Student Teachers Supporting Pupil Learning: Developing understanding, developing confidence

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Abstract

This paper reports on research aiming to develop understanding of a project involving pupils working individually with student teachers on a regular basis. Data was collected from focus group discussions with student teachers and pupils. The context is that of a cohort of student mathematics teachers undertaking a subject knowledge course prior to initial teacher education. However, the findings are relevant across teacher education because they have implications for supporting pupil mentoring in schools as well as for the development of student teachers' professional learning.

The research findings indicate that the subject mentoring project developed confidence in subject for both student teachers and pupils. In developing pupils' subject knowledge student teachers developed an understanding of the need to explore the subject from multiple perspectives. Pupils developed confidence in attempting subject matter outside the mentoring sessions. Participants also suggested that the evaluation of the impact of the project should not be considered in isolation as the project was run in the context of a range of related school interventions and the focus on subject improvement from a range of perspectives was a key feature.

Key Words: Teacher education; multiple perspectives; mathematics; confidence, mentoring, student, pupil, trainee, interventions, school improvement.

Introduction

This research examines a project involving regular, focussed curriculum support with secondary school pupils being supported on a one-to-one basis by secondary student teachers. The project was a collaboration between the higher education institution and the school and the research aimed to further develop an understanding of the impact of the project on both student teacher and pupil.

The sixteen student teachers were participating in a Higher Education programme: the Subject Knowledge Enhancement Course (SKE). The SKE programme is part of a current national initiative from the Training and Development Agency (TDA) aimed at students who have secured a place on an initial teacher education (ITE) course but who may not have sufficient content in their degree to enter directly to ITE. It is aimed specifically at students in secondary shortage subjects. The SKE can be set in a national context of the Smith Enquiry (2004) that recommended that there was a need to look beyond the pool of mathematics graduates in order to fulfil the supply of mathematics teachers, noting, for example, that it would require around 40% of mathematics graduates to opt for Initial Teacher Education (ITE) per year to fill training places, a challenging outcome to achieve (Smith, 2004, p.46). Subsequently, several strategies have been employed to address the identified significant difficulties with the recruitment of mathematics teachers. These strategies include pre-initial teacher education courses for graduates with degrees other than mathematics and in-service initiatives for teachers who may not have originally specialised in secondary mathematics.

The school involved is a smaller than average high school which takes its pupils (aged 11-16) from the urban districts of the North West of England. The school's most recent external inspection judged the school as 'outstanding'. Mathematics became a focus for the school through the development of an in-house ESTEEM Plan (Engaging Strategies to Target Excellence in English and Mathematics). The ESTEEM Plan brought together existing and new strategies to support pupils in achieving their A*-C grades GCSEs in English and Mathematics. The school's focus on these grades links to a national context whereby schools are required to meet minimum targets in these areas. This also reflects the priority given to

attainment in English and Mathematics as a vehicle for supporting pupil progression onto post-16 courses within the school. The mathematics mentoring project examined here is part of the ESTEEM package of interventions. Pupils selected for the mentoring project are identified through the school's monitoring processes in these subjects. All of the pupils selected were in Year 11, a balance of genders and were identified as those who may potentially benefit from involvement in the project, often due to assessment results indicating that their attainment may be on the 'C/D' borderline at GCSE.

Whilst the project was an action research project designed to inform the development of the SKE course, the findings have the potential to inform the wider teacher education and school communities as there are implications for developing links between ITE providers and schools as well as raising issues of learner confidence.

Literature Review

Confident Learners and Confident Individuals

The current English statutory national curriculum (QCA, 2007) frames 'confident individuals' as a key aim including pupils '*having a sense of self worth'*, '*being self aware and dealing well with their emotions'* and '*becoming increasingly independent and are able to take the initiative and organise themselves'* .

Graven (2004) draws on situated models of learning (e.g. Wenger, 1998) to conceptualise confidence as both a process and a product of moving towards belonging to a community. This view frames confidence as being developed by learning through experiencing. In this study the pupils learnt by experiencing supported and positive mathematical experiences and the student teachers experience supporting the pupils and start to develop their identity as teachers. This conceptualisation of confidence differs from cognitive theories, for example Wasson (2009) viewing confidence as an attitude towards one's own capability. For the pupils in the study, this would manifest as believing that they were capable of tackling mathematical problems; and for the student teachers, a belief that they were able to support the pupils. Both of these conceptions of confidence are relevant to this study as student teachers need to both experience supporting

pupils in developing understanding so that they view themselves as teachers but to also believe that they are capable of drawing on their skills to do so.

