Promoting creative thinking through the use of ICT

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Abstract A great deal has been written about the use of web-based technologies such as the Internet in promoting learning in education. In schools, research has focused primarily on social interaction and group work, student achievement levels and curriculum development. Very little study seems to have been brought to bear upon the promotion of creative thinking by the use of online technologies, and this paper attempts to contribute to this field of study. This paper reports on a pilot study which has investigated the creative impact of information and communication technology (ICT) in a rural primary school in South-west England. The school is unique because it provides a personal networked computer for each of its 41 Year 6 students (aged 10–11 years). A small group of students were interviewed about the learning activities they engaged in over the year, and this paper reports on initial findings with a special emphasis on creative working and thinking (n = 6). A model of creativity is presented with three discrete but related modes of activity — problem solving, creative cognition, and social interaction. The paper provides new findings about the nature of creativity in the context of computer based learning environments.

Keywords: Creative cognition; Interview; IT-use; Primary; Problem solving; Social interaction; World-wide web.

Introduction

Recent research into the use of educational ICT has focused primarily on social interaction and group work (Wild, 1996), student achievement levels (Jackson & Kutnick, 1996) and curriculum development. Very little study has focused upon promoting creative thinking through the use of online technologies, and this paper attempts to contribute to this area.

Creative thinking is one of the most important skills children can acquire and develop whilst in their early years. Creative thinking can be used within a number of learning contexts to enrich the acquisition of knowledge and skills. Crucially, without the ability to think in a creative manner, children would be unimaginative and lacking in the necessary transferable skills to engage in personal and professional life. Creative people have been the focus of a great deal of research. Significantly, Child (1986; p 222) has warned that without the continued emergence

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of creative people the survival of advanced industrialised nations would be threatened as they are becoming increasingly needed in all walks of life, including political, social and scientific spheres.

Creativity has been defined in a number of different contexts. Boden (2001; p 95) believes that creativity is ‘the ability to come up with new ideas that are surprising yet intelligible, and also valuable in some way.’ Ausubel (1963) defined creativity as ‘a rare and unique talent in a particular field of endeavour’, whilst Bruner (1965) offered a less elitist definition when he suggested that creativity results in ‘an act that produces effective surprise’.

The notion of surprise is useful when one considers the differential between divergent and convergent thinking (Guildford, 1962). Solutions to problems that are merely ‘reproductive’ and unimaginative are labelled convergent. Conversely, new and novel solutions using lateral thinking and productivity that lie outside conventional thought are said to be divergent (see for example Turner, 1977; p. 55). Loveless (2000), echoing Bruner’s ideas, argues that creative thinking involves the representation in meaning derived from a dialogue between children and their work. These are the cognitive processes necessary for the encoding and decoding of meaning embedded within the text.

Creativity is evident in a number of diverse learning contexts. Gardner for example sees creativity as a cognitive process in which several intelligences are working in harmony (Gardner, 1983; 1999), and this can specifically be applied where seeing, thinking and innovating are combined. It is clear from these definitions that the notion of creativity is a complex one and an area of learning that is in need of more concerted investigation. The recent escalation of ICT provision in British schools provides even greater impetus for teachers to develop a better understanding of creative thought and action. Teachers will need to justify their use of ICT and will be required to demonstrate the effectiveness of computer supported learning in the form of measurable student attainment.

The National Grid for Learning

In the UK, the National Grid for Learning (NGfL) and other government funded initiatives have been responsible for ensuring that the Britain is now at the international forefront of ICT use in compulsory education, with approximately 98% of primary schools connected to the Internet at the time of writing. The provision of networked computers, Internet connectivity and specialised telecommunications technologies does not automatically result in good teaching methods and innovative professional practice. A further study is in progress to determine how these new technologies are being used in primary schools throughout the South West of England. However, creative use of technology within the classroom will often lead to creative thinking. It will be the children that can adapt readily to new learning opportunities who will benefit the most from these new technologies. A key question in this field of enquiry is the extent to which teachers can help to promote creativity through the use of ICT.

Promoting creativity

Encouraging creativity in the classroom is primarily the task of the teacher. Harnessing the power of divergent thought and marrying this with the power of ICT
will be the aim of many teachers who espouse the use of computers in the classroom. Creative thinking is achievable by all children, regardless of their academic attainment, providing that conditions are conducive and children have acquired the relevant skills and knowledge. Providing opportunities for all children to succeed is the key to maximising individual strengths and abilities. These opportunities may present themselves through individual study-based tasks or through collaborative group activities where every member’s contribution is valued and where peer tutoring offers children the chance to develop their creative thinking as they attempt to explain a solution to a problem to another member of the group.

