Puppets and engagement in science

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Abstract
The PUPPETS Project uses puppets as a stimulus for children to engage in conversations involving reasoning in primary science lessons. This case study examines the impact of puppets on children's engagement in a science lesson. Data were gathered from teachers who observed a series of demonstration lessons. The use of a puppet led to high levels of engagement from children, and some factors that enabled the puppet to achieve this were identified. The use of demonstration lessons is put forward as a possible model for teacher professional development.

Synopsis

Background, aims and framework

The PUPPETS Project is a research and development project that aims to help teachers provide more opportunities for productive talk in science lessons, using puppets as a stimulus. The research examines the effectiveness of hand-held puppets for engaging primary school children's attention, challenging their ideas and promoting learning conversations in science.

The value of talk in children's learning is well-documented. Vygotsky's (1978) work on language and social interaction has been built on by Mercer and his colleagues in their research into classroom interactions (e.g. Mercer, Wegerif & Dawes, 1999). These and others have found that talking about their ideas helps children to clarify their thinking and develop their capacity to reason (Kuhn, Shaw & Felton, 1997; Venville, 2002). The amount and nature of children's talk in science lessons depends on decisions made by the teacher. The opportunities provided for talk, the stimulus to generate talk and the learning environment to support talk are all determined by teachers. However, research such as Newton, Driver and Osborne (1999) indicates that in many science classrooms teachers do not create circumstances that maximise children's talk.

In our initial research we set out to investigate whether the use of puppets can provide a stimulus that will generate the kind of talk that helps thinking and reasoning in science. We aimed to help teachers enhance their practice, by increasing the opportunities for children's talk that promotes thinking and reasoning, and becoming more dialogic in their teaching (Alexander 2006). The research questions which we addressed were:

1. In what ways can puppets be used to enhance children's engagement and promote learning conversations in science?
2. Is it possible to change teachers' beliefs about the value of children's talk and their management of talk in science lessons by using puppets for teaching science?

These research questions have been reported on elsewhere (e.g. Naylor et al, 2005; Simon et al, 2008). The outcomes for both research questions were extremely positive. Our intention was to implement the research through a programme of teacher professional development, so that the

research would have an impact on professional practice. We therefore had to consider how to influence teachers who were not involved in the research.

In our more recent research, reported on here, we analyse further the role of the puppet in engaging children in science lessons, using a case study approach based on demonstration lessons. The specific research questions addressed were:

1. Can we gain further information about how puppets influence the nature of a science lesson and positively engage children?
2. To what extent would a demonstration lesson provide a suitable means of enabling teachers to recognise the potential value of using puppets in science lessons?

Methods and samples

The initial research included a pilot study, to explore the suitability of the puppets for a variety of ages and to develop an analytical framework for discourse. An analytical framework was developed using an open-coding approach (Strauss and Corbin, 1998), and refined during the research. In the main study teachers were video-taped teaching science lessons with and without puppets, so that the impact of the puppets could be determined.

Since the main study we have continued to collect data on the impact of the puppets. Data collection methods have included lesson observation, interviews with teachers and written feedback from teachers. The case study reported on here involved a series of five demonstration lessons using a puppet, taught to children aged 6 – 9 years. The demonstration lessons were part of a teacher professional development programme, which included puppets and more general issues about science teaching.

There was no prior relationship between the children and the teacher taking the demonstration lessons. The lessons began with an expert teacher introducing the puppet to the children, then explaining that the puppet had a problem. The puppet went on to describe its problem, then ask the children for help. The children discussed how they could help to solve the problem, then explained to the puppet how they thought the problem might be solved. A limited amount of equipment was provided so that the children could carry out simple practical investigations to solve the problem.

For example, in one demonstration lesson the puppet's problem was explained through a short story about visiting a chip shop. The owner had the idea of wrapping his customers' chips in fancy wrapping paper, so it looked like he was giving them a present! However some of the wrapping paper wasn't very suitable. When Ricky, the puppet, had visited the shop, his chips had fallen out when the paper got wet in the rain. His grandma found that the colour from the wrapping paper ran onto her chips. Ricky asked the children for help in solving the problem of which wrapping paper would be suitable. This led into a short practical activity to test different types of wrapping paper. A short plenary discussion concluded with the children explaining to Ricky which kind of paper would be best and what Ricky should say to the owner of the shop.

Each of the five lessons was observed by approximately 30 - 40 primary school teachers (total number = 178). The teachers had the opportunity to move around during the lesson and observe different groups of children. They offered low level practical support when children needed assistance (e.g. children needing help in using scissors), but they did not offer guidance to the children or intervene in more substantial ways. At the end of each lesson, the teachers discussed in groups what they had observed and attempted to identify significant factors that appeared to influence the lesson, especially those which they judged were important in enabling the puppet to capture the children's attention and engage them effectively in the lesson. A plenary discussion enabled teachers to explain their views and justify why they thought certain factors were important, based on the evidence of the lesson. In this way a consensus view could emerge about which factors were generally viewed as significant. The teachers also provided written feedback.

The teachers did not know the children that they were observing, so they were not able to make comparative judgements about the class that they observed. What they were able to do was draw on their professional expertise and anticipate how other classes might have responded in similar circumstances.

