurable. It is more challenging to try and follow the creative process; challenging in terms of developing a methodology for the investigation, reviewing creative outputs and then attempting to understand the process of young Human Computer Interaction [yHCI].

However there is a growing body of knowledge about adult artists using computers for creative purposes. As computers have become able to manipulate more complex knowledge based systems, the nature of the interaction has changed; from instructional to emancipatory [Watson 1997]. The Creativity and Cognition Research Studios at Loughborough University, UK have a track record of over 15 years in the field of Art practice augmented by digital agents. Edmonds [2000] outlines some of this work. Intelligent agents augment and emancipate artists by generating realisations of deep structures which the artist can make aesthetic judgements about. The key argument becomes about the role of the intelligent user interface allowing artists to lift their concerns to a different plane and therefore promoting more advanced creative thinking. The difficulty that some traditionalists may have with this idea is that the surface skills have been replaced by a machine; the basic production skills are no longer necessary.

It seems that there can be an increasing role for computer support to augment and stimulate creative thinking, this is a different proposition than the role of computers to make human processes redundant and reduce operational costs. This can be further characterised by a definition of creativity in Edmonds 2000:

'formulating new patterns or possibilities, rather than solving old problems'

There has also been a shift away from using artificial intelligence [AI] to automate human processes and to use AI to enhance human creative activities such as design.

New digital artists or artists new to digital creativity, such as the 1996 artists-in-residence at the Creativity and Cognition Research Studios highlighted the role of computers to structure work, but also revealed that there were technological challenges and barriers to implement some of the artists ideas.

What is interesting about the early findings and perspectives of work with children acting as artists is that they do not have the same perceptions of technological barriers. It seems

possible to hypothesize that children brought up with digital technologies will create new creative ideas in collaboration with computers, rather than the seeing the machine as an unyielding and mature tool.

A well-known example of a non-collaborative art-making machine is AARON. The programmer, Harold Cohen, transfers some of his knowledge and perceptions into rules and these 'are informed by criteria, which are not simply standards of performance but standards of performance with respect to specific issues'. AARON draws pictures on its own. The artist has made the agents, which makes the picture. The rules make the generative art.

One transition that is important is the development of new genres of content which are only possible with computer power and knowledge based systems. The children in the study develop generative music [Eno 1996], which is rule based, and which creates subtly different versions of a piece or set of rules each time it plays. In his diary A Year with Swollen Appendices, Brian Eno writes abut his fascination with unfinished work [a better concept he believes than interactivity]. He was interested in composition seeds rather than precise musical descriptions. The Koan authoring system provided this for him, 'since he knows nothing about writing code for computers'. Generative art subsequently became a more widely discussed and implemented concept. It is not fixed, it is an information age idea not an industrial age one.

A set of rules, a kind of musical intelligence, is built into the Koan music software generative engine. For children it represents a simple yet structured approach to musical authoring and composition, the children can make aesthetic judgements about the surface affects in collaboration with the intelligent user interface. How well do they do with generative music and how do they do it?

In this case study, which considers the role of computers for creativity, a school in the city of Brighton and Hove, UK is using NMTs across the curriculum to motivate and enhance general literacy of 11 -16 year old students from disadvantaged social conditions. East Brighton College of Media Arts (Comart) is a school with 480 students serving a very mixed social area with many of the students being drawn from an area of social deprivation, which has been identified under the UK governments' New Deal in the Community programme. The College also belongs to an Education Action Zone of two secondary and eight primary schools.

A new curriculum program called 'Improving Student Performance Through Media Arts' has been introduced with the vision: of raising the status and commitment to learning and achievement in and through the arts and media. Part of this process is creating consistency in learning and teaching within and across subject specialisms via *a 'Multi-media for all'* policy using Photography, Illustration, Video, Film, Animation, Graphics, Text, and Audio sound.

Students in key stage 3 (aged 11-14) have two hours a week of teaching and learning time for Multi Media, using NMTs in creative ways, embracing the above vision and use of media. Students aged 14-16, studying GCSE's have four hours a week, some studying ICT and some studying Media Studies. More able students study for both GCSE's in the same time allowance. All students have the opportunity to study Technology (Graphics and textiles); Art; Drama; Music or Dance in the options at key stage 4 [ages 14-16].

The Media Arts staff feel trained and supported and feel confident enough to try new approaches to learning, using any combination of technologies with students in the classroom. Staff at the College have written a new and dynamic curriculum, with schemes of work designed to promote flexible learning and teaching styles.

Students have responded positively, with levels of literacy rising and produce work which shows evidence of independent learning. Students are transferring their skills across the curriculum, using Photoshop in Art; Power Point for presentations of work in English and Humanities and Macromedia Director in Multi Media. The College is using visual learning

techniques in order to promote understanding and knowledge across the curriculum, for instance, mind maps in Humanities. GCSE results for Media, Art and ICT were 53%; 62% and 63% A* - C respectively, in 2001, this is a substantial improvement on previous school performance.

Two early teenagers are confronted by a new software programme and a new idea. They spend some time exploring the software programme and discovering what it can do. In the school they have got used to an exploratory and diagnostic way of doing things - 'what does this do and I am any good at it so far?' are the internal dialogues they might be asking themselves.

Relatively quickly they have worked with a simple knowledge based system and found different types of sound, ways of adjusting the speed and pitch or altering the emotional content of sound and music via the scale or mode. This is different from learning music from the rules of past experience and orthodoxy only - there is no notation and no systematic music theory or hours of practice. None of these would be expected from the social profile of the children at the school in any case. It is quick, intuitive and purposeful. Interestingly it also collaborative, children can work in a changing triad of machine, artist and artist's assistant. Children collaborate with the 'effortless ease of a gull in the air' [Peake 1955].

