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AN EVALUATION OF PRIMARY TRAINEES' VIEWS OF THE SUBJECT KNOWLEDGE AUDIT PROCESS

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This paper reports on the findings of a small study exploring primary trainee teachers' experiences and perceptions of the mathematical subject knowledge audit carried out during their training. Many trainees described the exercise as a form-filling waste of time, although the institution is required to gather evidence of trainees developing their subject knowledge for inspection amongst other purposes. Through a combination of questionnaire responses and written reflective comments gathered from across the ITT programmes, some views appeared to be commonly held by trainees about the nature and purpose of the audit process. This paper examines the data with a view to modifying the mathematics subject knowledge audit for future cohorts of trainees.

INTRODUCTION

The research reported here is from a Primary Education Research Fund project within the Department of Education at the University of Gloucestershire. It develops a link between the researcher's Masters dissertation of 2003 which explored primary trainees' beliefs and views about teaching mathematics during the first year of their undergraduate programme, (in a different university) and the initial ideas for an Ed.D thesis which aims to examine the critical relationship between teachers' subject knowledge in mathematics and their use of learning examples, whether generated by the teacher or the pupils, in the classroom. The work has evolved from the researcher's interest in these areas, following a move after 18 years of primary school teaching and leadership into teaching mathematics and other aspects of primary education on Initial Teacher Education programmes in 2002.

It was back in 1992 that concerns about teachers' subject knowledge were raised by Alexander et al, and later the curriculum for initial teacher training (ITT) included a strong focus on subject knowledge both for trainees' standards and providers requirements (DfEE, 1998). The document 'Qualifying to Teach' (DfES/TTA, 2002) sets out standards for teachers' to have secure 'knowledge and understanding'. In recent years evaluations of the National Numeracy Strategy (NNS), now part of the Primary National Strategy, have maintained that teachers' subject knowledge is a weakness, and Strategy staff and others have developed materials to address this. It is against this background of ongoing concern about subject knowledge that this research was instigated, looking particularly at the assessment of mathematical subject knowledge in primary trainee teachers.

Subject Knowledge Research

Influential work by Shulman (1986) identified categories of teacher knowledge, and

three of these have been used as a core further work - s*ubject matter knowledge, pedagogical content knowledge* and *curricular knowledge*. In terms of these areas, studies by Rowland, Martyn, Barber and Heal (2000) and by Rowland, Huckstep and Thwaites (2003) developed the notion of the knowledge quartet, a framework for reflecting on trainees' classroom practice in terms of subject knowledge. Another important recent study is that by Ma (1999) who compared Chinese and United States teachers' subject knowledge. She discovered that Chinese teachers had a deeper conceptual understanding of mathematics which included a breadth and depth that extended to knowledge of the content and pedagogy of the entire primary mathematics curriculum, not just an equivalent Key Stage or year group. Ma also described how teachers with this level of knowledge could make connections between aspects and approaches in mathematics, an ability which Askew et al (1997) had identified in effective numeracy teaching.

Auditing trainees' subject knowledge

Approaches to assessing and monitoring trainees vary from one institution to another, but one of the most common forms is the use of self-assessment audits. In the base institution for this research, trainees are asked to review their confidence and ability at each of the aspects of mathematics (number, algebra, shape and space, data handling) and where they feel less confident, they carry our personal research and study to 'brush up' their knowledge. One drawback of this system is that some trainees, just before submitting their final audit, will complete it in a way that suggests they are good in all areas of mathematics, and it is their word which is taken by the tutors to be correct. In this way, the audit could become for some trainees a form-filling exercise that may have little accuracy regarding their level of subject knowledge. There are, of course, some trainees who use the audit process effectively and will actively address some of their weaknesses.

The Study: Context and Methods

The study reported here took place during the 2004/5 academic year in one ITT institution. The data was collected by a combination of questionnaire and written evaluations of the audit process and was drawn from all three years of the B.Ed programme and the PGCE cohort. The starting point for data collection was the Year 3 trainees of the B.Ed. course, who were about to submit their completed audit along with their written assignment on their final mathematics module. The audit was discussed in teaching groups, and within each group, smaller groups had some time to discuss and reflect on the process before recording written comments on paper that was then collected for analysis. The remaining cohorts (Years 1 and 2 on the B.Ed. course and the PGCE cohort) were issued with a 14-item questionnaire, which was completed during a taught session, taking around 10-15 minutes to complete.

The questionnaire included 8 questions requiring a yes or no response, and the remaining questions were 4-point Likert scales that asked for qualitative responses about the mathematics programmes and the audit process. The number of returns is as

follows:

Year 1	41	
Year 2	54	
Year 3	54	
PGCE	64	Total responses: 213

RESULTS AND DISCUSSION

Looking firstly at the returns from Year 1 trainees who had only recently been introduced to the audit, the first question asks about confidence in mathematics. About half said they felt confident and half not confident. This would reflect their backgrounds in mathematics before starting the B.Ed. course. Interestingly, the same question for Year 2 reveals that almost two-thirds (63%) feel not confident in mathematics. In the PGCE cohort there is greater confidence with 64% saying they felt confident.

Question 2 asked whether the trainees' confidence had improved during the course. This was too early to make a fair judgement for Year 1 trainees, but in the Year 2 cohort slightly more than half (52%) felt their confidence had not improved. The PGCE group, being halfway through their one year programme were clearly feeling they had improved in confidence, with 72% feeling they had improved over the course.