Creative abilities can be enhanced through practical application, and the use of ICT can enable children to have an immediate ‘hands on’ facility where they can feel in control of their own learning. The use of multitask settings allow children the option to withdraw from problem solving temporarily in order to pursue other useful activities. Whilst engaged in less cerebral activities their minds are free to follow creative strands where thoughts and ideas drift in and out of conscious thought as possibilities to be considered and rejected. This teaching style and the use of projects which cross traditional subject areas allows for cross fertilisation of ideas and facilitates the opportunity to make connections and see practical applications.

The skill of teaching to foster creativity has to be a combination of structured and unstructured activities to enable unconscious as well as conscious thought and where intuitive reasoning is as valued as rational calculation. There is a fine balance between freedom and control. In all of this, motivation is a key factor for stimulating creative performance and the notion of self-directed learning is crucial to the development of the independent thinker. Encouraging children to think about their own thinking (metacognition) can enhance the learning process and teaching children to foster creativity encourages a responsibility for learning.

A model of creativity

An early model representing human creativity was presented by Wallas (1926) which identified a process characterised by four key stages. These were preparation, incubation, illumination and verification. In the preparatory stage, the thinker logically and systematically examines the problem space, often creating a problem ‘set’. If the problem is laid to one side, a period of ‘incubation’ may ensue where the subconscious may continue to work on it. Incubation ends when ‘illumination’ or the ‘Eureka!’ moment occurs with sudden insight into the problem emerging into consciousness. Finally, verification of the solution involves checking to see that it is appropriate and effective in solving the problem. Wallas’ model is therefore applicable in relating creativity to problem solving, and this is a theme that runs through a great deal of the literature.

Other models of creativity such as Jackson & Messick’s (1965) stress the ‘unusual’ component in creative thought, usually leading to some form of productive action. Turner (1977; p 57) offers ‘poetic licence’ as an exemplar of this theme, citing metaphors as a creative way of communicating emotion.

This paper presents a model pertinent to the use of ICT in the classroom. From the models cited, and from other research in the field, it is considered that the three activity modes of social interaction, problem solving and creative cognition represent most if not all of the daily learning activities observed in classroom based learning (Fig. 1).
The authors believe that these three modes are vital if the processes involved in creativity are to be better understood. The model shows that the three domains are independent but interactive, and in some cases it may be difficult to separate out and distinguish between them. The model also demonstrates the location of transformative thought, which seems to be at the nexus of the three behaviours already outlined. The development of this model is at an early stage and further research will be necessary to validate it. The authors intend to develop these ideas further, and other ongoing studies in this area will contribute towards this process.

Examples of creativity in problem solving may be observed in a variety of online activities including behaviour resulting from lateral or divergent thinking including expert manipulation of text and graphics; creative use of colour, animation and effects to convey particular messages, and economic navigation through complex web-based resources.

Examples of creativity in online social interaction include: creation and use of alternative personae (avatars) in chat rooms (see Turkle, 1995); self expression through the use of text-based communication; and discursive discussion and argument in electronic environments. According to Leach (2001; p 177) the social dimension of creativity has been largely ignored by traditional accounts of creativity. The model presented redresses this balance, providing a new focus for the study of creativity within the context of ICT in teaching and learning.

Examples of creativity in creative cognition include: creation and management of a personal website; creative writing using a word-processor; and discovering and adapting to new ways of working and studying using electronic environments. In order to illustrate the potential to promote creativity through the use of the Internet, a brief description of the merits of website creation is offered below.

The creation of personal web pages

When children create personal web pages they are required to combine the three key areas of social interaction, problem solving and creative cognition. This coalescence of activity enables them to present themselves publicly to those who visit their site, promotes text-based communication and inspires them to develop further interests in the areas represented on the site. They may even diversify to other areas and develop skills commensurate with these new interests.

