

## INFLUENCES ON STUDENT TEACHERS OF MATHEMATICS D N

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*This paper reviews work in progress on a study of the nature of influences upon student teachers of secondary mathematics. A practitioner research model has been employed in three phases to date, involving three cohorts (student teachers on the one year post-graduate certificate in education course (PGCE) at Sheffield Hallam University. The findings suggest that mathematics teachers were motivated to advise student teachers most frequently about aspects of class management. Other aspects of guidance offered within this structure were mainly focused on explanation, examples and exercises. There was some attempt to exhort student teachers to use a range of activities, but little guidance was offered about specific activities.*

### **Phase 1 1995/96**

This phase is described in more detail by Smith (1996a). To summarise, many of Sheffield Hallam's student teachers had commented upon their perception of a strong difference between the views of school teaching propounded by the university based teacher trainers (e.g. Smith, 1996b) and those propounded by many teachers in their practice schools. This apparent dichotomy might be characterised as university tutors being seen to be advocating strong but *idealised* positions and approaches whilst the influential teachers in school are characterised as being more pragmatic and *practical*.

The aim of the first phase of the study was to explore and describe the gap between university ideals and school practice in terms of advocated mathematics teaching styles. To inquire into these questions a survey was undertaken of the views of all twenty-one students on Sheffield Hallam University 1995/96 cohort of mathematics PGCE students.

This survey confirmed that the students did perceive a gap between what was being advocated by university tutors and the practice observed in their placement schools;

- These particular student teachers regarded school teachers of mathematics to be doing too much routine practice work and insufficient investigative work .
- The student teachers appeared to be convinced of the desirability of engaging their pupils in active learning tasks (although one or two seem to be indicating that tutors were overstating the case in an effort to counterbalance school practices).

- Many of the student teachers were aware of school teachers adopting different ways of working with different ability pupil groups.
- These particular student teachers allied their own views closely to the perceived views of their university tutors.

It is reasonable to speculate that once these students become full time teachers, the initial influence of the university tutors may fade over the years. Phase 1 of the study had not been designed to identify any changes in views.

#### Phase 2 1996/97

This phase studied nine student teachers as they progressed through their PGCE year in 1996/97. The students completed surveys at three points in the year; on entry, half way through the year and during the final session at the end of the year. The surveys were used to identify which individual students were making changes in their views regarding teaching approaches. These individuals were subsequently interviewed to obtain more detail.

There were few generalities in the changes experienced by the students, the most significant being a convergence towards the view that lower attaining pupils would benefit from the use of practical equipment and practical tasks.

Most of the changes in views occurred at the individual level, where changes made by students appeared to follow a pragmatic line, responding to the classroom environment student teachers found in their practice. However, some students made changes in their teaching approaches happily and consciously, acknowledging their initial lack of background knowledge. Other students made such changes pragmatically, but sometimes reluctantly as the changes conflicted with strongly held views on the nature of the task. This bears comparison with other studies, e.g. a study of student teachers' implementation of investigative approaches (Cooper, B. 1990) where strongly held views about the correct nature of mathematical education persisted through the PGCE year.

A significant issue that emerged during phase 2 was that of the relationship between the student teacher and the various classroom teachers from whom they were temporarily taking over. The

particular aspect that caused difficulty was the student teachers frequent attempts to emulate the class teachers' style and approach. At best this can be an emulation of a range of effective styles, at worst the student is trying to emulate a range of conflicting styles and sometimes attempting to do so with a single class.

### Phase 3 1997/98

This consisted of an investigation into the influence of mathematics teachers on student teachers of secondary mathematics, with a particular focus on the selection of pupil activities in the construction of lesson plans. Evidence was collected in three ways;

- I. a documentary analysis of lesson observation feedback forms (10 per student) which are used to provide the 14 student teachers with written guidance on their teaching
2. a questionnaire survey completed by 26 out of 61 mathematics teachers and school-based mentors who were offering the student teachers advice
3. interviews in which the 14 student teachers lesson plans were used to stimulate recall of planning decisions regarding the selection of pupil activities

The documentary analysis of lesson observation forms was focused specifically on advice to the student teacher about the choice of tasks for pupils. In summary;

- The advice relating to teaching approaches was predominantly concerned with exposition, examples and exercises. Students were advised about the clarity of their exposition, both orally and in relation to board work. The quantity, quality and graduation of examples and exercises were commented upon.
- One third of the teaching practices passed with no other aspects of pupil tasks being commented upon, that is no comment on alternate approaches involving pupil discussion of mathematics, investigative work, practical work, or non- routine problem solving. (Cockcroft, 1982, para. 243) .
- In general there was little comment on pupil learning activities except some requests for 'more variety', but no alternate tasks were offered. It is possible that summative lesson observation forms are not an appropriate place for teachers to advise student teachers on alternative approaches, but that alternatives might well be considered *before* rather than after teaching.

