InterActive Education: Teaching and Learning in the Information Age

www.interactiveeducation.ac.uk

InterActive Education: teaching and learning in the information age is the largest ICT and education project so far in the UK. The project was designed from the outset to bridge the divide between research and practice. At its heart is a unique partnership between university researchers, teacher educators and teachers, working together as equals to find out how ICT can be most effectively used to enhance learning.

Aims of the project

The overall aim of the project is to examine the ways in which new technologies can be used in educational settings to enhance teaching and learning. Specific aims are:

- to describe and theorise the links between teaching and learning in ICT-rich settings;

- to characterise young people's and teacher's out-of-school learning with technology in order to draw on this potential within school-based learning situations;

- to characterise productive professional development practices;

- to identify the conditions which give rise to effective management practices enabling the creation of innovative computer-based learning environments;

- to highlight the similarities and differences between subject cultures with respect to both pedagogic practices and students' approaches to learning which incorporate new technologies;

- to identify the ways in which research evidence can be transformed and developed to be of value to educational practitioners.

Context

Ten schools and colleges and over 50 teachers are partners in the research. These come from the primary, secondary and FE phases; teachers of English, Mathematics, Music, History, Geography, Science and MFL are involved.

Preliminary findings

What are teachers and researchers finding out?

• ICT is only a tool which has to be understood by teachers and incorporated into their practices as appropriate.

• Using ICT to enhance learning involves more than just meeting the technical challenge - though that is important.

• Whereas it is true that students are often highly engaged with ICT, this engagement can lead to individualised and idiosyncratic knowledge construction which does not fit with what the teacher intends students to learn.

• The interactive whiteboard can be a powerful new tool to support collective knowledge building which draws on students' individual knowings.

• In learning, the interaction of new and traditional technologies - like pencil and paper are complex and subtle. We are beginning to understand them.

• Teachers often underestimate the nature and extent of students' use of ICT both outside school and inside school. This means that students' expertise is likely to be under-valued and under-used.

Background

The project centres around the design and evaluation of longitudinal teaching and learning initiatives within the areas of English, history, geography, modern foreign languages, science, music, mathematics. The following five research themes frame the project:

• Teaching and Learning

• Educational Policy and Management of ICT in Schools

• The Role of Subject Cultures in Mediating ICT Use

• Teachers and Professional Development

• Learners' Out-of-School Uses of Computers

Within this context the specific research methods being used are multi-layered operating at a macro, meso and micro level within the project schools, including: questionnaires to students on out of school uses of computers; focus group interviews with students about their out-of-school computer use; case studies of young people's out-of-school computer use; questionnaire to teachers; interviews with project teachers; video recordings and observations of the process of teaching and learning; diagnostic assessment; interviews with senior management and ICT coordinators; policy document analysis. We are developing innovative ways of using digital video of classroom interactions as a tool for analysing the processes and the outcomes of learning.

Findings from the Music Team

As a team, we have explored Music ICT software, viewed and considered the spaces for music and ICT within the different institutions and shared ideas on the work that the teachers have carried out in school. This has informed modifications to the designs, all of which have been carried out a second time. The teachers focussed their designs on composition using eJayTM and Cubase or Cubasis software:

• At Colstons Primary School Year 6 composed music in ternary form using Dance eJayTM

• At St. Michaels CEVC Primary School Year 6 used auto-accompaniment software as a basis for musical discovery.

• At Cotham School Year 7 worked on African drumming.

• At Fairfield High School Year 8 explored Spanish music.

• At Sir Bernard Lovell School Years 8 & 9 composed music to a model design including pictures as a stimulus.

• At Cotham School Year 9 created music to accompany video images.

**ICT and Learning in Music Composition**

Composing through ICT worked best when students were given open-ended tasks. For example, at St Michael's school the pupils were given the 12 bar blues chord sequence and were asked to create one or more part to fit with this; some children added rhythms, some produced rhythms and melodies and others sang vocal lines to the ICT accompaniment.

Music software allowed students access to music composition without the need for formal theoretical or practical skills.

The visual representation of music on the computer screen acts as a focus for collaboration and joint meaning making.

Clear guidance in use of the ICT software was fundamental to work in music. Two approaches for work within Cubase - the use of the notepad and html help - have been particularly successful since they allow for a paper-free classroom in an environment where space is at a premium.

