A data collection process for an embedded case study focusing on the teacher-teaching assistant partnership in the mathematics classroom

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This paper discusses the progress to date of an NCETM/ESRC case studentship project which focuses on the partnership between teachers and teaching assistants in secondary mathematics classrooms. The research background and rationale for the study are explained and the development of an innovative system of classroom observation to track the movement of the teacher and teaching assistant during mathematics lessons is discussed. Examples from the pilot study are employed to illustrate how this data tracking system is being used to triangulate the teachers' and teaching assistants' interview responses and identify how the teacher and teaching assistant work collaboratively in the classroom environment.

Keywords: mathematics teachers; teaching assistants; classroom observation; embedded case study; triangulation of data.

Introduction

The use of teaching assistants (TAs) in secondary mathematics classrooms has been the focus of a number of studies in recent years with varying conclusions as to whether the impact of additional adults in the classroom is positive or negative. The question of what impact TAs have on pupils' progress has been, and still is, highly debated. Whilst, in the past, it has been generally acknowledged that teaching assistants have a positive effect on pupils' achievement, there is little evidence in the UK on how this is accomplished.

The lack of practical guidance for teachers and teaching assistants on how to work collaboratively has led to different ways of working in different schools. It is this partnership between mathematics teachers and their teaching assistants that forms the basis for this NCETM/ESRC funded case studentship project which aims to identify the characteristics which contribute towards an effective mathematics teacher-teaching assistant partnership.

Previous research in the field has mainly focused on employing quantitative approaches to assess the impact of teaching assistants; this research project employs a multiple embedded case study methodology, using both quantitative and qualitative methods. The case studies focus on three mathematics teacher-teaching assistant partnerships working in different schools, with the intention of developing intervention strategies which encourage an effective working partnership. The embedded case study research methods are used to characterise teachers' and TAs' informal experiences and ways of working together, and to identify the factors which contribute towards an effective teacher-TA partnership. Grounded theory methods provide the means for developing the models of current working practice through the analysis of qualitative data. An intervention strategy will be designed based on these findings and a trial that involves both teachers and TAs will take place.

The research context

The full time equivalent number of teaching assistants employed in secondary schools in the UK as at November 2010 was 45,400 (Department for Education 2011), a number that has been increasing year-on-year since 1997 (Department for Education and Schools 2005), despite recommendations by Handover (The Telegraph 2009) that the number of TAs should be reduced. Establishing what impact these TAs have on pupil achievement and identifying how TAs can be deployed and utilised effectively is of the utmost importance to the future of the TA role. Although there is a significant number of TAs employed in secondary schools in England, limited research has been conducted concerning their deployment, impact and effectiveness.

One of the few studies that considers TAs employed in secondary schools in England was conducted by Smith, Whitby and Sharp (2004). The report provides an insight into how teaching assistants are deployed in schools, what impact they have on teaching and learning, and what attributes, training and qualifications they possess.

A study, which has a similar focus to that conducted by Smith, Whitby and Sharp (2004) is the Deployment and Impact of Support Staff (DISS) (Blatchford et al. 2009) project. Conducted over a 5-year period, the project involved multiple strands of research designed to gather data relating to the deployment and impact of support staff. A significant finding of the study, which received high profile media coverage at the time (BBC 2009 and Guardian 2009), was that the more support pupils received, the less progress they made in mathematics subject knowledge.

Whilst the studies conducted by Blatchford et al. and Smith, Whitby and Sharp focused on the impact of teaching assistants on pupil progress and attainment, and how support staff are deployed in schools, Walsh (2005) and Devecchi and Rouse (2010) focused more specifically on the teacher-TA partnership itself.

The research study conducted by Walsh (2005) relies on questionnaire data obtained from teachers, teaching assistants and Special Educational Needs Co-ordinators (SENCOs) to identify how effective the participants feel their teacher-TA partnership is, and what factors could improve the effectiveness of the partnership. Devecchi and Rouse (ibid) employ an alternative approach utilising an ethnographic study to gather data which highlights the attributes of teachers and TAs and the aspects of the school environment which encourage an effective working relationship.

The development and implementation of an intervention program that encourages the professional development of teachers of mathematics and their TAs, improves the effectiveness of the teacher-TA partnership and proactively aids the cultivation of a deeper understanding of mathematics would address a number of the issues and recommendations highlighted in these previous research studies.

Rationale for the study

The standards framework for teachers (Training and Development Agency for schools (TDA), 2007) places an increasing emphasis on the effective working relationships between teachers and teaching assistants in the classroom.

As mentioned previously, there is little research evidence in the UK on how to create and sustain an effective teacher-TA partnership in secondary school mathematics classrooms. The DISS study (Blatchford et al., 2009) highlights the need for further research into the work of TAs and an increased focus on the training and professional development of both teachers and TAs.

