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TO WHAT EXTENT DO TRAINEE TEACHERS FEEL PREPARED TO USE SOFTWARE IN THEIR MATHEMATICS TEACHING?

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Over recent years, the DfES has directed teachers to integrate Information and Communications Technology (ICT) across the curriculum. Teachers have all been encouraged to attend New Opportunities Fund training (at an approximate cost to the government of £450 per teacher) (Fox, 2000) and Initial Teacher Training institutions have been required to address the QTS standards (DfEE, 1998, TTA, 2002). In light of this, ICT has been a particular focus of our Undergraduate and Postgraduate Primary Mathematics Curriculum courses over the last seven years. The aim of our study was to review trainees' perceptions regarding how well they felt their college experiences within mathematics had prepared them to use software in their primary mathematics teaching.

METHODOLOGY

The sample was drawn from final year trainee teachers about to begin their final block placement. The rationale for this was that these trainees had recently completed their primary mathematics curriculum courses and had teaching at the forefront of their minds since they were preparing themselves for their final school placement.

The trainees completed a questionnaire with follow up interviews of ten respondents. Data from questionnaire and interviews were analysed in order to determine trainees' perspectives on their use of software in primary mathematics and how effectively they felt the college courses had prepared them for this. Due to the number of respondents (35% of a total of 250 trainees), qualitative analysis was undertaken.

From this analysis electronic materials in the form of on-line student help pages were developed and our courses were evaluated and amended.

FINDINGS

67% of the respondents stated that they felt competent or very competent about using computers generally. 35% of all respondents stated that the college mathematics curriculum course had prepared them well or very well for using computers in their mathematics lessons. A further 45% had no strong opinion. 86% of all respondents stated that they had used computer software in their teaching of mathematics on school placements. There was no identification of the frequency of this, or the success with which trainees used it. The examples of software that the trainees identified that they had used varied widely, from generic software to mathematics specific software and from school-purchased CDRoms to websites. Examples of generic software included databases, spreadsheets and Logo. Mathematics specific software included examples such as software from the NNS CDRom and other

software purchased by the school. There was also a range of use of software across parts of the daily mathematics lesson. Of the examples provided in the questionnaires, 23% of students using ICT used it as part of the oral/mental starter, 59% was part of the main and 18% as part of the plenary. 35% of the examples involved the whole class, 44% a group of pupils and 21% involved individuals. The reasons that trainees gave for incorporating software into their primary mathematics teaching included pupil motivation, accessing the curriculum, practice and consolidation, interactivity, application of mathematics, teacher assessment, saving teacher time and because they felt they had to. 14% of respondents had not used software in their teaching of primary mathematics. Reasons given included a lack of accessibility to hardware and software, organisational issues, and trainees' lack of confidence.

DISCUSSION

Although it is encouraging that two thirds of the trainees felt competent or better about using computers generally, there is some concern that only one third of the trainees felt that the primary mathematics curriculum courses had prepared them for using software in their teaching of primary mathematics. We recognise that there may have been a flaw in the design of the questionnaire, leading to potentially less-useful data, as the trainees were able to respond with no strong opinion either way. However, we can still be encouraged even though we recognise that there is scope for further improvement.

A large proportion of the trainees had used a range of software in their primary mathematics teaching. This reflects the range of software that we use in college-based sessions and illustrates Abbott's notion of the development of open and flexible learning using ICT as "generic tools for learning which have relevance across the curriculum" (Abbott, 2001, p. 38). The trainees appear to be using software largely in the main part of the lesson and with groups of pupils which, interestingly, does not mirror our sessions. This may be due to the lack of accessibility of hardware for whole-class teaching situations. These findings inform us that we need to consider how clearly we address the use of software in each part of the daily mathematics lesson and with a range of pupil groupings.

Although we are unable to ascertain the effectiveness of trainees' use of software, the reasons they gave for incorporating software into their primary mathematics teaching included various issues that were mathematics-focused and enabled "quality learning experiences." (Davis, Deforges, Jessel, Somekh, Taylor and Vaughan, 1997, p. 15). These were: accessing the curriculum, practise and consolidation, interactivity and application of mathematics. McCormick (1999) suggests that including ICT in the curriculum has its own intrinsic value, and that ICT is a valuable resource that can help pupils learn. Other reasons given by the trainees, which are more generic, included pupil motivation, teacher assessment, saving teacher time and because trainees felt there was a requirement to use ICT.

One out of seven trainees said they had not used software in their teaching of primary mathematics at all. Their reasons given for this enabled us to identify areas of the course where we could give further thought to helping them address issues of accessibility to hardware and software, organisational issues, and their confidence. Problems regarding software availability were identified a decade ago (Donnelly, 1995). Donnelly identified varying provision in "staff expertise, hardware and software availability and school commitment to IT." (p. 18).

Issues concerning accessibility of software for primary mathematics lessons can be raised at divisional planning level, perhaps with a move towards using more software that students will have their own access to. These include the National Numeracy Strategy Teaching Programs (www.standards.dfes.gov.uk/numeracy/publications), the NNS CDRom Software (DfES, 2000), the Mathematical Activities for Year 6 CDRom (DfES 2004) and other appropriate websites.

We need to maintain a priority within the primary mathematics curriculum course to ensure that trainees feel confident to only use software when it is the best resource to meet the learning needs of the pupils (DfEE, 1998). This will avoid the tendency to "use programs somewhat unquestionably" (Cook & Finlayson, 1999, p. 60) or because the trainees feel they have to.

We wish to illustrate two further issues raised in the interviews through case studies.