Front of class

The organisation of computers and furniture in the music room affected collaborative possibilities in the classroom. The following layout seems to provide scope for collaboration; allows all students to view teacher-led work at the front of the classroom, with minimum movement and enabled the teacher to move freely around the room to monitor students' work.
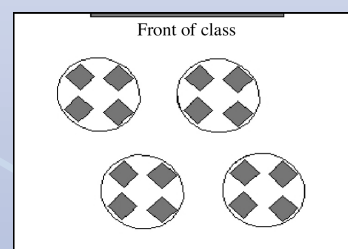
Vignettes

• Creating Dance Music with eJay™

In Colstons School, Jo Heppinstall and Natalie Butterworth developed a design initiative for Year 6 students using Dance eJayTM software. The students were asked to compose a piece in ABA form with a 16-bar ambient introduction. Many pupils commented on how eJay™ enabled them to work in a style similar to the music they listen to at home. They also enjoyed working with a package that gave them access to sounds that might otherwise not be available within a primary school e.g. drums and electric guitars:

> *'...we're into hip-hop and rock and stuff like that...so it's quite...strange for us, to hear the music we're into [in school]...it's new...it's good.'*

> *'It is much more interesting [than other composing work] and there is more range of sounds.'*

As a generalist teacher with no previous experience of using ICT in the music classroom, Jo feels that she benefited enormously from working with others:

> *'Meeting together as a Music team was good....and listening to the secondary people, because you don't get that involved in the secondary school unless you know somebody very closely who works in a secondary school...it was very interesting to hear Andrew's (a teacher from another primary school) ideas and what was happening in his classroom. The meetings at the university were useful...it was nice that you didn't feel so isolated.'*

Composing Spanish Music

Becca Ball at Fairfield School had not used ICT with Key Stage 3 music before the project. Whilst major technical hitches caused many problems within her Year 8 subject design she felt very positive about work:

> *'At another in-service course training the other day [I realised] through doing this project, I'm actually 'ahead' of some of the other schools around. [Since working on the project] I have worked more on templates...and it's made me think how I can use them throughout [the curriculum] even as early as Year 7.*

Music for the Movies

In Cotham School, together with the Composer-in-Residence at the school, Paul Taylor, the Head of Arts, devised a subject design in which Year 9 students explored the relationship between film and music using Cubase VST 5.1. The template contained prepared musical clichés, which had to be synchronised with the film that was loaded into the program and therefore available on screen throughout. This formed the last scheme of work for the students before most of them gave up studying Music in school and was the first time that the teacher had experimented with visual as well as audio material.

The initiative proved very appealing to boys and girls. It was a highly inclusive project: many students arranged the fragments of music, cutting, copying and pasting them appropriately but higher achievers also composed their own fragments or even whole sections of music to fit the film.

For further information on results for the Music team, contact Marina Gall at Marina.Gall@bristol.ac.uk

Findings from the English Team

ICT posed significant opportunities and challenges for English as a subject. As new communicative practices become increasingly commonplace in the wider world the meanings of 'English' and 'Literacy' are being redefined. Teachers and students working in ICT rich environments are very aware of the discrepancy between school and leisure/work literacies.

In our schools we have found that:

The multi-modal dimensions of digital communication challenged the notion of English Language and Literacy as being about words, sentences and texts. The verbal aspect of communication was only part of what was being communicated. There is often a tension between the verbal act of meaning-making, and the meaning-making which comes from layout and from the other resources intrinsic to the materiality of digital texts (e.g. hyperlinks). Working in multimedia can be empowering especially for students with lower levels of attainment in traditional literacy skills. For example year 9 pupils with low attainment in traditional literacy at John Cabot CTC were able to communicate effectively showing understanding of audience, purpose and genre in the creation of multimedia texts.

ICT enabled a re-representation of language as a symbolic system: abstract ideas about the internal structures of words could be shown graphically and manipulated kinaesthetically. The re-presentation of language in multi-modal texts allowed abstract ideas about the structure of language to be embodied. In Year 6 work on word structure, students were able to move morphemes around a white board and in their PowerPoint slides.

Using ICT changed the nature of writing. The writing process became more fluid when students used computer software to create texts. Students creating both traditional and multimodal texts using ICT often attended to the visual and spatial qualities of text creation early in the design process as in selecting fonts, templates or choosing images. At the same time, students were often unaware of word-processing editing functions which could support their redrafting of texts.

ICT created increased possibilities for the production of authentic texts for 'real' purposes and audiences. This revisiting of a tenet of English teaching has had empowering effects for students. Teachers working with ICT have often been drawn to student centred approaches with more open objectives which can counter or complement the explicit and targeted Literacy Strategy approach. This has been productively explored in the production of a school newsletter; PowerPoints advertising an English department for open evening; and holiday brochures for a class 'Travel Agents Corner'.

The open user-navigated structure of the Worldwide Web posed particular problems in pedagogical contexts. ICT created increased possibilities for searching information, but such information is still more chaotic, multifarious and extensive than that found in paper-based libraries. The absence of 'gatekeeping', or authenticated provenance, for the texts led to difficulties in assessing the value of the sources accessed.

