The Practice of Teacher Aides in Tasmanian Primary Mathematics Classrooms

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This paper describes a pilot study investigating Teacher Aides (TAs) in primary mathematics classrooms. Three teacher/TA teams were investigated. The teachers were asked about the role of TAs in their classrooms, and the TAs were asked about their confidence in mathematics and in the desirability of professional learning. The TAs indicated a need to update their knowledge of mathematics content and terminology. It is also suggested that more research to investigate methods of assisting students with learning difficulties is required.

In Australian Schools Teacher Aides (TAs), also known as Teacher Assistants, are employed to assist teachers in classrooms; this assistance may be in the form of support for students with disabilities, support for students with learning difficulties, or support in preparing materials (Forlin, 2010). These TAs may have completed TA training, may be qualified teachers, or may have not received any training. They may be employed to assist a specific student, a group of students, or as general classroom aides. They may work within the classroom or work with students in a separate environment. It has been demonstrated, however, that even if they are employed to assist one particular student, they influence the whole class environment, as they usually interact with students around them (Blatchford, Russell, Bassett, Brown, & Martin, 2007).

Research has shown that whilst the presence of TAs in a classroom is seen as beneficial by teachers, this presence does not necessarily lead to improved academic outcomes for the students in mathematics (Farrell, Alborz, Howes, & Pearson, 2010). There is also research to suggest that their presence may be detrimental to students' mathematical outcomes (Webster et al., 2010). This paper describes a pilot study of TAs and teachers to investigate the role of TAs in Tasmanian primary schools.

Literature Review

In 2011 there were approximately 6900 teachers and 1900 Teacher Aides (TAs) in Tasmania (Garsend, 2011). Although this means that there are approximately two TAs for every seven teachers, previous research in other countries shows that many teachers have no training in working with TAs during their pre-service courses (Webster, et al., 2010). In addition, in Tasmania it is not essential that a TA should have any training in instruction (Department of Education [DoE], 2008). Despite this lack of training for TAs, it is part of their duties to "Prepare teaching aides and other material to support teaching and learning programs including supporting the implementation of individual student education and behaviour programs" (DoE). As evidence from overseas shows that TAs may be employed to help students with learning difficulties in mathematics, the most vulnerable of students may be receiving the least qualified help (Gerber, Finn, Achilles, & Boyd-Zaharias, 2001).

TAs have been found to have a positive effect on the classroom environment. Teachers assisted by a TA report higher job satisfaction, as the support from the TA lowers the teacher's level of stress and workload by relieving them of their administrative duties. The

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presence of TAs also reduces off-task behaviour and disruption and allows the teachers more time to teach. TAs can also have a positive impact on the personal and social development of pupils, and can encourage parental involvement in their children's learning (Woolfson & Truswell, 2007).

When TAs are prepared and trained, and have support and guidance from the teacher, TAs can also have a positive effect on the academic progress of the students (Webster et al., 2010). Blatchford, Russell, Bassett, Brown, and Martin (2007) show that well trained TAs can improve the learning outcomes in literacy for students when they are running targeted programs. The results in relation to numeracy, however, are less positive (Farrell, Alborz, Howes, & Pearson, 2010). In fact, there is evidence that shows that TAs may have a negative effect on the academic progress of the students they assist. This result persists even when the results are controlled for level of disability and socio-economic status. Even more disturbing is that the negative effect is more pronounced for the students with more serious problems. Students with TAs may have worse academic outcomes when compared to similar students without a TA (Webster et al, 2010).

It has been posited that one of the reasons for these reduced academic outcomes is that TA-supported pupils become separated from their teachers and the curriculum as a result of spending more time with the TAs (Radford, Blatchford, & Webster, 2011). Another reason for these reduced academic outcomes may be the type of interaction that takes place between the student and TA. It has been demonstrated that whereas "teachers spent more time explaining concepts, provided more feedback, linked the current lesson to students' prior knowledge, and attempted to promote students' thinking and cognitive thinking in a task" (p. 328), TAs are reactive – responding to the needs of the student and lesson at the moment. As a result, they may give confusing and inaccurate explanations. In addition, they found that whereas teachers tend to ask questions in a lesson that encourage students to open up and to offer their opinions, TAs tend to close down discussion. This may be because the TAs believe that teachers place a greater value on written work completion rather than discussion. In addition, because TAs may wish to help their students avoid failure, they often supply the answers without any scaffolding questions. This problem is exacerbated by the TAs' lack of mathematical knowledge.