Web pages give children the freedom to present their own ‘shop window’ of work, communicate with other children around the world and publish their own creative ideas instantly. This creative action takes the form of an organic process where iteration and reiteration occur on an almost daily basis as children refine their skills, discover new ways of communication and generally construct their site.
The process leading to creative action (i.e. the creation of a personal website) can be represented by mapping the relative contribution of each behaviour onto the model (Fig. 2). Generally, most students would interact with their peers to communicate plans, gain feedback and discuss ideas. However, unless the creation of the website is a group project, most students would spend a great deal more of their cognitive resources in thinking independently about the content, appearance and nature of their site. They would be predicted to spend even more time on problem solving activities, including familiarisation with software, searching for and laying out materials, file management, manipulation of images, and so on. The length of each arrow represents these levels of cognitive commitment in the form of a bold triangle. It may also be hypothesised that as each behaviour is equalised across the task, the bold triangle will vary in size and increase in congruence. In order to begin testing the model, the following research design was used.

**Research design**

**The class setting**

The study took place in a classroom within the 280 student rural primary school. Interviews were conducted during the last term of the children’s primary schooling after Standardised Attainment Tests (SATs). The Year Six class (aged 10–11 years) was unusual in two respects; there were 41 children in the class, and each of them had the exclusive use of a personal computer on their desk at all times. Because of the number of the children in the class, some of them sat in a separate room for the majority of the day. To accommodate this number of children and computers, the room is organised as shown in Fig. 3. The teacher’s desk (indicated by a black marker) has two computers and there is an interactive whiteboard, which can send text written on the board to all the individual computers. There is also large screen projection and a sound system for showing films and PowerPoint presentations.

The school has an intranet that houses class pages upon which students’ web pages, tasks, and ‘to do’ lists are posted. Children also have access to many electronic resources including scanners, digital cameras, CD ROMs, Internet, email, instant messaging, Word, Excel and PowerPoint. When children need to do work in books, the keyboard slides out of the way underneath the monitor. For whole class sessions, children from the annexe sit on chairs in the main classroom.

The school adheres to a policy of inclusion; of the 41 children in class, five were statemented* and 15 were registered as having special educational needs. Approximately 20 of the 280 students on the school roll had been excluded from other schools.

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*In the light of an assessment, it may be necessary for a Local Education Authority to make special educational provision for a pupil with specific learning difficulties and the LEA will then make and maintain a statement of the pupil’s special educational needs’ (Section 324(1) Education Act, 1996).

Sample
The impact of the ICT provision on these different attainment levels was of special interest and therefore six children were selected, as being representative of the low, medium and high attainment groups within the class. These categories were based upon teacher assessment of attainment. Previous research (see, for example, Littleton et al., 1998) has shown that gender is a potential source of attitude differences to computing and so one boy and one girl were selected from each of the high, medium and low attainment groups within the class ($n = 6$). The children selected were not amongst those with statements for special educational needs.

Methodology
The task of finding out what impact the innovation of ICT in the class had made on staff and children, and to what extent it might encourage creativity was foreseen as being a difficult one. The size and layout of the classroom made observation of the whole class impossible as there were no obvious vantage points from which the whole class could be seen, and in any case, much of the learning was happening at the small interface between child and screen. Furthermore, the timing of the research, after SATs meant that the usual pattern of working had been suspended. It was therefore decided to interview the six children about their attitudes and experience of ICT in this class in the hole that this might reveal more about the development of these attitudes over the previous year and gain an insight into how they had become creative and proficient users of ICT.

It was thought that, given the innovative nature of the learning situation, an inductive analysis would yield a basis for development of an explanatory framework. Therefore, a grounded theory approach was adopted (Strauss & Corbin, 1990). The transcripts would be read by three researchers and common themes and issues compared and discussed to tease out the important elements in the experience of this level of ICT provision. The developing framework would then be examined as more data were collected.

Pilot interviews were conducted to refine a semi-structured interview schedule and to determine whether interviewing pairs would elicit more information than individuals. However, paired interviews presented problems in attributing comments to individuals and as the students were very willing to talk to the researcher, it was decided to interview them one to one. A series of visits were made to familiarise the children with the researcher. Interviews took between 45 and 90 min. Interviews with the lower attainment children tended to be shorter than those for the high attainment children, but required more rephrasing and probing to elicit responses. Interviews were also conducted with the teacher and two learning support assistants in the class.