Use of well-designed ICT environments helped pupils grasp abstract concepts such as imagery, literary relations and morphology. For instance, Rachel Yates and Sam Mills have looked at what happens when pupils produce PowerPoint representations of poems combining image and text. Sam Mills reported that pupils' subsequent GCSE writing has shown a stronger attention to and ability to describe imagery.

Vignettes

Rachel Yates, Cotham Grammar School

Rachel was in her second year of secondary English teaching when she joined the InterActive Education team. She has been tenacious in developing her own ICT expertise often in the face of technical and institutional challenges. She has worked on subject designs using digital cameras and PowerPoint to explore the grammar of still and moving images as well as experimenting with visual representation of poetry. In the process of reworking her designs she has incorporated ICT to allow an increased attentiveness to pupil choice and control at the same time as valuing the affordances of data projection for whole class instruction and reflection. Trained within the Literacy Strategy model, working in the Interactive Project has entailed significant modification and strategic professional questioning of her initial commitment to a highly structured objective led approach.

> *'When I was teaching, whole class teaching, I was very much at the front and that was my responsibility. But when they were doing collaborative learning I took a step back and that was very positive in the second project because in the computer room I felt much more relaxed and more in control and more let's just let it happen. So I think my mindset changed.'*

Pam Kelly, Colston's Primary School

Pam is a highly experienced, confident and expert primary teacher who was unconfident and sceptical in her approach to ICT. Her subject design involved pupils working in pairs on a creative writing task. The innovation for Pam was that they would compose direct to screen and write collaboratively. This apparently straightforward and traditional task raised powerful questions about the nature of the writing process, the way pupils negotiate collaborative writing and the culture of multimodality that pupils are now bringing into the classroom. The pupils' control of the technology disrupted the teacher's defined stages of composition and changed the nature of the task itself. Pupils worked creatively and sensitively in relation to font and image from the outset. Some pupils produced highly graphical pieces which disrupted the language bias of the task.

Dan Sutch, St Michael's CE VC School, South Gloucestershire

Dan wanted to use ICT to drive up the standards of spelling in his Year 6 students, in preparation for Key Stage 2 tests. As the work progressed, he moved away from teaching spellings to teaching the structure of vocabulary within the context of promoting knowledge and awareness of language. Dan was an ICT enthusiast and an energetic recently qualified teacher working in a well-equipped and successful beacon school with a national reputation for its Key Stage 1 Phonics teaching. The Wordroot software enabled students to see, test and manipulate the 'Lego-like' patterns in the structure of 'hard words". Such words have spellings based on morphemes borrowed from other languages. These constitute a major proportion of the longer words used in more sophisticated contexts. Pupils achieved record results in their English Key stage SATs.

Chris Davies and Adrian Blight, John Cabot City Technology College

These teachers working in a city technology college were keen to experiment with highly innovative ways of using ICT. Two designs involved the pupils in collaboratively writing hypertexts: Year 11 pupils produced a revision website for Of Mice and Men and Year 13 pupils produced a literary connections website around World War I texts. For some learners this was a strong motivator, resulting in engaged, collaborative and intensively researched work. Year 11 pupils all evaluated the project positively and the target group reported a deeper and altered valuation of their assigned character. Note for example this pupil's comment on 'Slim' as an authority figure within the text:

> *'It was fairly obvious from reading the book but it became more and more visible from actually doing the website.'*

For further information on results from the English team, contact Sasha Matthewman at S.Matthewman@bristol.ac.uk

Findings from the Mathematics Team

A holistic perspective on design

The design of the whole mathematical learning environment is a key factor in terms of students' learning. This includes paying attention to: the design of the computer interface; teacher's use of language and inter-change between teacher and students; time for individual investigation; time for whole-class work; the nature and extent of the use of non digital tools (e.g. paper and pencil).

Learning and ICT

In our schools we have found that well-designed use of ICT can:

• extended students' mathematical questioning and use of mathematical language.

• supported experimentation and play.

• allowed students to manipulate abstract mathematical concepts.

• provided new and dynamic ways of representing mathematical ideas that stimulate learning.

• provided rapid feedback for learning.

The teacher was key - shifts between individual and common knowledge

Students often brought an experimental and playful approach to the use of ICT from their out-of-school experiences. This was positive from the point of view of individual and independent learning. However this approach could lead to individual and idiosyncratic development of mathematical knowledge. This is why the teacher played a key role in drawing together individual and sometimes informal knowledge into collective and common knowledge.

The teacher was key - opportunistically leading students into the world of mathematics

With well-designed mathematical environments and experienced use of digital and non digital tools the teacher can opportunistically lead students into more sophisticated mathematical worlds.