Initial evaluations of one-to-one tuition programmes in school also show an emerging pattern of increased confidence amongst the teaching staff who participate due to increased engagement with learning (e.g. Kirkham, 2010). In this study we were interested in the impact of the project on the students who took on this role of teacher/mentor and how this linked to their development as beginning teachers.

Multiple Representations of Mathematics

A 'constructivist' view of learning is that individuals need to construct their understanding from their experience. McNiff (2001) explains this by suggesting that this is an individual process of interpreting experiences in the light of prior experiences and knowledge and that the resultant sense making will differ from individual to individual (McNiff, 2001, p.5). Bruner and Keeney's seminal work (e.g. Bruner and Kenney, 1965) placed representation at the heart of mathematical learning and development asserting that learners will draw upon a range of imagery and representations in order to make progress, or construct meaning. Much of Bruner's work relates to young children but many have since gone on to argue that learners of mathematics of all ages can construct meaning from a range of representation. Similarly Schmidt (2000) explains that von Glasersfeld's work links 'understanding' to a process whereby a learner 'must accommodate his or her concepts to the use of related words in diverse contexts' (Schmidt, 2000, p. 28). Whilst this argument relates to language Schmidt goes on to relate this to concept development and understanding. It is this that Rowland (2001) draws on to argue that 'diagnostic' talk about mathematics is an important tool to further support children's development in mathematics as this supports the development of negotiated meaning. ACME's The Advisory Committee on Mathematics Education's (ACME) descriptions of approaches to support learners of mathematics by having 'multiple experiences of mathematical ideas' (ACME, 2011:13) as well as to 'avoid unhelpful conceptions from particular examples' (ACME, 2011:13) support the use of a rich variety of representation (e.g. diagrams, descriptions and imagery) as part of the tool kit of the effective

mathematics teacher. Ryken (2009) claims that engaging and analysing multiple representations supports student mathematics teachers in developing their teaching practices.

The use of learner centred, collaborative approaches to learning is known to have positive impact upon pupil learning (Swann, 2006) and Swann tentatively notes that less-learner centred approaches are linked to declines in affective areas such as confidence and anxiety.

Mentoring and Coaching

Finally, it is necessary to consider the nature of the relationship between student and pupil. Mentoring and coaching are terms often used interchangeably in practice and elements of each are relevant here. Firstly, the mentoring approach used in the project that is the focus of this paper combined affective and effective practices i.e. the project aimed to support mathematical development alongside confidence boosting and empowering of pupils. Stewart (2006) points out, however, that there may be tensions between mentoring for academic achievement and more 'holistic' mentoring; despite these tensions one of Stewart's key recommendations is that adult-pupil mentoring includes and values social skills. Stewart also argues that mentoring should be well embedded within school systems and pupils are empowered to be involved in target setting processes.

Roberts (2000) identifies eight attributes of mentoring often found in the literature:

1. A process form
2. An active relationship
3. A helping process
4. A teaching-learning process
5. Reflective practice
6. A career and personal development process
7. A formalised process
8. A role constructed by or for a mentor.

(Roberts, 2000, p.151)

SchÖn's (1987) conceptions of 'reflective practice' in education are apparent here and may help to distinguish mentoring from coaching. Many of Roberts' attributes are relevant to the project and this provides a helpful model. Student teachers' roles were negotiated by their tutors and the school for example, and there was a focus on the teaching-learning process, meta-level reflection on this process was a feature of the student teachers' course.

Ives (2008) argues that, partly due to a cross over with mentoring in education contexts, coaching is increasingly difficult to define, demonstrating the close relationship of these approaches. He suggests that coaching paradigms may fit a range of approaches from goal-orientated to individually focussed models, e.g. 'therapeutic' or 'personal development' focussed.

Finally, Hargreaves provides a helpful definition of mentoring that resounds with the project aims and illustrates the complexity of the relationship and multi-layered intentions:

"…a combination of coaching, counselling and assessment, leading to increased aspirations, motivation, attainment and smoother transition phases, with a common purpose of breaking down barriers to learning and releasing potential."