Although the interview featured a number of ‘primer’ questions, the interviewees were encouraged to talk about anything they wished, as it was thought that this could raise issues which had not been predicted during the design of the interview schedule. The interviews were transcribed verbatim and then read by all three members of the research team. Several themes emerged from the reading and re-reading of the transcripts, including social interaction, issues of help and support, creative uses, motivational aspects, and on/off task behaviour. The analysis and reading of related research suggested that social interaction, issues around problem solving and finding help and support for learning and productive uses might interact in enhancing creativity in the classroom.
Results and discussion

Names have been changed in the following extracts from transcripts to maintain confidentiality. The findings indicate that computers have enabled more open-ended tasks to be set by the teacher, which allow a breadth of learning styles and attainment levels to be accommodated. Often several tasks will be ongoing and students can choose which to pursue at different times. This fosters creativity by enabling a period of incubation of problems while working on different areas but leaving the way open for transformational creative cognition, the ‘eureka’ element of the model, to synthesise the constituent elements into creative action. This also substantially increases the amount of time that the students are ‘on task’ as the process of creativity is also multilayered. Students are still cognitively engaged with the problem at another level, while they are actively engaged on another task or indeed ‘off task’. For example, one student reported:

... like when you’ve got loads of pieces of work you think, ‘oh, my hand’s getting tired, I might as well go on and do my presentation and get that out of the way’.

(Source: interview with lower attainment girl)

Subsequent observations have shown how students switch rapidly between tasks aided by the multilayered nature of Windows software to maintain a number of different tasks. Furthermore, their creativity will operate in different areas of the model for the several tasks being undertaken as illustrated by the example in Fig. 2.

In addition, it does not require tasks set by the teacher to be the only source of productive tasks in fostering creativity. Students may be ‘off task’ in downloading sound and video clips of Britney Spears, or another popular singer, actor or sports star for example, but their minds may also be ‘incubating’ other problems, possibly transforming a presentation to make it more memorable.

Examples of tasks mentioned by students included web page construction, presentation about different religions using PowerPoint, Reflections work, where the children looked back over their time in the class, but they also talked about exploration of programmes that were self instigated.

The Department for Education and Employment publication ‘All Our Futures’ (DfEE, 1999) considers freedom to be an important element in creativity, particularly where the use of computers goes beyond narrow boundaries:

Freedom to experiment is essential for creativity. But so too are skills, knowledge and understanding. [. . . ] . . . the alternative is not to disregard the teaching of skills and understanding, but to recognise the mutual dependence of freedom and control at the heart of the creative process. (ibid. p 38).

The students in this class experienced this daily.

[Computers are] really useful because you can write up your work and print it out and you can make cards and things on them.

Cards?

Like ‘get well soon’ cards and things you can write whatever you want on them.

(Source: interview with medium attainment girl)

Open-ended tasks such as this, combined with students being made responsible for their learning has meant they can work at their own level on the same task differentiated by outcome. There has been a significant role for ‘incidental’ learning because wide searching has meant other areas of learning are happened upon beyond the focus of the task. One girl was asked whether she obtained her information from books or from the computer:

You can choose really. Usually I go to both. I go to the Library first and look up something in that and if you find something useful like on Henry or something, you can type it up on the computer and it will come up on the computer and you will find out lots about it.

(Source: interview with medium attainment girl)

This student used a strategy to research topics. However, some of the lower attainment children tended to adopt a less structured approach but still find learning opportunities by serendipity as they ‘roamed within hyperspace’ due to the extended freedom available:

And you think oh I know that will be useful for that piece of work so you go onto that and so on.

(Source: interview with lower attainment girl)

This use of computers is particularly marked in this classroom. The teaching of ICT earlier in the school seems to have much in common with many other schools:

Right, and lower down the school, what year were you in when you started to use any kind of computer?

Umm, Year 3.

So, that was when you were about seven?

Yeah.

And what sorts of things did you do then?

Nothing, it was just sort of typing really. It wasn’t much because they were only Acorns, so there wasn’t much.

There wasn’t much you could do? So, it was getting familiar with where the letters were on the keyboard and stuff?

Uh huh.

[Discussion continues…]

So by the time you got to Year 5 what sort of computing were you doing then?

It was the same as Year 3.

What just typing up?

Yeah, yeah.

So, it’s been a really big change this year in the sorts of things you’ve been doing?

Yeah. Uh huh.

Can you give me some examples of the sorts of things you have done?

We’ve used them for doing work. Umm, searching up things in our own time. Umm . . . working on CDs, work again. Lots of stuff.

(Source: interview with medium attainment boy)

There is an apparent narrowness about their earlier contact with computers which has evidently been broadened in this final year at primary school.

And also how to write stuff up and how to find out information, which I think Mr Deacon just tells us about stuff and we can just learn how to do something by having an explore and learning what it’s all about.