The original focus for this project was a letter in Nature *'Oldest playable musical instrument found at Jiahu early Neolithic site in China'* [Zhang et al 1999]. They describe 'six exquisitely made complete flutes… from the ulnae of the red -crowned cranes (*Gras japonensis* Millen)… and have 5,6,7 and 8 holes.' Carbon dating places them at '7,700 to 9,000 calendar years BP or nearly 5,700 to 7,000 cal [calibrated] BC. These flutes are claimed to be the 'earliest, complete, playable, tightly dated multinote musical instruments'. The best-preserved flute was playable, but most were damaged or highly fragile.

Zhang et al used a 'Strobocomm' sound analysis stroboscope and two human players to create and analyse the sounds. Initial testing did not discover what the tonal scale of the bones flutes of Jiahu was, but 'indications are that the flutes could not just play single notes' but 'perhaps even music'. They speculated in the paper about the role of the flutes in this complex, highly organised Neolithic society 'ancient Chinese tradition held that they were strong cosmological connections with music' and that ' the performance of ritual and music were specifically associated with matters of state.'

The two children in the school, and others in other schools, were asked to consider these speculations about the use of sound and music. Then they were encouraged to make the sounds or music which their imagination formulated, using the Koan X software system. An additional feature of the project was that samples of the sounds from the best-preserved flute had been on the Nature website but it was no longer available. We asked them to produce a sound sample as one output for their gedanken [thought] experiment.

'What is the sound of one flute playing?'

'If a flute plays in the past and no-one is there to hear it, does it make a sound?'

Once the two children had completed this task they asked to move on to something of current interest to them - a dance piece on teenage gangs. They could move on using the techniques to new horizons. But they had used the generative system to produce generative sound and music content. The school had provided them with a way of dealing with new production methods. In addition to being consumers they were producers as well, generators of new content not just auditors of other people's work.

The barriers to production and distribution have been reduced with NMTs; we can all develop and provide access to our material on a many-to-many basis via the internet. Does this mean that media consumption has fallen and that media creation has increased? The internet is an uncontrolled network which means that it is very difficult for businesses to make a return on

investment and that the content is not systematised. In Europe organisations such as ERICA [European Research into Consumer Affairs - www.net-consumers.org] are investigating, as internet usage widens, the ways to protect children from disturbing content as well encouraging children and other disadvantaged groups to create content themselves. The information age is not the industrial age with lots of computers, it is a generative world with fewer and fewer fixed ideas and processes.

The assumptions behind much IT teaching and other IT experiences for children have been questioned [Pettigrew and Elliott 1999], since what needs to be learned is an approach, the reliance on teaching microskills is redundant and demotivates children. They argue that 'technology changes so fast, it is more important to lean how to develop IT skills than to learn a particular program' and 'you are unlikely to transfer learning from one application to another if you are simply memorising sequences and do not understand the principles'.

The role of intelligent use interfaces and how children construct a model and relationship to deal with them has been covered in previous work with children [Pettigrew 2002]. Using creative digital arts projects enables children to disconnect from the efficiency use of computer, it moves them from instructional use to emancipatory use where the user programs the machine not the other way round. In a summary of work including a project to create a piece of generative music to last for ever 'Eternity', it was found that children are open to creative uses of computers and find it easy. Barriers to new usage are more likely to be administrative than artistic. The paper concludes that 'generative software systems are emancipatory and that this changes the way in which adults and children interact.' By letting go, away from fixed content and processes, the information age can he achieved.

Children are more able now to be generators of content as well as consumers of it, at least in the developed world. Computers have improved efficiency to some extent, but they can also be used to liberate people to be more creative: self-programming workers as opposed to generic labour [Castells 1998]. It seems that attitudes to machines are changing, particularly in the young. Children in this simple case study quickly got used to a system, used it and moved on with the help of a machine. The machine is an appliance, a tool, a collaborator.

In the development of man's thinking and his relationship with the world Bruce Mazlish [Mazlish 1994] argues that there are four breaks or gaps which need to be understood and adapted to. Copernicus defined the relationship of man to the physical world; Darwin defined the relationship of man with other animals; Freud made us aware of the relationship between our rational and irrational natures. These are all discontinuities in thinking that most people in the developed world get used to. The Fourth Discontinuity is the one we are now trying to understand and deal with.

Mazlish argues that human evolution will develop further by humans learning to live with a new man-machine relationship, he states that 'the sharp discontinuity between humans and machines is no longer tenable'. Media convergence is technology driven and this could be subtly changing attitudes and consumption patterns which will make it more likely that cyborgs, combots or other new man-machine combinations can be developed. Mazlish's view is that we have taken the path to enter a world beyond the Fourth Discontinuity, and 'we can be free to reconfigure the relationship between humans and machines in various ways - for there is, of course, no single right way'.

I compute, therefore I am.

~~ ENDS ~~

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Short Bio

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Jon Pettigrew BSc (Psych), MBA is a researcher with the Creativity and Cognition Research Studios Loughborough University [UK], leading to a PhD supervised by Professor Ernest Edmonds. In 1990 he co-founded sseyo ltd which developed and published music software tools and content, in March 2002 it became part of the Tao group of companies and the intent multimedia platform for consumer devices. Jon signed Brian Eno to the sseyo label in 1995. From 1997 Jon was a consultant to the company and to other organisations, working extensively in digital arts often with children. He is an adviser to ERICA, European Research into Consumer Affairs and Chair of the Advisory Board for the Insititute of Digital Art and Technology [Plymouth and Newport Universities, UK].

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