Case Study: Differentiated Needs

In this case study we meet two PGCE trainees. Darren argues for the integration of ICT as a resource in college sessions rather than what he perceives as a "separate discipline." Hazel comments on the value of learning about specific software and increasing her confidence in its usage:

Interviewer: Can you tell me how you feel your (curriculum) mathematics course has prepared you to use ICT in your maths teaching?

Darren: It hasn't ... as I've been steeped in ICT for a couple of decades. I don't see IT as a separate discipline … Every curriculum course has held ICT as something weird and wonderful and therefore intimidating. When we go to the ICT suite, it is a perfunctory look rather than something in depth. I have individual learning needs and ICT isn't an issue. It doesn't mean others don't get something out of it. Why are we talking about computers? Why don't we talk about the telephone? Everyone wonders why there are so many ICT lessons when we know about computers. We know what to do with them – they are held as something new and amazing. It is good to see videos of using it and critically discuss it.

Hazel: We've been given ideas in lessons, they've shown us different things to use. Going through Grass and Rhino was good because I didn't know they existed. Knowing that you don't have to use it if paper is better, like for example Battleships. A lot of students feel they have to use it because there

is a big up on ICT in school. It makes you aware of things that you didn't know existed. It gave me confidence – it is quite daunting. If you do cross-curricular with maths, IT can be hard to teach. You have the whole class, they're excited, noisy, not familiar with the computers. If you have to try to incorporate it in another lesson it can be daunting. The lessons here made me realize that it is not too hard. They gave us demonstrations – we've had videos and the data projector – it makes you realize it is possible.

These comments heighten our awareness of the range of competence in trainees' personal use of ICT and the implications for this in our college courses. Darren's views reflect our intention to take a more integrated approach to mathematics teaching in the future given our new hardware resources. We are reminded that this should not be at the detriment to students like Hazel who may need to gain in confidence in using software within their mathematics teaching.

Even though Darren is competent in this own use of ICT, we need to make explicit the value of using software where appropriate to enhance children's learning or our teaching of mathematics.

This is an aspect to be discussed in future planning meetings within the division.

Case Study: School Experience

Tina is a fourth-year undergraduate trainee who highlights discrepancies between college expectations of the use of ICT and the reality of the school context:

Interviewer: Can you share a time with me when you used ICT in a maths lesson?

Tina: I've used it mainly in the oral/mental starter. **Probably because the schools I was in didn't have the facilities.** The maths activity CDRom was for one child to use, but I used it with the big screen and we talked altogether about what we thought the answer should be. They didn't want to stop. They would have gone on all lesson if I'd let them! **They hadn't used the computer much before** so I guess that it was the novelty factor. It may have worn off.

Interviewer: Can you tell me how you feel your [curriculum] mathematics course has prepared you to use ICT in your maths teaching?

Tina: We had the chance to look at a lot of different software. But that was software on the network which bears no relevance to school.

Interviewer: What do you mean?

Tina: There is a lot more here than there is in school. They have the NNS CD, and have got basic Scheme CDs but **I haven't seen lots of maths CDs in school**. **The staff don't use it**. The maths course has helped me use Roamer. Schools don't use it. They are pleased for you to use it. I'd like to use OHT counters and OHT calculators, but up til now **the classes I've been in didn't have OHPs.** The one I am going into for my final block placement does.

Tina's comments confirm for us that college expectations for trainees to use ICT in mathematics lessons are not necessarily in line with what is available to them in practice in schools. Tina acknowledges that the computer is not the only ICT facility to use within mathematics teaching. This is an aspect that we include in our curriculum courses. However, we need to consider raising trainees' awareness of utilizing what is available to all schools and trainees, for example the NNS software and Internet sites. In addition to this, there may be a case for raising with the School Partnership Committee our concerns regarding the lack of parity between trainees' school experiences regarding teacher's own practice of incorporating software into mathematics teaching. This disparity is not surprising given that prior to NOF training, the training available to schools tended to focus on the acquisition of technical skills rather than on pedagogical considerations (Harris, 1999). Even after the level of support given to teachers through initiatives such as NOF training (costing some £250 million), it appears that some teachers still feel they are having external pressures of ICT use imposed on them (Fox, 2000).

CONCLUSION: A TECHNOCENTRIC APPROACH?

This project has focused on trainees' perceptions of how well they consider college has prepared them to use software in their primary mathematics teaching. Although the majority of trainees feel competent in their own use of ICT and feel that the course has prepared them for using software in their primary mathematics teaching, we have identified several areas for development. In adopting new "strategies which enhance the learning of others" we can explore the possibilities for transforming our primary mathematics curriculum course and our pedagogy, using ICT as a "catalyst for new ways of working." (Loveless & Ellis, 2001, p. 67). We believe that college tutors, practising teachers and trainees may need to re-think "the process of teaching and learning and develop new approaches to pedagogy, learning materials and the use of ICT." (Guile, 1998, p. 17) Higgins and Muijs suggest we may do this by choosing programs that compliment our current pedagogy. They also suggest, more pragmatically, that we may need to "adjust [our] teaching strategies and approaches to compliment or compensate for the strengths or weaknesses of the ICT equipment programs which [we] have available." (in Thompson, 1999, p. 115).

We must admit that our project is "technocentric" (Papert, 1993). Our rationale for this choice of study was to evaluate our college courses, with government requirements in mind, and to determine what future improvements might be made. In doing so, we have concluded that the courses tend towards a technocentric approach. We have identified the need to move towards more *integration* of ICT as a resource within primary mathematics teaching and learning, whilst asking ourselves "some important questions about the reasons for using IT in the classroom." (Loveless, 1999, p. 1). This process has already begun within the division through recent planning meetings and the development of an on-line trainee support pack.

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