(Source: interview with high attainment girl)

The learning of ICT is not seen as a linear progression through different programmes but as an opportunity to explore amongst a number of different programmes, from which children can choose the most appropriate.

And if tomorrow you went into the classroom and you didn’t have computers any more, they had cleared them all out what would happen? How would that affect you?

Umm … I think it would be hard to work on like projects and stuff and like in some of our projects we always make like PowerPoint presentations and like with the digital camera pictures you couldn’t take pictures and like print them off and put them into our work because there would be no way to do it.

(Source: interview with high attainment girl)
The main elements are demonstrated to the students and then they are able to extrapolate from these to discover more attributes and uses. Through social interaction, the learning of these more advanced aspects spreads through the class almost like an infection. This exponential divergence is also reflected in the model of creativity proposed. The process of creativity is not seen as a number of discrete steps but the synthesis of social interaction and problem solving with the catalyst of insightful creative cognition, and this transforms the products of class work.

The teacher uses social interaction both formally in grouping the children and informally through turning a blind eye to some of the instant messaging and emailing with which the children intersperse their work.

Well email is like it takes a bit longer because they’ve got to open their file and get it out but MSN is just an instant messenger so if you are on line you can just double click on someone’s name and you can just say ‘Hey’ or something and a little box will appear on screen and say who’s on line and you can click on them and see that person has sent me an instant message back.

More like talking, I suppose than sending a letter.

Yeah. It’s got a minimum number of words as well so it can’t be bigger than about five pages so you’ll say like in a letter you’d say ‘How are you? I’m fine blah, blah, blah’, you can say “How are you?” and they’ll send back ‘I’m fine. How are you?’ so it’s much more one to one.

So, it’s much more batting it to and fro.

We get told off if we do it in work time, which we do a lot though.

[Further discussion about social interaction]

Because I wondered whether it [social interaction] might be difficult because you are all sitting there with your screens…

We chat a lot though. [Laughing]

I had noticed! [Laughing]

Yeah but if someone is at the other side of the room we can MSN them and talk to them virtually.

So as a class, you haven’t lost out on feeling together?

No, because we do a lot together as well.

You do quite a lot of group work, don’t you?

Yeah, because Mr Deacon thinks it’s important to work together, and that is one of the reasons we went to Heatree House [a residential outdoor pursuits week] which was good. I really enjoyed that. (Source: interview with high attainment girl)

Well, school work, we do quite a lot of work in groups and we use computers for that all the time, but if we are doing it on our own, we can choose books or computers.

But in groups, we normally do use computers.

Why do you think that is?

I don’t know. So that then we can all work as one group on one piece of paper.

(Source: interview with medium attainment boy)

A social constructivist approach to learning is promoted by the use of computers which enable a shared product to be more easily created. The computers were used in a number of ways; sometimes each student prepared a section individually and then these were collated on a single computer with progress by individuals being checked by email; sometimes they sat around one computer and discussed the topic before entering text together; sometimes, as with their web pages, their work and personal likes were available to the whole school to view and comment upon.

My web pages. It’s got a lot of work on there that I’ve done, science, English and maths.

And what is it about the web page that you particularly like then?
You just copied the work and stuck it to one big page and it would stay there and people from the rest of the school were able to view it and see what you have done. 

And is it only work you’ve got on there?
I’ve got pictures, web pages, video clips, sounds.

(Source: Interview with high attainment boy)

One of the freedoms afforded by the computers was the quality of the presentation of work. While it freed the students to express their individuality...

Because if you’re writing about like the Reflections work you can make a nice title, put a border round it and it makes it more interesting to do and pick a font for it, and if you do it by hand you have to do it one way because that’s the way you write and you can put it in any one you want. Everyone uses Comic Sans but I use Tempest Sans and there’s something like Papyrus or something like that and it is really good.

(Source: Interview with high attainment girl)

... it also removed difficulties of making work look good, and increased the confidence of lower attainment students to produce something which would be valued and displayed on the classroom walls.

... placing higher expectations upon them and showing them how to achieve those results and when they achieve better than they could they print it off in wonderful colour and graphics and pictures and tables and graphs and it goes up on the wall next to the work of the really clever kid, and suddenly they’re sitting up straight, they are smiling, they’ve got a spring in their step.

(Source: interview with learning support assistant)

Furthermore, as the children became proficient at using the computer programmes, it freed them to be more creative and look beyond the ‘how’ to the ‘what’ or ‘why’.