Results and analysis

All of the teachers commented favourably on the impact of the puppet; no teachers indicated that the puppet's impact had been anything other than very positive. There was widespread agreement that the children were

highly engaged by their conversation with the puppet, motivated to solve the problem presented by the puppet, and keen to let the puppet know what they had found out. Teachers were keen to go back to school and work with their own children, using a similar approach to teaching and learning science. Comments from teachers included:

> *This was a very motivating session.*
>
> *Throughout the whole presentation the children were transfixed; their eyes never left the puppet's face whilst it was speaking.*
>
> *The children spoke directly to Ricky (the puppet) and . . . the puppet echoed their thinking . . . and spoke encouragingly to the children.*
>
> *The children were focussed on the task in hand and worked quickly . . .*
>
> *The children were highly focused on the follow up practical activity. They stayed on task and worked with a clear sense of purpose to solve the problem.*
>
> *When the boys did start their investigation they worked systematically and quickly. They had taken a long time to get going, but now they seemed to know what they were doing . . . They showed me that we often do intervene too early and do not give children enough time to work through a problem themselves.*

These comments are consistent with data from the main study, which showed that puppets can have a positive impact on children's engagement and motivation.

Through discussion and feedback teachers identified a number of factors which they saw as relevant to the high levels of engagement shown. These included the following.

- The puppet character, and the story it told, made the problem an authentic problem that children were keen to solve in order to help the puppet. This led to high levels of motivation amongst the children.
- The everyday situation described by the puppet made links with the children's personal experience.
- The puppet presented plausible alternative ideas through narrative and dialogue. This generated cognitive conflict in the children, and led to very focused discussions in an attempt to resolve that conflict.
- The puppet suspended judgement about the children's ideas, which encouraged them to explain, to justify their ideas, and to find out more in order to convince the puppet.
- The puppet was viewed as a peer by the children, without the status and authority of the teacher, and this enabled the teacher to present ideas through the puppet that children would not readily accept from the teacher.
- The puppet's role was to be uncertain and unsure about what to do. Because the puppet did not understand, the children felt that they had to help him.
- The format of the lesson meant that the teachers observing were not able to take on the roles that they typically took on during science lessons. Teacher intervention while the children attempted to find solutions was minimised. One teacher described her feelings as 'I found myself itching to get involved! I . . . had to physically move myself away from the boys as I knew I would want to intervene, or be bossy!' This minimal teacher intervention gave the children space to think about how they might solve the problem. Having the opportunity to devise their own solutions to the problem appeared to help keep them focused and motivated.
- One teacher noted that the problem could easily have been introduced by the expert teacher, but that 'he was unlikely to have the same level of motivation from the children. Through the puppet the teacher was able to put forward an idea that was wrong. If the teacher had done this, the children would soon realise that they had been led on. However the main advantage was the children really thought they were helping the puppet and their efforts were directed into finding a solution to his problem.'
- The puppet took on the role of the least knowledgeable member of the class, which helped the children who normally lacked the confidence to share their ideas. They were more likely to feel comfortable speaking with a puppet who knows less than they do. In this respect the impact on low attaining children is likely to be particularly noticeable.
- The children empathise with the puppet. They understand the problem it has and feel sorry for the puppet that has the problem. They work harder than usual to explain their ideas to the puppet (who doesn't

understand), rather than for the teacher (who 'knows all the answers and will know what they mean even if they don't explain well').

Conclusions and implications

The case study confirmed the positive impact of using puppets in science lessons, even in the rather unusual circumstances of children being observed by a large group of teachers. A number of factors, especially those relating to the role of the puppet and the teacher, were identified as significant in maximising the puppet's impact. In the case study the children appeared to empathise with the puppet, to feel a degree of responsibility for it and to want to share their knowledge and expertise with it. This appeared to create the circumstances where they remained focused on the task, there was an obvious purpose for their scientific activities, and they took a large part of the responsibility for their own learning. The puppet presented a problem in a way that created uncertainty, and resolving this uncertainty became the focus of the lesson. Teacher intervention was minimal, so the main responsibility for solving the problem was the children's.

The structure of the demonstration lesson represents a very different type of pedagogy from many science lessons, in which the problem is posed by the teacher, the method of solving the problem is directed by the teacher, the teacher determines the significance of the data collected and guides the class towards a conclusion. The factors described above help to describe some of the possible mechanisms by which puppets can have a positive impact in science lessons. They also present a significant professional challenge for teachers of science, who may well find that their usual beliefs about how a good science lesson is structured are called into question by the demonstration lesson.

The demonstration lessons were very positively received by the teachers observing. The teacher demonstrating does need a high level of expertise and confidence to work in front of a large audience of teachers, especially in circumstances where there is no prior relationship with the class of children involved in the lesson. However in many respects this arrangement closely models an authentic classroom experience, with the teachers able to select which children to observe and target their attention on specific aspects of the lesson. The real time nature of the lesson, coupled with the outcomes being unknown in advance, gives the demonstration lesson a sense of reality which video evidence rarely achieves. Teachers are provided with a common basis of evidence for discussion and reflection, and the children themselves can be invited to comment on how they perceived the lesson.

We therefore suggest that demonstration lessons may be a viable model for teacher professional development, providing one possible mechanism by which the positive results of the main study might be used to influence professional practice. No evidence is yet available on whether the teachers involved have changed their professional practice as a result of the experience. Further feedback will be obtained about whether the positive comments made at the time are translated into professional action.

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