Research conducted by Ma (1999) has found that Chinese teachers' deeper understanding of mathematics is linked to the time and support they are given to work collaboratively on the content of their lessons. The necessary sharing of the content of a lesson between a teacher and a TA in the UK offers an opportunity for developing such deep subject knowledge, similar to that which is achieved in China through collaborative planning, thus mirroring the successes in China but using established patterns of working in the UK.

The importance of having a deep understanding of mathematics and its interrelation with pedagogical knowledge has been recognised by Ball (1989) following a large-scale study of teachers in the US. Our study examines how teachers and TAs work together to determine which characteristics of an effective partnership offer opportunities for developing deep understanding of mathematics. An intervention for mutual professional development will be developed and trialled, based on the findings of our research.

The successful implementation of an intervention strategy which encourages professional development is planned to have an impact on school and government policy which will, in turn, affect the way teachers and teaching assistants work together in secondary mathematics classrooms. Successful implementation of an intervention is intended to develop teachers' and TAs' mutual deeper understanding of mathematics which should impact on pupil attainment in the subject.

Development of the Teacher-TA tracking software

In preparation for the pilot study for the embedded case studies, we developed an observation schedule to record the details of the pupils with whom the teacher and TA were interacting. However, following a discussion with Muijs (2011) regarding the quantitative nature of previous research in the field, we considered alternative methods of recording observation data.

Initially, the concept of tracking the movements of the teacher and TA was based on recording their respective locations at various intervals during the lesson on printed outlines of the classroom layout. Although this method of recording the data was reasonably efficient, we felt the data would be more readily manipulated and evaluated if it was recorded as digital images on a computer.

Whilst it was possible to save individual images to represent the respective movements of the teacher and the TA, the process of editing and saving each diagram was too time-consuming during the classroom observations. In order to record the locations of both teacher and TA during the observations, it was necessary to automate the data recording process as much as possible. The initial version of the tracking software was a simple design which allowed the user to add the location of the teacher and TA, save a copy of the image, then modify the teacher and TA locations and save the next image.

The key components of the software design have remained the same in subsequent versions; however, small changes have been made iteratively to improve the efficiency of the software. These improvements have been made to minimise the time required to record the data, so that a sufficient amount of time is available during the classroom observations for the researcher to record field notes.

Managing and summarising the data

The locations of the teacher and TA are recorded every minute; therefore the data collected from the tracking software comes in the form of 45-55 individual images,

depending on the length of the lesson being observed. These images are collated within a single Microsoft Publisher document, with each page displaying 6 images; arrows are added to the images to illustrate the movements of the teacher and TA (see figures 1, 2 and 3 below). These images can then be used to identify any interaction between the teacher and the TA during the lesson and to triangulate the responses regarding classroom practice obtained during the interview phase of the research.

In order to interpret the data further, the classroom outline is separated into multiple regions; the time the teacher and TA spend in each of these regions is then calculated and a summary image of the classroom outline is produced (see figure 4). This summary can then be used to identify whether the teacher and TA work with the same pupils, the amount of time the teacher and TA spend working with different pupils/groups of pupils and, as with the individual images, can also be used to triangulate the comments made by the teacher and TA during their interviews.

Utilising the tracking software: - examples from the pilot study

To illustrate how the tracking software can be used to triangulate the teacher's and TA's interview responses, we have identified a number of comments from both the teacher and TA which can be supported by the data obtained from the tracking software. During the pilot study interviews, both the teacher and the teaching assistant were asked what would usually happen in a typical mathematics lesson and what they felt their role and responsibilities were within the lesson.

The TA described her practice at the start of the lesson as being "usually spent very quietly, just looking around, monitoring who's listening; if they're [the pupils] not listening, creeping over and giving them a nudge". This description of the TA's usual practice is highlighted in figures 1 and 2, which are the first two images taken from the results of the tracking software for one of the lesson observations.

The responses from both the teacher and TA concurred, in that they felt they had a very good working relationship and an effective partnership working together within lessons. The TA explained how she felt she was a trusted and respected member of staff and how, in the classroom, both the teacher and TA would often briefly discuss the content of the lesson, what progress the pupils were making and what issues the pupils were coming across, if any. One of these interactions between the teaching and TA is displayed in figure 3; during the specific lesson in which this data was obtained, three of these brief discussions took place.