The third question tried to get a feeling for how competent the trainees felt in themselves about each aspect of mathematics; number, algebra, shape and space, measures, data handling, whilst question four asked how confident they felt about teaching each aspect in school.

Across all cohorts, a total of 97% said they felt competent in number and 94% felt confident to teach it in school. In discussions, this seemed to be due to the intense focus on number work in the parts of their respective courses they had covered up to that point.

Whilst it did not seem surprising that number would be an aspect that trainees were reasonably competent and confident in, it also came as no great shock to find that algebra was an aspect where they were much less happy about their knowledge and performance. Across the cohorts again, 66% felt competent in algebra, and only 61% felt confident they could teach the early beginnings of algebra in primary school.

The results for each aspect are produced in the table below:

	% of trainees who feel competent about this	% of trainees who feel confident to teach it

Number	97	94
Algebra	66	61
Shape and Space	88	85
Measures	89	84
Data handling	82	79

It would seem from these figures that competence in an aspect of mathematics correlates quite closely with confidence in teaching it, which in itself would suggest that by improving subject knowledge, teaching will also become more effective.

The questions then focus more specifically on how the training addresses subject knowledge. 71% of Year 1 and 69% of Year 2 felt the course had been effective in supporting their mathematical subject knowledge, but for the PGCE cohort the figure was higher at 76%. Trainees almost unanimously agreed that subject knowledge would support their mathematics teaching in school, with 94% feeling this was the case. A large majority of each cohort believed they needed their subject knowledge to be secure to GCSE level in order to be able to teach primary mathematics effectively, the overall figure of 81% being matched quite closely in all cohorts.

Trainees' perceptions of how well the audit process supported their subject knowledge development were much lower. Year 1 trainees perhaps were able to see how the audit might help them with their knowledge and accordingly 63% said they thought the audit was helpful. However by Year 2, the proportion drops to just 7%, suggesting there is a need to relate the audit more closely to the taught sessions in order to give it more meaning for that group of trainees. Of the PGCE cohort, only 23% felt the audit was helpful. Overall, just 13% of those asked felt the audit had helped improve their teaching of mathematics, whilst 91% felt the audit was simply there to fulfil a university requirement but had little impact on them as individuals.

Finally from the questionnaire, less than a third (31%) felt the audit process had been explained clearly to them in terms of its purpose and how it operates. This clearly gives a message to the tutors with regard to how the audit is presented and followed up with each group. There may be an assumption amongst tutors that the way the audit is presented is satisfactory since the submissions by Year 3 and PGCE cohorts show that most trainees have worked on the audit and improved their competence in all areas of mathematics. This may be case of each side feeling they have told the other what they want to hear, but in reality both sides are lacking in terms of giving clear and useful information.

SOME COMMENTS FROM YEAR 3 TRAINEES

Fifty-four trainees across 3 groups were asked about their experiences of the audit process, and recorded their thoughts and comments for analysis. Reproduced here is a selection of the comments made which help give an insight into the statistical output

generated by the questionnaires. The context is that the Year 3 trainees submit their completed audit with their final mathematics assignment halfway through the year. The discussions took place during the final taught session after they had submitted the audits for tutor comments.

This first response in many ways sums up the notion that led to the project in the first place:

> 'The idea behind the audit is good, however I do not feel the process is successful. Some people are making them up rather than spending the time completing independent study tasks to develop their own personal knowledge.'

This suggests a perceived lack of purpose in the audit; hence it is not given appropriate attention. This idea is echoed in the following comment, which clearly identifies the procedural approach of some trainees to the completion of the audit:

> 'In theory it is a good idea, but it doesn't really work because you are left to do it by yourself. With all the other work we have to do the audit tends to get left to the last minute.'

One trainee simply wrote this:

> 'Lectures, seminars and reading useful but the audit had no meaning.'

An example that perhaps highlights the need for communication of the purpose and process of the audit to be more clearly explained to trainees is the following:

> 'For auditing to be effective an initial audit should be done to provide a base line. This should be repeated periodically. In this way the audit is constructive and demonstrates progression.'

This trainee has suggested how the audit might be better presented, but in fact they have described how the audit is supposed to work anyway…highlighting the need for better communication to trainees about how to carry out the audit over the duration of their course!

Amongst the misunderstandings, there were some trainees who found it beneficial, for example the trainee who said of the audit:

> 'Very important for personal development in finding the gaps in my knowledge.'

One comment that concurred with much of what has been said also resonated with an idea that Murphy (2003) presented in a similar study:

> 'They do usefully show us any obvious gaps in our subject knowledge, but as we don't refer to them much through the course, they are often seen as hoops to jump through just before we have to hand them in.'

Another point about the usefulness of the audit comes from the following trainee's responses:

> 'I would prefer to sit a test than rather than filling in a time consuming audit. By passing the QTS test we do not prove that our subject knowledge is up to date.'

This view is challenged in this final example, which also goes on to question the importance given to the audits by tutors:

> 'Don't QTS tests prove our knowledge? (The audit is) never mentioned by university staff – does this show its level of importance?'

SUMMARY

The data collected in this project arose from an ongoing procedural activity which is designed to support primary trainees in developing their mathematical subject knowledge, something widely regarded as a key element towards effective teaching and learning in mathematics. There seem to be two points of view which although are intended to meet and thus be productive, namely the views of tutors and the views of the trainees, but the evidence from this report suggest the two views are not in true alignment and that the audit process needs to be reviewed in terms of its purpose and its procedure, and the way in which its importance is portrayed to trainees.

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