It is clear from the statement of duties from the DoE in Tasmania that TAs should be working under a teacher's supervision. It is of concern that this may not always be the case. This research was partly prompted by the researcher's experience as a mathematics teacher educator. At the institution where the researcher teaches there are many students, from all over Australia, who are TAs working towards a full teaching qualification. It is clear from posts on the discussion boards that at least some of these students are finding the material they use for mathematics interventions themselves, without the assistance of a teacher.

The literature on the use of TAs in Australia is sparse outside of the area of giving assistance to students with physical disabilities. One aim of this study was to examine the practice of TAs giving assistance in mathematics classrooms in primary schools to find out where more research is needed. The other aims of the study were to examine TAs' confidence in mathematics instruction, to examine TAs' use of questioning, and to determine if there is a need for professional development for TAs in mathematics.

Methodology

This investigation was carried out via a case study. Case studies involve the collection of detailed data on an entity to enable understanding of that entity. Case studies are often

carried out via observation and interviews, and allow "an investigation to retain the holistic and meaningful characteristics of real life events" (Burns, 2000, p. 460). They can be useful as pilot studies, as they may "bring to light variables, phenomena, processes and relationships that deserve more intensive investigations" (p.460). It was intended that the close examination of a small number of participants would allow the investigator to collect data that would enable a well-targeted broader study in the future. The investigation was also carried out using a grounded theory approach (Strauss & Corbin, 1998). With this approach, the "researcher begins with an area of study and allows theory to emerge from the data" (Strauss & Corbin, 1998, p. 12).

The participants were three volunteer Teacher/TA teams from three government primary schools. Each teacher took part in a semi-structured interview. Each TA took part in a semi-structured interview, an observation of a lesson, and then a follow up semi-structured interview. All the interviews were carried out on an individual basis. All of these interviews and observations were audio-recorded.

The teachers were asked about the level of TA support they received, the guidance they gave the TAs, the selection of materials and resources, and whether or not they found the presence of TAs beneficial. In addition, they were asked about any training they had received in working with TAs. The TAs were asked about their training and qualifications, the length of time they had been working as a TA, the nature of their work, the level of guidance they received from the teachers, their confidence in working in mathematics, and if they would like training in mathematics instruction.

The transcripts of the interviews and observation were analysed using the process of open coding and grouping (Strauss & Corbin, 1998). As a consequence the results were categorised as follows: *Confidence*, *Resources*, *Questioning of Students*, *Awareness of Student Needs*, *Relationships with Teachers*, and *The Desire for Training*. In addition another category, *Other Issues*, was added to describe themes of interest that did not fit into the other categories.

Results

The levels of experience, the time taken by each TA in mathematics instruction, and their qualifications are summarised in Table 1. All of the TAs and teachers in the study were females.

Confidence

The TAs were asked about their confidence in mathematics instruction. TA1 and TA2 both stated that they were confident in their mathematics instructions, although TA2 stated that she had been less confident when she had been an Aide in Grades 5 and 6 in previous years. TA3, who was new to mathematics instruction, was less confident, stating that she didn't know if she was "doing it right". She had more experience in literacy support and felt more confident in this area. For both literacy and numeracy, however, she stated that she would be "very keen to get some feedback". TA1 was confident in working with the books in the mathematics program used at her school (Go Maths, Origo Education) and was careful to follow the resources provided in this program when required. She felt that her mathematics knowledge had increased by following the books in the program. All of the TAs stated that they did not teach first concepts but helped to reinforce learning of work previously taught.