Discovering negative scale factors for enlargements by working with Cabri-Géomètre

Ellie Coombs, Year 9 John Cabot City Technology College

Sam and Nabil construct **Fig.1** in Cabri and start changing the scale factor.

Nabil: Ehi Sam look at this! Sam, it turns around! (**Fig.2**)
Because it's going minus isn't it so it goes the other way .. so it... if say ..if we ... wow!

Sam: Move that one.

Nabil: This one?
Nabil changes the scale factor instead. The transformed figure disappears from the screen.

Nabil: It's running away Sam! It's running away! (**Fig.3**)

Ellie: Oh, it's running away! That was an interesting thing. What happens when you do a negative?

Nabil: It goes the opposite way.

Ellie: It goes the opposite way. Cool. Yes, when it's negative. Do a negative again so that we can see it a bit better. It turns upside down, doesn't it? So you can really comment on that. That's what I meant by orientation, because it does not stay the same way around. Well done boys!

scale factor = 0.4   scale factor = -0.3   scale factor = -1.8

Fig.1   Fig.2   Fig.3
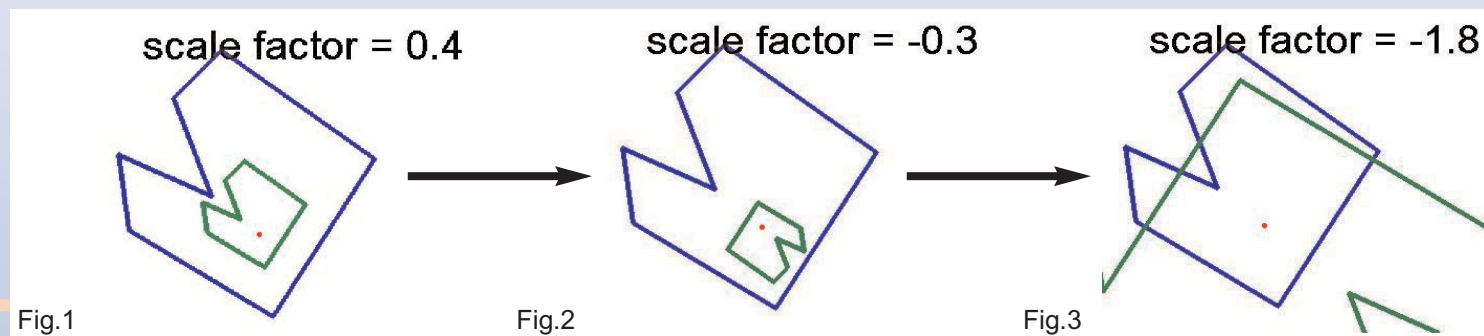
What Ellie said about working within the InterActive project:

Ellie: I just finished my 4th year of teaching and it was that stage when you want to do something different for a start and also it was quite a long time since I had done my PGCE and when you do your PGCE you do a lot of thinking about your lessons....when you are getting into a classroom....because you have so little time....you're neglecting it more in a way....you don't do that deep thinking about what you're actually teaching. So I think it was quite a good time to go back and do that deep in-depth thinking.

I really enjoyed having the meeting with you two [researchers at the University], it gave me so many ideas. [...] What did I enjoy?......not having the attention on me, but having the attention on my lesson and my planning was just really nice. And that was really nice to just be able to bounce ideas off somebody else. Because I think you are quite isolated when you are a teacher, you are in the classroom on your own and you do do your own things in a way, not that in-depth because people don't have time in school. And I really enjoyed that aspect of it. And just that you were coming up with lots of new things that I hadn't thought of. And as well I really felt that you gave me a lot of confidence in trying out different things and you were just like 'Yeah go ahead and just do it'.

For further information on results from the Maths team, contact: Federica Olivero at fede.olivero@bris.ac.uk

Suggestions for further reading

Gall, M. & Breeze, N. (2003) Enhancing Learning Using ICT in the Music Classroom, in National Association of Music Educators Magazine 2003 Issue 11

Matthewman, S. & Triggs, P. (2004) Obsessive Compulsive Font Disorder': The challenge of supporting pupils writing with the computer, in Computers and Education, Elsevier Ltd

Morgan, J. & Tidmarsh, C. (2004) Re-Conceptualising ICT in Geography Teaching, in Education, Communication and Information Journal (ECi). Vol 4 (1) March 2004

Sutherland, R. (2004) Designs for Learning: ICT and Knowledge in the classroom, in Computers and Education, Elsevier Ltd.

Weeden, M. (2002) Proof, proof and more proof, Micromath, (18) 3, pp.29-32.