

University Schools: A Collaborative Approach to ITT in Secondary Mathematics

Fiona Cockerham and Rob Timlin

Faculty of Education, Manchester Metropolitan University

In this paper we discuss the difficulties and tensions currently facing our initial teacher training (ITT) programme in secondary mathematics at Manchester Metropolitan University, and outline the pilot we have trialled to try to address some of these issues. We have called the schools we have worked with for this pilot 'University schools'. This model of teacher training is currently in its third year of development in 10 schools; it has been evaluated throughout this period via interviews with student teachers, weekly feedback from student teachers in the form of reflections, lesson observations, discussion with MMU staff involved in the programme, and discussions with teachers in the pilot schools. The paper outlines our findings and then draws conclusions about the success of this training model.

Keywords: collaboration, teacher training, practice, theory, pedagogy

Background: the problems of initial teacher training (ITT)

The difficulties we have identified at Manchester Metropolitan University which present barriers to high quality teacher training can be conveniently categorised into three broad areas: placement, integration and quality. Although by no means limited to the training of teachers of mathematics, the problems are especially pressing on such courses of study. We summarise the issues briefly here, prior to explaining our model in the next section.

Placement

Traditional routes into teaching via a college- or university-based course require that student teachers be 'placed' in appropriate school(s) for practical experience. In subjects such as mathematics, as well as other subjects that have shortages, it is often difficult to find placements, not least because of a corresponding shortage of existing teachers to support the training of new ones. A further consideration affecting mathematics is the heavy emphasis government places on examination league tables and success in English and mathematics, creating potential reluctance on the part of schools to allow inexperienced student teachers access to these crucial subjects.

The lack of placements for mathematics student teachers has a further negative aspect in that university tutors may have to accept placements that may not be entirely suitable. Even if it was possible to find sufficient places, the great variation in the effectiveness of serving teachers means that not all those who agree to mentor student teachers are necessarily well equipped for the task. Universities provide training for the teachers who volunteer to mentor student teachers, but uptake is reported to be variable, and universities cannot adequately monitor mentors, nor compel their attendance at training. Consequently some student teachers may receive a less than ideal training experience with respect to support.

Integration

The integration of subject knowledge with sound principles of pedagogical practice to produce what is commonly known as pedagogical subject knowledge (Shulman, 1998) is a key concern of teacher training. The student teacher is keen to pass on the principles of mathematical thought and reasoning but must be alert to the need to provide support for learners to construct mathematical knowledge for themselves, rather than ‘absorb’ it in the mode implied by the traditional transmission style which they might have experienced in their own education. Additionally, they must meet the challenge of engaging often reluctant and occasionally recalcitrant learners. In such circumstances the student teacher must find a way to adapt pedagogy to serve their subject. Wideen et al. (1998) note that the implicit theory underlying traditional teacher education is that the university provides the theory, methods and skills, while schools provide the setting in which that knowledge is practised; the student teacher then provides the effort to apply the knowledge. However, as Barone et al. (1996) report, the theory presented in teaching programmes often has little connection to the practice that is seen in schools, echoing Zeichner and Tabachnick’s (1981) comment that many notions and concepts developed during pre-service training were ‘washed out during field experience’. Comparable findings were also reported by Cole and Knowles (1993).

Once on placement and away from the advice and sounding board provided by university tutors and fellow student teachers, the novice teacher has to negotiate a tortuous path that may dent the enthusiasm and idealism which drew them into teaching in the first place. Too often, pedagogy is sacrificed to ensure compliance. Inventive and imaginative practice enthused over at university becomes reductionist process-driven teaching. In some cases school-based mentors and other staff in school encourage student teachers to adopt an unduly cynical approach to teaching (Nolan, 2012). Brouwer (1989) and more recently Allen (2009) report on the dominating influence of school placement on pre-service teachers; for Brouwer (1989), the most important factor promoting transfer from teacher education into practice was the degree to which there was alternation and integration of the theory and the practice.

