Secondary PGCE students’ use of ICT in science teaching: case studies of practice

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The project aimed to answer three questions:

* What ICT do science student teachers use in their school experience?
* How are students using ICT in their teaching?
* What reasons do students give for using particular ICT resources?

The project also aimed to identify resources that could be usefully shared with other students (and probably teachers too). Biographical material about the students was also collected so that future students could recognise the variety of ICT skills and backgrounds that students bring to their courses. It is envisioned that exemplar case studies will be presented on the web.

# The Case Studies

Data were collected from a student teacher sample of fifteen: four PGCE students from each of the three ITT providers and three GTPs. Each participant was asked to estimate their different ICT usages, such as the Internet or interactive white board during their current teaching practice, each was observed during a lesson in which ICT was used and they were also interviewed about why particular types of ICT had been used in their teaching.

A case study for each student was assembled in a similar format: A short biography of the student: Male/female, age, degree subject, previous work experience and how they had used ICT in the past. Students described which forms of ICT they used in lessons, an “estimate” of how often they used each type of ICT tool and an explanation of why they used that particular method for teaching.

# Frequency of Use of Different ICT tools

The graph summarises the frequency of usage of different ICT tools over a total of 1407 lesson recorded according to the Key:

1. Data logging

2. Interactive whiteboard used just as a projector screen

3. Interactive whiteboard - used interactively

4. Multimedia

5. Excel spreadsheet

6. Internet access

7. Word processing

Most frequently used was the interactive white board used as a screen. Data logging and spreadsheets were the least used.

# Student Teacher Reasons for Using ICT

Student teachers were able to rationalise their use of ICT in lessons that they had previously taught. Their reasons were categorised by groups used by Ruthven, Hennesey and Deaney (2004) in their study of ICT use by experienced teachers.

*1. Saving time and increasing efficiency*

Many students admitted that using ICT helps then get through the lesson quickly, saves time writing on the board and quickly puts up information. ICT helps maintain pace because ready-made slides or presentations are quick and snappy to use. Pupils have less time to “chat” or become distracted while the teacher writes on the board. Increasingly schools are buying in proprietary lesson packages pre-prepared and comprehensive, requiring minimal preparation, which are professionally produced and attractive.

Most students also saved time by putting “three key objectives on the board” or to summarise a section and getting pupils to copy, thereby following the KS3 Strategy guideline. Bullet points on the board were used as a starter or a plenary or for exam revision. Students used it to get key facts and information up on the board quickly and efficiently.

*2. Motivation*

Images can give a variety of visual stimuli to support and enhance teaching. Animations were thought to help pupils visualise difficult concepts or to understand the mechanics of processes especially if a practical is not easy to see or follow, or not available for demonstrating.

Students used video clips to bring reality to the lessons, particularly experiences not normally possible within the classroom. Data logging shows immediate, real time results as an experiment is progressing and this immediacy holds interest and concentration and the ability to respond, ask questions and discuss at the moment of action.

*3. Conceptual Learning*

There was limited evidence of the use of ICT for conceptual understanding, although when used in this way it was a powerful tool used to model something that cannot be easily seen, for virtual experiments in which parameters can be quickly changed and to see an effect in real time.

*4. Pupil Research/Presentation*

In very few instances were pupils able to research and present back to their peers. When they did, pupils used ICT imaginatively. Occasionally they presented to their peers using Power point, made leaflets that were available in classrooms, and, in one case, sequenced digital images to present the concept of subduction. There were several instances when pupils undertook Internet research and some instances of Internet revision and test website use.

*5. Adding authenticity*

To make science more credible to the average secondary school pupil, the work can be put into a context that pupils will recognise as important in their lives and ICT was particularly helpful where practical applications were difficult or dangerous to demonstrate. Showing pupils results in ‘real time’ was another way to give authenticity, particularly for pupils’ own results.

 *6. Trainee teacher survival.*

This grouping of students’ comments about their reasons for using ICT could not be fitted into the established theoretical groupings and we grouped them in a separate category specific to the work of student teachers

Student teachers use an extensive range of survival techniques (Furlong and Maynard, 1995) in which ICT plays a part sometimes on the flimsiest of justifications to ‘cross off’ one of the standards. Many use ICT as a way of overcoming their own shortcoming such as poor handwriting and a few trainees mentioned class management and collecting resources for their future teaching.

## **Conclusions**

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This project’s findings suggests that teacher training providers could examine practices in their institutions and in partner schools to establish new priorities for the purposeful use of ICT in students’ science lessons and to provide the necessary mentor training. ITT providers could explore strategies for the “effective” use of ICT in science such as more integration of ICT in teaching and pupil involvement. In particular the use of data logging, almost exclusively used in science, could be more extensively explored and encouraged. In the light of new syllabuses that have an emphasis on ‘how science works’ we must seek opportunities for the context specific use of ICT.

# Evaluation

Five case studies were evaluated. A senior colleague at Brunel University with expertise in teacher education noted that they were an effective way of providing other teacher educators with examples from practice. She noted the issue of whether ICT supports children’s subject specific learning, whether the ICT remains the property of the teacher, whether PowerPoint is sufficiently responsive to group needs and any gender or age issues that emerge. A group of eight PGCE students from Brunel University were asked to review the case studies and their responses were recorded on a questionnaire sheet. A summary of their responses to each question is as follows:

1. the majority responded that Cases 1 and 2 were most similar to their own use of ICT.
2. there is a distribution across all Cases for ideas about how and why to use ICT in science education; one respondent answered that none had given them any ideas.
3. respondents considered incorporating PowerPoint – with images - into their future teaching, together with using the interactive whiteboard, images for practical work and datalogging
4. A number of reasons were given for incorporating these ICT ideas that included: being re-useable resources; the possibility of putting them on a website for pupils; gaining and maintaining attention; making lesson organisation easier; involving pupils; using images; using real-time practical work; providing a focus for attention; providing visual reminders for pupils; time-saving; the ability for pupils to visualise concepts.
5. the majority considered Cases 1,2 and 3 to be most useful when planning a lesson
6. a number of responses to each case study were noted:

Case Study 1 shows how to get subject matter across

Case Study 2 shows how an interactive whiteboard can be used within a well-structured plan

Case study 3 shows how interactive use of ICT can keep attention, again within a lively and varied lesson

Case Study 4 demonstrates how the lesson plan relates to the subject being taught

Case Study 5 provides some useful explanations.

**References:**

Furlong, J. and Maynard, T. (1995) *Mentoring Student Teachers. The growth of professional knowledge*. London: Routledge.

Ruthven, K., Hennessy, S. and Deaney, R. (2004) *Eliciting situated expertise in ICT-integrated mathematics and science teaching.* Final Report to ESRC 2004. Cambridge: University of Cambridge Faculty of Education*.*