(Hargreaves 2004, cited in Russell, 2009, p58)

Methodology and Methods

The aim of the study was to develop an understanding of the impact of the project on both students and pupils with a view to further developing the project to meet their needs and so is based on an action research approach, that of learning through action (e.g. Koshy, 2010). The project had run in previous years and was noted to have had a positive impact on the pupils' external examination outcomes. The research aimed to further probe the reason why this was the case and so to learn through both the action and reflection.

Focus group data was collected from pupils two-thirds of the way through the project. Pupils were asked to discuss their views and open prompt questions were given to support these discussions:

- What are your views on the mentoring project?
- What are the good points of the mentoring project?
- What could we change to improve the mentoring project?

Pupils recorded their written responses on a poster as well as taking part in the discussion. They were invited to discuss and expand verbally upon what they had written. The two co-researchers took notes during the discussions and cross-referenced to identify themes immediately after the discussion. Participation in the focus group was offered to all the pupils taking part in the project and was at a time when they were able to attend. The focus group was a self selected group. The aims and purposes were outlined to pupils prior to the session. The same approach and the same questions were used for the student teachers although this focus group took place at a different time and location. In addition, the initial findings from the pupil focus group were shared with the student teachers and they were asked to comment on these. Institutional ethical guidelines were followed at all times. For example, the aims of the research were shared with the participants and participation was voluntary, informed consent was obtained. The focus group data was examined by the co-researchers immediately after the sessions and themes were identified. The use of note taking by both researchers was triangulated with the pupil/student posters.

Findings

The first strand in the pupils' discussion was that of pupil confidence. The pupils valued the one-to-one support and expressed developing confidence in a number of ways, for example one pupil described how she was now able to open an exam paper and feel as though it would be possible to attempt it in contrast to feeling as though she could not at the start of the project.

Pupils also recognised and valued the way that their student teachers drew on a variety of methods to explain their mathematics and 'having multiple experiences of mathematical ideas' was a strand in their responses. Finally, pupils had reflected thoughtfully upon the way that the project linked to a variety of interventions aimed at raising attainment in mathematics and they stated that a

strength of the project was that it was part of a series of interventions and could not be separated from that. That they were meeting mathematics in a variety of contexts (small group, classroom, revision groups and project groups) gave them a variety of opportunities to make sense of mathematics.

There were links between the findings on impact on pupils and that on student teachers. The student teachers stated that they valued the way that the project required them to explore multiple representations and perspectives on mathematics, they felt that this supported them in developing their confidence in their subject knowledge. There was also a developing recognition that pupils' needs may not only be mathematical as in paired work there was felt to be differences in pupils' approaches to the mathematics. The project was felt by student teachers to have highlighted the need to consider classes as groups of individuals with individual differences in understanding and wider needs.

Discussion

Pupils Learning Mathematics and Multiple Representations

Student teachers felt that the project contextualised their development on the subject knowledge enhancement course. It provided an opportunity for creativity in explaining mathematics and to develop an understanding of the mathematical needs of an individual. This links to Ryken's (2009) claim that engaging and analysing multiple representations supports student mathematics teachers in developing their teaching practices. Interestingly, few of the student teachers referred explicitly to the mechanism for analysing representations; the student teachers were working on a linked portfolio assignment designed to facilitate metacognitive reflection upon the mathematical interconnections involved. This may be due to the timing of the focus group as the student teachers had not yet completed this process. There is potential to follow this up at a later date although it may be helpful to note that tutor feedback was that the student teachers drew powerfully on the project experiences in their assessment submissions.

Student teachers reported that the project required them to 'explain in different ways and look at mathematics from different perspectives' they demonstrated a

developing understanding of the need for the *learner* to negotiate meaning 'not just my own perspectives' (Focus Group response). Roberts' attributes of mentoring included dimensions of reflection and career development, in this case this impact was on the student teachers as they noted that the project had had a positive impact upon their own subject knowledge development.

That the project required them to 're-teach ourselves and re-examine the basics' (Focus Group response) provides them with an opportunity to understand the mathematical needs of pupils as individuals. This along with the realisation that 'even pupils at the same grade have different learning styles and abilities' demonstrates a growing awareness of the complexity of the classroom (or a realisation of their previous unconscious incompetence, in Howell's (1982) model a potentially necessary step to developing tacit unconsciously competent practices).