Anecdotally, university tutors on their periodic but infrequent visits to student teachers on placement are frequently surprised and dismayed to see student teachers previously noted for their innovation and creativity relapsing into didactic teaching. One of the problems faced by university tutors concerned with the gap between theory and practice is that “teachers often feel threatened by theory” (Elliot, 1991: 45): many feel that they are unable to use the theory presented to them by experts and are therefore ‘falling short of living up to expectations’. Student teachers in turn see that they are not the only ones struggling to embed these ideals into their classroom and the whole idea of applying theory is discarded. “The only way out of the feeling of always falling short is to adapt to the common habit of teachers to consider teacher education too theoretical and useless” (Korthagen, 2001: 5). Elliot (1991: 47) similarly concludes that “The perceived gap between theory and practice originates not so much from demonstrable mismatches between ideal and practice but from the experience of being held accountable for them”.

Quality

Initial teacher training providers who find themselves with a cohort of high calibre students, sufficient placements and committed school-based colleagues to support the

development of effective pedagogy will still face the hurdle of monitoring the outcome of their efforts. Ensuring a common understanding of ‘quality’ in ITT presents difficulties despite the existence, in England, of a set of Teachers’ Standards (DfE, 2013). Adding in the criteria used by Ofsted to judge lessons as either ‘outstanding’, ‘good’, ‘requires improvement’ or ‘inadequate’ adds further confusion. Informally, what constitutes an ‘outstanding’ lesson may vary depending on the school context, so that an ‘outstanding’ lesson in one school may be judged as ‘requiring improvement’ in another: mentors supporting student teachers in ‘challenging’ schools may deem simply surviving a Year 9 lesson an outstanding achievement. Consequently university tutors’ infrequent visits are inadequate to monitor and support a shared sense of quality across multiple schools in a university partnership. The consequence of this can be novice teachers released into teaching wrongly graded and lacking understanding of their true capacity and potential for development.

Moving towards a new model of ITT

Finland’s teacher training focuses heavily on the integration of theory and practice in schools, and has strongly influenced the development of our model of teacher training. Teacher training in Finland is completed in specialist teacher training schools, where theory and practice are considered to be conceptually inseparable. Integration of theory with practice is seen as fundamental to promoting teacher autonomy and professionalism (Heikennen et al., 2011). Furthermore, the relationship between the university teacher and the training school teacher is considered crucial to teacher development, and both class teacher and university tutor are equally responsible for supervision, but from different, overlapping, perspectives. The university tutor observes lessons to ensure that the student teacher is building their practice upon theory and can identify the theory that arises out of their practice in the classroom. The classroom teacher focuses on subject knowledge. Similar practices have also been developed in the United States, in ‘Professional Development (or practice) Schools’ (Bullough and Kauchak, 1997). This collaboration between the school and the university is an area we wanted to develop.

The second aspect that we wanted to develop in our teacher training course was the use of collaborative teaching to develop innovative lessons as well as encouraging our student teachers to become more reflective practitioners. Northfield and Gunstone (1997: 49) state that “Learning about teaching is a collaborative activity” and that it is most productive when conducted in small groups where ideas and experiences can be shared and discussed.

The University School Model at MMU

The secondary mathematics department at MMU has placed mathematics student teachers into selected schools in multiples of three; a university tutor works in the mathematics department of the school each week that the students are on placement there. There are as many as 15 mathematics student teachers in each school, down to a minimum of six, and the tutor works between one and two full days a week in the school. Schools are paired and work together to create a cohesive training model for the students they share.

The students in the university school model are enrolled on a PGCE course and have the same entitlement as those on the traditional PGCE route. The difference in the university school model is the way they work in their placement schools. The

role of the university tutor is similar to that identified in the Finnish system, that is, as support for the class teacher's role by observing student teachers' lessons, giving feedback, and helping to plan lessons, with a focus on developing pedagogy throughout this process. There is an opportunity for lessons to be modelled and delivered by the university tutor during the block placements in school. This is extremely powerful in linking theory to practice and showing how it is relevant for the classes being taught by the student teachers.