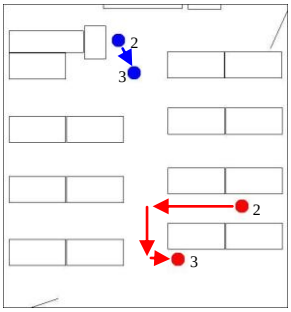

Fig. 1

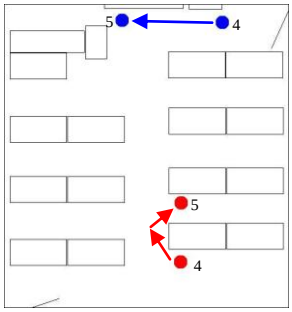

Fig. 2

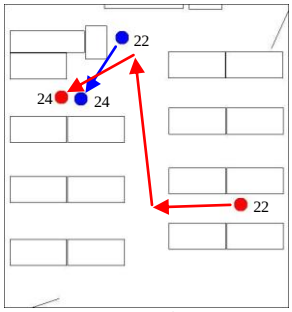

Fig. 3

In the interview responses, both the teacher and TA agreed that the discipline of the pupils was the teacher's responsibility; however, both teacher and TA commented that the TA also plays a significant role in assisting in the management of pupils' behaviour. The teacher commented that "the kids [sic] at the front in this class tend to be the chatty ones, if anything, and I certainly don't expect her [the TA] to

defuse that". The TA commented that she felt she helped to manage the behaviour of the pupils by moving around the class, "I don't tend to sit and work with one person all the time; I flit about because I think that's when the disruption starts". The movement of the TA around the classroom and the teacher's focus on the behaviour of the pupils at the front of the class is highlighted in the summary of the lesson observation displayed in figure 4.

The teacher and TA both commented on the importance of the TA moving around the classroom and working with all the pupils. The teacher stated how the TA "works with all the kids [sic], basically. If there's a kid [sic] that has been away she will tend to sort of sit with them and catch them up". The TA concurred with the teacher, stating that she would usually "go round and explain things again and help them [the pupils] on their way and set them off and hopefully give them some independence and then move on to somebody else". The summary of the lesson observation highlights how the TA usually moves around the classroom and works with a range of pupils. Although it appears that the TA works with one group of pupils for a significant amount of time more than the others, the researcher's field notes, made during the lesson, comment on one of the pupils in that group being absent in the previous lesson. The time spent working with the pupil, who was absent previously, supports the comment made by the teacher about how the TA tends to work with pupils who have been absent to help them catch up with the work.

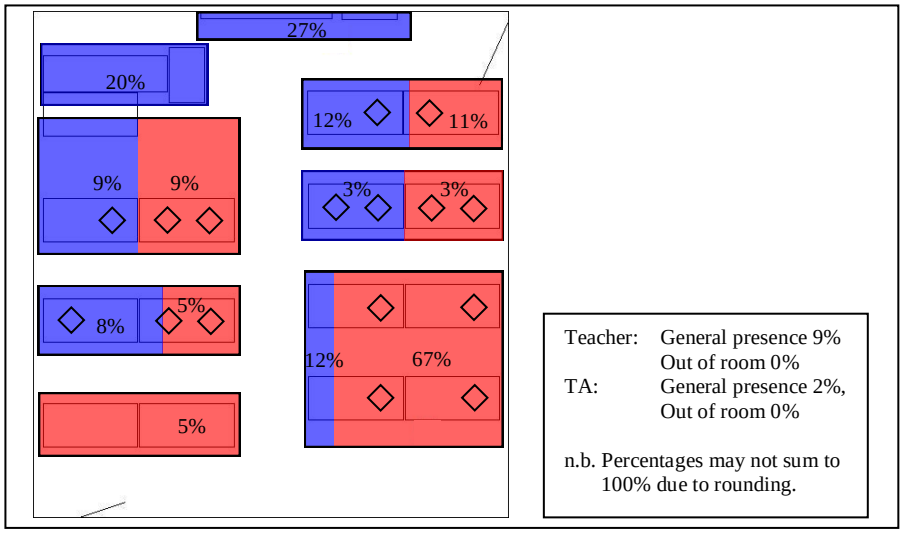

Fig. 4: Summary of results for teacher and TA tracking during 1 lesson

One of the main factors, identified from the interviews, which strengthened the teacher-TA partnership was the level of trust between those involved. The teacher commented "I trust her subject knowledge; I don't have any issues leaving her with a group of kids [sic]… and I know that whatever she says will be accurate". Similarly the TA stated "I think we get on very well, and she trusts me to know what I'm talking about". Although the summary of the teacher and TA movements suggests that both the TA and teacher work with all the pupils in the class, the individual tracking images highlight how the teacher and TA tend to work independently, highlighting the level of trust they have in each other.

Concluding remarks

The iterative process used to develop the tracking software has ensured that the collection of data during lesson observations is both efficient and accurate, and the

use of teacher and TA tracking provides an innovative alternative to using a more statically-structured observation schedule to gather data about classroom practice. The data collected via the software provides an invaluable insight into how the teacher and TA work together in the classroom, whilst also offering an opportunity to triangulate data obtained during interviews with both the teacher and TA.

The tracking software will be utilised during the embedded case studies and the individual images, illustrating the movements of the teacher and TA, will be analysed and summarised in a similar manner to those obtained during the pilot study. At present, the use of a Tablet in conjunction with the software is being considered as this will minimise the intrusion during lesson observations, compared with a laptop computer, whilst improving the efficiency of the tracking process.

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