Each of the student teachers in the cohort worked with a number of classes in their placement schools during the first half (of the year). The mathematics teachers who normally took these classes were asked in a questionnaire to identify the range of advice that they had provided to the student teachers. The total number of mathematics teachers invited to participate was 61. The total number of respondents was 26. Some 13 of these respondents had received training as school-based mentors. The questionnaires for teachers raised a wider range of issues than the documentary analysis, including advice in relation to pupil tasks but also questions relating to the relationship between student teacher and class teacher and questions relating to advice on class management.

Some differences were identified between school-based mentors and class teachers. In comparison with class teachers, mentors were

- more strongly inclined to identify student teachers strengths
- more likely to offer student teachers challenges
- always involved in the assessment of student teachers
- more likely to see themselves as guides to the school
- more likely to see themselves in a coaching role with the student teacher
- more strongly identified with a reflective practitioner model of development
- more likely to attempt to exemplify good practice
- more involved in the planning of the student teachers learning experiences

These differences could be thought surprising. The very limited time involved in school-based mentor training cannot be expected to make a great impact in comparison to the long term experiences of a professional career. However, school-based mentors are different from other mathematics teachers in the sense of generally having opted into the teacher training role and in tending to be more senior members of staff.

The questionnaire responses regarding advice offered to student teachers can be summarised as follows;

- Class management was the main focus, with frequent advice about keeping pupils busy.

- The second most frequent advice related to pitch and differentiation; again this was often phrased in terms of keeping the pupils busy. In other words, the most able pupils should not be allowed to run out of work, and the least able pupils should have work which is accessible and keeps them occupied.
- Advice about choice of activities was not a particularly strong feature but where advice was to be offered, it would mainly involve aspects of explanation, examples and exercises. There were some appeals for variety without specific alternatives being suggested.

The student teachers were interviewed about their lesson planning decisions, with the intention of identifying the sources of ideas for pupil activities. On a straightforward count of identified influences, the major sources of pupil activities in order of frequency were:

1. the student teachers "own ideas" (57%)
2. ideas developed from the pupil textbook (20%)
3. mathematics department teacher / school-based mentor (9%)
4. university sessions (8%)
5. other i.e. peers, in - service course, reference texts (6%)

#### Some conclusions

The evidence accumulated from three different approaches used in phase 3, together with evidence from phases I and 2 suggested that mathematics teachers are motivated to advise student teachers most frequently about aspects of class management. This may encourage student teachers to view class management and the learning of mathematics as though they are entirely separate issues. Other aspects of craft knowledge were also shared, but were subordinate to a concern with class management. The 'other aspects' of guidance offered in this context were mainly focused on explanation, examples and exercises. There was some attempt to exhort student teachers to use a range of activities, but little guidance was offered about specific activities.

Student teachers in this study have relied predominantly on their own devices in order to produce pupil activities, suggesting that direct influences on their choice of activities are weak. It may be that external influences remain, but are influences on the *type of activity* undertaken rather than the particular activity. This might provide an opportunity for further research.

### Suggestions for "Further Research"

With a lack of direction from school on the issue and a relatively limited quantity of suggestions from HE, student teachers generally have chosen to devise their own pupil activities. This raises for me the related issues of what the student teachers are trying to achieve with their activities and how they design the activities. Clearly there are obvious targets, such as the teaching of lesson objectives. What kinds of activities do they design to meet these targets? What principles, in addition to the maintenance of order, are being used to choose between competing alternatives? How do student teachers articulate these principles? Where do the principles originate? Given an ambitious suggested pupil activity, how do student teachers modify it to make it more "workable" for them in the classroom. What is the thinking behind such modifications?

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### References

- Cockcroft, W. H., 1982, *Mathematics Counts*, HMSO  
Cooper, B., 1990, *PGCE Students and Investigational Approaches in Secondary Maths*, Research Papers in Education, Vol. 5, NO.2.  
Smith, D. N., 1996a, *College Ideals and School Practice* ", Mathematics Education Review no.7, January 1996, pp 25-30.  
Smith, Jim., 1996b, *Getting Started*, Mathematical Association, April 1996, 92pp, ISBN 0 906 588 340