Block A

During the first teaching placement the student teachers teach in threes (or triads). Each triad has approximately three classes that they are responsible for, and the remainder of their timetable is used for intervention that the school feels is beneficial (usually year 11 exam preparation classes to support revision). They are encouraged to ensure that all three take part in both planning and delivery of shared lessons. They are equally responsible for the learning that takes place in these lessons regardless of who is delivering, since the exchange of ideas and the discussion around why certain tasks have been chosen is crucial to their development. After each lesson they teach, they give and receive feedback to each other. They are encouraged to be precise in this feedback. The model has developed this year to trialling the use of two shared classes and one individual class.

Block B

During the second teaching placement there is a greater emphasis placed on individual teaching. Student teachers continue to teach one class on their timetable as a shared class, and the other two classes are taught individually. This usually also includes some year 11 intervention. There continues to be at least six student teachers in each school with an emphasis on sharing ideas, collaborating and supporting each other. They are encouraged to observe each other teach and give feedback even in their individual classes. They continue to receive feedback from each other in each lesson taught as a triad.

Methodology

The aim of this research is to assess the impact that the university school model of training has on the placement schools in terms of staff development and pupil progress; the quality of lessons the trainees are delivering by working collaboratively; the impact on pedagogy through bridging the gap between theory and practice; and to ensure a consistency in the training experience. However, this paper reports on only part of the action research cycle as discussed by Cohen et al. (2011) as there is further research to be developed. The university schools model has been piloted in 10 schools over three years involving a total of 148 student teachers. The schools were chosen based on previous experience working with Manchester Metropolitan University and established expert practice. The location of the schools has determined which trainees are involved in the model based on their travel time. Over the three year period, we have collected a range of data, including: lesson observations by university tutors; students' weekly reflections on their teaching practice; further reflections at key points of the year on their involvement in the university schools model; year-end group interviews with both university school and traditional route students focusing on their experience in the PGCE and how they

have developed in preparation for their induction year as a newly qualified teacher (NQT). Additionally, school mentors have given feedback during the pilot in the form of an open discussion where they were asked to comment on this model of teacher training. The data reported in this paper is primarily concerned with participants' perceptions at particular stages along with impressions from the university tutors and school based mentors.

Findings and discussion

Placement

Being able to place multiple student teachers into our selected university schools affords us the opportunity to work with colleagues who see training teachers as a fundamental role of their school, and who recognise the continuing professional development (CPD) it provides. However, the issue of having numerous student teachers working in a mathematics department and the effect this has on results for government league tables is a crucial consideration. Each university school has used the numerous student teachers in their mathematics departments for some form of intervention, in most cases year 11 GCSE revision. This has varied in its nature from in-class support in small key groups to working with targeted pupils outside the classroom. This has been perceived as extremely beneficial in raising school standards. An e-mail from one university school reported:

Involvement in this model has directly contributed to raising standards in maths. Since becoming involved in the multiple placement model in 2010 we have seen a distinct rise in maths results. Prior to involvement in the multiple placement model results were around 62-64% A*-C for maths. In the first year of the model (2010-11) it rose to 66% A*-C. In the second year of the model (2011-12) the results were 76% A*-C. (School A)

Due to the collaborative nature of their first teaching placement, student teachers have had experience of teaching classes that in the traditional model would have been considered unsuitable for them to teach. These have been described as the lower attaining classes where pupils exhibit more challenging behaviour and many pupils are on the special educational needs register. Teaching in threes means that pupil understanding can be aided by the availability in the room of additional mathematics specialists. These classes have been frequently used for both Block A and Block B placements as schools recognise the benefit of a high teacher-to-pupil ratio:

In addition to the benefits for the trainees, the model has had particular benefits for our pupils ... Many of the lessons benefited from having three additional maths specialists in the room. (School A)

A student in a different school also commented on this issue in their reflection:

I was very anxious about taking over year 9 as I had no idea how I was going to work with and contend with the behaviour that I had seen them portray to their class teachers...all of them seem to be working and I think it's due to the large amounts of adults that are in the room...all pupils get the opportunity to have their own one to one time throughout a lesson and this works for them well. (01-02-13)

Integration

One of the main benefits of the university tutor working alongside the teachers in the university schools is the ability to focus on pedagogy and theory. They are not

constrained by the same pressures experienced by class teachers and subject mentors and so can spend more time developing these aspects of the student teachers' teaching. This is very relevant in schools where students are guided to teach procedurally with little emphasis on underlying concepts. A student who had made excellent progress on Block A commented in a Block B reflection that she was not enjoying teaching because of this issue:

The trouble seems to have come with the class teacher in that he has a specific way of teaching the class, and that's the way that he wants me to teach. His way seems to be very textbook led, whereby an example is gone through on the board with the correct method and then the pupils answer questions similar to this, and because of this reason he seems to be stripping my lessons back to the minimum. This isn't the way that I would like to teach and so have found it a challenge to plan these kinds of lessons. After planning these lessons because of the lack of enthusiasm I have about them this is making me less confident in the classroom, which in turn is affecting my teaching style. (08-02-13)

A related issue is that beliefs about effective teaching styles in mathematics go beyond individual class teachers and are noticeable in pupil perceptions as well (Swan et al., 2000). Pupils play an important part in the learning process and the importance of this in the planning stage cannot be dismissed. Whilst reflecting on this lesson the student teacher said:

... then when we got into the class I was faced with resistance – not from the teacher, from the pupils. “You only learn when you copy things down and answer loads of questions, there's no point in doing stupid card sorts – it's not beneficial”. (15-02-13)

The university tutor has a unique opportunity to work alongside teachers and pupils in the school as well as students. By the end of the placement the teacher mentioned above was actively encouraging the student to do card sorts and mathematics trails around the room.

A unique benefit of the university schools model is the opportunity for student teachers to witness the university tutor delivering a lesson to a class that the students are teaching which is based on the theory discussed at university. This is extremely powerful in bridging the gap between theory and practice and showing that theory is relevant for the school they are placed in. After planning a lesson with their university tutor, one trio delivered the lesson but failed to recognise the importance of the use of the context and decided to not include this in the lesson and to revert to procedural methods. The lesson was not successful and the pupils had not made any progress when assessed at the end of the lesson. The lesson was then delivered by the university tutor, with emphasis placed on using the context to secure understanding. The students reflected on this experience in their weekly reflection:

We've learnt a lot in university about conceptualising maths in the classroom and how that is a really good foundation for understanding...that is one lesson we had planned to deliver in terms of concept but we all during the lesson fell back to procedure. For me this was highlighted when [the university tutor] started with a concept and at no point during the lesson did they revert to procedure, they kept the theme throughout and used questions to build up their understanding. It was good to see all that theory in practice, from conceptualising, to planning for questioning, to dealing with misconceptions. (24-10-13)

...the lesson was a success and it demonstrated to me that a contextual lesson, focussed on developing pupils' understanding, can show progress and it can be done in a similar amount of time as traditional lessons, based on methods. (22-10-13)

The collaboration between the student teachers in these lessons encourages a wealth of ideas to be shared before delivery. This often results in the students taking more risks in their lessons. In the first week of teaching in one tutor group the university lecturer observed lessons involving play-doh to conceptualise fractions, 'people maths' to explain bearings, and one group taking a class outside onto the field. The second lesson that one trio taught in their first week on teaching practice involved a mixture of 'people maths' to explain concepts, mathematics trails around the room and Tarsia puzzles to consolidate understanding. This exciting and innovative approach to learning has been witnessed in numerous lessons in the university school model and one subject mentor compares this to her experience with student teachers on a traditional route of training:

The lessons I have observed have certainly been of a higher quality than the majority of lessons on the previous PGCE model. The trainees are taking risks, being innovative and working on developing strengths that would usually not be considered until Block B. The lessons are focusing on understanding rather than procedural algorithms, and their ability to discuss pedagogy and critically reflect on their own (and each other's) lessons is excellent. (School B Mentor)

Quality

After each lesson has been delivered, the student triad meet and give each other feedback on the lesson. They complete a 'feedback sandwich form' for each lesson, which focuses them to discuss positive aspects and targets arising from the lesson. This not only aids the development of the student receiving the feedback, but also the critical analysis techniques of those giving the feedback. They are encouraged to be precise in their feedback and give clear targets to develop. This ensures that students are receiving valuable feedback every time they teach and helps them to develop effectively. Furthermore, the presence of the university tutor working in the school throughout the placement means that the grading of students' practice becomes more consistent. The students value this as they are being observed throughout the placement not just on pre-planned visits. As one student observed in an interview:

Because you're [the tutor] in school every single week it's not as big a deal. Because you have to make sure all your lessons are good. Whereas people that are in a school on their own, if they've got an observation, 'Oh my God I've got to do this really outstanding amazing lesson' but it might not be consistently good which is something you have to try to make sure you keep on top of. (04-2013)

This regular contact with the students, and the discussions with the mentors, ensures a secure understanding from all parties as to the progress the students are making. It also helps to ensure that targets for the induction year are more consistent throughout the university schools.

Conclusions

We have discussed only a few of our findings in relation to concerns about the integration of theory and practice in the training of pre-service teachers, the placement of these student teachers in schools that would support their training, the quality of the training they receive and the quality of the lessons they deliver. The research suggests that delivering lessons in collaborating groups of three and the university tutor working within and alongside the school has definite benefits in these areas.

Are there any emerging issues with the university school model? One concern is the quantity of solo teaching versus the quality of their teaching. This is the subject

of on-going research. The development of university schools is still in its early stages and we are currently collating more substantial evidence and comparing this to the traditional PGCE route, in order to evaluate the impact of both routes on the development of the teachers in their NQT and RQT years.

References

- Allen, J. (2009) Valuing practice over theory: how beginning teachers re-orient their practice in the transition from the university to the workplace. *Teaching and Teacher Education*, 25, 647–654.
- Barone, T., Berliner, D.C., Casanova, U. & McGowan, T. (1996) A future for teacher education. In Siluka, J. (Ed.) *Handbook of research on teacher education* (2nd edn.) (pp. 1108-1149). New York: Macmillan.
- Brouwer, C.N. (1989) *Integrative Teacher education principles and effects*. Amsterdam: Brouwer.
- Bullough, R.V. & Kauchak, D. (1997) Partnerships between higher education and secondary schools: Some problems. *Journal of Education for Teaching*, 23(3), 215-233.
- Cole A.L. & Knowles, J.G. (1993) Teacher development partnership research: A focus on methods and issues. *American Educational Research Journal*, 30(3), 473-495.
- Cohen, L., Manion, L., Morrison, K. & Bell, R. (2011) *Research methods in education*. 7th edn. London: Routledge
- Elliot, J. (1991) *Action research for educational change*. Buckingham: Open University Press.
- Heikenen, H., Tynjala, P. & Kiviniemi, U. (2011) Interactive Pedagogy in Practicum. In Mattsson, M., Eilertsen, T.V. & Rorrison, D. (Eds.) *A Practicum Turn in Teacher Education*. Rotterdam: Sense Publishers.
- Korthagen, F.A., Kessels, J., Koster, B., Lagerwerf, B. & Wubbels, T. (2011) *Linking Practice and Theory; The Pedagogy of Realistic Teacher Education*. London: Lawrence Erlbaum Associates.
- Nolan, K. (2012) Dispositions in the field: viewing mathematics teacher education through the lens of Bourdieu's social field theory. *Educational Studies in Mathematics*, 80(1–2), 201–216.
- Northfield, J. & Gunstone, R. (1997) Teacher education as a process of developing teacher knowledge. In Loughran, J. & Russell, T. (Eds.) *Purpose, passion and pedagogy in teacher education* (pp. 48-56). London: Falmer Press.
- Shulman, L. (1998) Theory, practice and the education of professionals. *The Elementary School Journal*, 98(5), 511-526.
- Swan, M. Bell, A. Phillips, R. & Shannon, A. (2000) The Purpose of Mathematical Activities and Pupils' Perceptions of Them. *Academic Journal from Research in Education*, 63.
- Wideen, M., Mayer-Smith, J. & Moon, B. (1998) A critical analysis of the research on learning to teach: Prospects and problems. Paper presented at the annual meeting of the *American Education Research Association*, Atlanta.
- Zeichner, K. & Tabachnick, B.R. (1981) Are the effects of university teacher education washed out by school experiences? *Journal of Teacher Education*, 32, 7-11.