Table 1
Details of Teachers Aides in the study

	Years of Experience	Qualifications	Time spent on mathematics instruction	Grade	Place of work	Number of students
TA1	16 years	Certificate IV in education	One one-hour session five days per week.	Grade 6	Outside of normal classroom	2
TA2	19 years	Certificate III in business, First Aid	One session per day five days per week.	Preparatory Grade	Within classroom	4-5
TA3	5 years	*	40 minutes to one hour once per week	Grade 1	Outside of normal classroom	8

* Information not collected

Resources

The TAs were asked to identify the resources used and how they accessed them. They identified computer and hands-on learning tools such as dominoes, blocks, unifix blocks, paddle-pop sticks, card games and computer games. TA2 also used workbooks that were part of the *Go Maths* program. All three TAs stated that these resources were chosen by the teacher, although they would occasionally make their own suggestions. For example, TA1 made the suggestion that her students use magazines to cut out pictures and make a shop in the classroom. The level of independence given to the teachers in the use of these resources varied. TA2 was the most highly supervised, and her teacher stated that she modelled all the work for the TA before any resources were used.

Questioning of Students

Each TA worked with a small group of children during a lesson that was observed by one of the investigators. TA2 played a card game with the students that involved the terminology of "tall, short and medium". In this lesson, cards were used which had pictures of pictures with different colours and different sizes. She gently reminded the children to use these words when they had a tendency to use the words "big" and "little" and then asked them to choose which word they would use.

Student: I got two pencils, the small one is green.

TA2: Small or short?

Student: Short.

TA2: Good!

TA1 conducted one-on-one lessons with two boys that involved fractions and graphing. It was noticeable that this TAs used prompting questions to assist the students to come to the answer.

Student 1 (reading from text book): If it takes ten hours to sail around an island, how long does it take to do it twice?

Pause

TA1: What's twice – how many times do you do something if you do it twice?

Student 1: Two times

TA1: So what's the answer?

Student 1: 20 hours!

TA1: Good, how did you know?

Student 1: 2 times 10 is 20.

Student 2 (working on multiplication tables): 8 times 6 – I can't work it out.

TA1: What is 8 times 3?

Student 2: I can't work it out.

TA1: What is two times 8?

Student 2: 2 times 8 is sixteen.

TA1: Can you add 8?

Student 2: 24.

TA1: Good! What is double 24?

Student 2: 48.

TA1: Good, so 8 times 6 is 48.

Awareness of Student Needs

All the TAs were keenly aware that they were dealing with students who had varying levels of learning ability and to be aware of the students' needs. For example, TA2 stated she kept constant watch for tiredness and made sure that she had a variety of activities planned. One of her students very much disliked changes in routine so she generally kept the structure of each day alike. She felt that it was very important to know the students well as individuals. In addition, she had become aware to allow the students "thinking time" after questions were asked. TA1 was aware that some of the children took longer to understand a concept but she needed to balance that with "slogging over the same thing" each day. TA3 was strongly aware that one of her students was "lower than the rest" and had trouble grasping the concepts.

Relationships with Teachers

All three TAs stated that they were very happy with the relationships they had with the teachers they worked with. All felt they could ask for help, clarification and advice when needed, that they could make suggestions, could talk about lessons they felt did not work well, and had regular meetings with their teachers. These meetings were usually held at the end of the lesson or at the end of the day. The teacher of TA2 stated that she encouraged the TA to "use her initiative" but always wanted to know what had happened. Occasionally she felt the TA had missed the point of the lesson. All TAs felt that they were treated as equals by the teachers and all the teachers spoke very appreciatively of their current TAs. However one teacher indicated that while she had a good working relationship with her present TA she had had problems in the past with TAs who overstepped their role. She was concerned that "some TAs do not realise they are not the teacher, and it is not their job to interfere with a child's behaviour and work".

Desire for Training

All three TAs were keen to have further training in mathematics support. It was interesting to note that TA1 used computers extensively in her instruction, but TA2 felt that she needed training in Interactive White Boards, computers and Ipads. She noticed that the students were confidently using IWBs and felt inadequate because she could not. All TAs stated that mathematics methods had changed since they were at school. TA2 spoke about her time as an Aide in Grade 5 and her problem with subtraction:

> TA2: [My problem was that] subtraction had changed, completely altered. We would take ten from down the bottom, and now it's the other way around. When we first did it I said to the children: That's not right! And they looked at me like I was quite alien.