Students and pupils valuing wider aspects of mentoring

Pupils valued the opportunity to develop and work towards self developed targets. They were keen to suggest targets and were positive about the opportunities to link their one-to-one session work with areas that either linked to current class work or areas identified with teachers as needing attention. Stewart (2006) sees this involvement of the mentee in target setting as vital to the pupil experience of mentoring and school leaders are known to value the role of student voice in raising pupil attainment (Stockhill, 2011). The students were positive about the pupils' involvement in target setting and expressed a developing awareness of a tension between pupil choice and student direction. Students also expressed a wish to have even more information about the content of the exams for which the pupils were being prepared and to interlink much more with the needs analysis for each pupil undertaken by the school. Several expressed a wish to link to the school scheme of work so that they could support the pupils with current classwork. Stewart's (2006) research into factors to ensure effective mentoring saw data exchange as being a key challenge for schools. He points out that 'the greater the number of adults involved the more the need for good communication' (Stewart, 2006:14). The use of an exam board package to

identify areas of focus had been well received where used and the project team will use this more extensively in the future with this project.

Stewart's finding that mentoring is most effective when linked to a whole school approach appears to have resonance with the pupils' views. The pupils reflected very thoughtfully on the range of interventions they were receiving in mathematics and they felt that it was the combination of opportunities, foci and contexts that made this a good learning experience. They expressed views that the impact of the project could not be separated from the range of support mechanisms. There may be a potential tension between the students' wish to link to the current class work and this multiple entry point approach valued by pupils. The project contributes a dimension to a package of approaches, rather than parallel teaching with what the pupils are experiencing in class. Linked to this was the finding that pace was of importance to the pupils. Several of the pupils commented positively on pace, for example:

'You can ask what you want to learn next, you can go at your own pace'

(Focus Group response)

One pupil reported that her student teacher had misjudged the pace and returned to the same topic repeatedly although she was ready to move on. That pace was mentioned as a positive by some and as a negative by one pupil suggests that this issue may be of importance to the pupils.

Pupil and student teacher confidence

Pupils described feeling that their confidence had been developed in part through learning concepts in different contexts. The mentoring does not take place in isolation and reinforces what they are learning in lessons and revision sessions. They also recognised that the mentoring sessions were not a repetition of what they were learning in lessons but were a different experience.

Pupils identified that the mentoring sessions gave them permission to make mistakes. When being mentored either individually, or in pairs they felt that they were much more comfortable making mistakes than they were in front of their

peers in lessons. Care had been taken when pairing the pupils to pair sensitively including consideration of same- gender pairs.

Student teachers identified that the mentoring programme had helped to build their confidence in mathematics. They reported that this was linked to the development of their subject knowledge. They recognised that pupils did not always understand concepts in the way that the student teacher was trying to teach them. This meant that the student teachers had to find alternative methods of teaching a concept. They fed back that learning about and developing these different approaches led to them in turn developing their knowledge and understanding of mathematical concepts. The student teachers described being taken out of their 'comfort zone' to be challenged to 'teach mathematical concepts in different ways' (Focus Group comment). This re-examination was felt by the student teachers to lead to a greater focus on relearning these concepts for their own learning with the need for them to *understand* these concepts rather than to be able to *do*.

Conclusions

This paper is limited as it is based on an action research approach, is localised to the context of the research and so not generalisible. The value of this paper is therefore that by understanding the nature of student teachers' development and the impact of such interventions on pupils further hypotheses about the nature of this development emerge that may be worthy of future exploration in the teacher education sector.

- Key ideas arising from the study relevant to this paper were:
- Working with pupils enabled student teachers to re-examine their subject knowledge and develop further understanding of the perspectives of others in their subject.
- Student teachers developed an understanding of the need to 'meet mathematics in different ways' and developed confidence in their own potential to develop their subject knowledge to meet this need.

- The project supported pupils in building confidence to tackle the subject matter outside the sessions.
- Pupils recognised and valued the learning opportunities in meeting subject matter in different ways. They also recognised and valued the opportunity to have an input into the pace of their own learning.

These key ideas can be fed into future course and partnership development.

In conclusion, school and university partnerships have the potential to be powerful contexts for student teacher and pupil learning. There are opportunities for both the development of subject matter understanding for all involved as well as wider affective effects such as the development of skills and confidence. The successes of this project cannot be separated from the wider experiences of the student teachers and the pupils and indeed the links to wider learning were valued by all concerned. The value, therefore, of planning such interventions within the wider school, ITE and national context should not be underestimated.

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