The available material for projects was broadened but because they were able to choose amongst different sources of information and different forms of presenting that information with ease, they could concentrate on selecting appropriate material and methods of presentation.

What do you think is the best thing about computers?
I don’t know, the knowledge bit, I suppose.
The knowledge, that there is so much stuff on there? Is that like CDs or the Internet?
The Internet, well everything.
How do you sort through all that?
I don’t know. You just learnt through the year what to do and you just know what to do now.

Yeah? I saw with the RE project the start of that and Mr Deacon saying for you to look at different areas and different religions and everybody went off. How did you tackle that?
Well I didn’t know first of all anything at all to do with our religion.
What was your religion?
Sikhism. I didn’t have a clue what we were doing. Then afterwards I knew quite a bit.

(Source: interview with medium attainment boy)

In school the children are using the tool of computing for their work and enjoyment so regularly, their skills become ‘over-learned’ and the focus can shift more to what is being learnt.

... it’s about the language development of the child, the intellectual development, getting children to acquire skills to use and apply them so that they’re fixed in their mind, whether that involves talking, discussing, group work, teaching, building, making, sticking in all the subjects like I did before I had all this equipment. Where it’s appropriate, it’s used.

(Source: interview with class teacher)
Both teacher and student can track the tasks by email ‘To Do’ lists and this again frees students from trying to remember what they have to do.

*How do you think the computers help your teachers?*

It helps us because Sir can write something on the board and it writes it onto his computer and he can send it to us so then he can wipe the board and do something else.

*So, you’ve got a record of what he is wanting you to do?*

Yeah.

*And what about as you go on with pieces of work, how can he help you with computers then?*

He teaches us new things to do that we don’t already know, stuff that maybe useful.

*So, like a new programme or something?*

Yeah. Or something new that he’s found out and he demonstrates to us.

*So, Mr Deacon is always finding out new things as well?*

Yeah. Yeah. (Source: interview with medium attainment boy)

The teacher models how exploration leads to discovery of new features, which contributes to the exploratory ethos of the class. The initial demonstration is not the definitive guide on how to operate a programme. Students and staff share new discoveries.

At the beginning of the year they don’t know how to use the software so we explain how to use the software, but that only takes about half an hour and then they are off and they’ve got to explore it, they have a task you must build a website, that could take the whole year the task is still there in the back of their minds but they don’t have to become bogged down that we have to get this done.

(Source: interview with learning support assistant)

This also illustrates the ‘incubation’ of ideas (Wallas, 1926) which can lead to the transformation of thinking into creative action where new and unexpected outcomes can enrich the structure of tasks set by the teacher.

**Conclusions**

Rather than using the tremendous potential of the divergent, lateral navigation associated with this medium, some ICT use in schools places creativity in a straitjacket. The way ICT is used and taught in this classroom is far from the small steps approach of Computer Assisted Learning Programmes, or ICT taught as discrete skills. The focus is very much on computers as an effective mind tool which can liberate and foster creativity in students.

This initial study into the propagation of creative thinking through the use of ICT has illuminated several issues and raised a number of pertinent questions related to teaching and learning. The role of the classroom teacher is obviously affected, as are the activities generally undertaken by the children themselves. Motivational issues are one of the key areas of future research, as is the acquisition of ICT skills. However, the most obvious characteristic emerging from the current research appears to be the extent to which students can adapt to the new learning environment and the extent to which they call upon their cognitive resources to study within it.

The lower attainment children find the work they have been set challenging and in focussing on completion of task (because they are challenged to complete the work they have been set) it appears that lower attainment children tend to have less opportunity to develop higher levels of creativity and productive problem solving in their work. However, those children who would have found it difficult to maintain
concentration in a more conventional classroom are able to spend time apparently ‘off task’ but still writing or learning new manipulation skills with the computer. Although they may not have achieved as much in the narrower context of the task set, they too have achieved ‘peripheral’ or ‘incidental’ learning from the motivational aspects of things they can access using the computer, and this may result in transformative learning. Similarly, in social interaction, the possibilities for collaborative work in creative action may not be taken up as readily by the lower attainment children. This effect is currently being researched in an observational study in progress, and the authors intend to publish the findings of this in the future.

Further work is needed to verify the proposed model of creativity in ICT, and more studies are in progress within the school, and also in another school with fewer ICT resources. It is hoped that comparisons can be made that will highlight the extent to which ICT can be used to increase creative cognition and creative action in primary school education.

References