All were keen to have more training in the language of mathematics because they did not feel confident that they were using the terminology correctly. TA3 stated this forcefully:

> TA3: Any training, any feedback, even if it's little. Any guide as to what I am doing, someone who speaks the same language as the teachers do. I want to give the same message to the children that they get from [their] teachers.

Interestingly, the teacher of TA3 stated that the TAs in the school had all worked in the school "enough to understand the models and language."

Other Issues

The teachers of TA2 and TA3 expressed their concern, quite strongly, that recent cuts in education funding had resulted in the employment of fewer TAs in Tasmania. The teacher of TA3 expressed her concern that the TA did not have time to sit in on mathematics lessons where she was not involved, so she could observe lessons with the whole class. She also stated that there was a high demand for her assistance so that the TAs in her school were "spread very thin." TA2 also spoke of the variety of work she was required to do that might include changing a nappy to helping with instruction.

Discussion

An area of particular interest with this study was the use of questioning and prompts used by the TAs. Radford, Blatchford and Webster (2011) suggest that the questioning methods used, and the tendency for TAs to "do" their work for the students, was actually detrimental to the students' learning. For these three TAs, however, this was not observed. All three avoided giving answers directly to their students and were careful to give prompting questions only. However, it was not clear during the observation that when TA2 asked the student to "double 24" he was aware of how this strategy worked.

The TAs were concerned about their lack of current mathematical knowledge. They were usually, although not always, confident that they knew the content that they were required to teach, but not confident that they were using current terminology and methods. TA1, who had access to the materials used by the whole school, was much more confident in this area as she had learnt from the *Go Maths* books that were being used by the school as a whole. It is apparent that while the teacher of TA2 always modelled the work the students were doing in front of the TA the other teachers expected their TAs to carry out work they were given without such modelling. This research suggests that teachers may need to take more care to give more explicit instruction. This, however, will take more

time and it is apparent that, like teachers, TAs may already be working under a tight schedule.

This research has brought up some issues that need consideration by teachers. Farrell et al. (2010) found that teachers believed they benefited from having TAs in their classes, and the three teachers in this study all spoke enthusiastically about the help they received. It was evident, however, that there was a gap between the teachers' confidence in their TAs and the TAs confidence in their own knowledge. Whereas one of the TAs always worked within the classroom, two of the TAs were working outside of the main classroom for extended periods. For these TAs the teachers could not be sure that the TAs were using the appropriate mathematical language or were always accurate in their explanations, and these TAs were acutely aware of this and concerned that they might be making errors.

All of the TAs were aware of their limitations and were keen to have professional development in the area of mathematics instruction. Hurst and Sparrow (2012) demonstrated that TAs whose content knowledge increased after professional development then experienced increased confidence in their teaching. All of the students observed in this research had learning difficulties of some kind, some severe. It is of concern that some of the most vulnerable students are given mathematics instruction by people with little to no training in the area.

It could be argued that these students with learning difficulties should be instructed by teachers with specialised knowledge of teaching such students. This needs to be balanced, however, by the importance of involvement of TAs who are from the same community as the school students. For example, in Hurst and Sparrow's study it was important that there was involvement by the local Aboriginal and Islander Education Officers in the schools. In cases such as these the involvement of community members may well outweigh the benefits of specialist teachers, and the running of professional development to increase the skills and knowledge of community members could be the option.

Conclusion

It was apparent from the interviews with the TAs that they were all keen to give their students the best learning experiences possible. They were very aware that most of the students they were instructing had difficulties in some way. They were also aware that they might be doing something different to the teachers and were concerned that they might be doing something detrimental to their students' learning. In particular, they were concerned about their use of mathematical language.

From this small study it appears that TAs involved in mathematics instruction are keen to have professional development in this area. More research into the content and type of this professional development is required. In addition, more research into the best ways of giving instruction to students with mathematical difficulties is also needed. Should we continue as now, where TAs give instruction with varying levels of supervision, should we put resources into the professional development of TAs, or should all such instruction be given by specialist teachers?

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