The PUPPETS Project: puppets and change in teacher practice

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Background, aims and framework

The PUPPETS Project is a research and development initiative funded by the Nuffield Foundation, UK, which aimed to help teachers provide more opportunities for productive talk in science lessons, using puppets as a stimulus. The research focused on the effectiveness of hand-held puppets to engage primary school children's attention and promote conversations involving reasoning 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 other researchers 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. Reasons for this may include the uncertainty teachers have about the value of children's conversations, limited knowledge of appropriate teaching strategies, and insecure subject knowledge (Osborne and Simon, 1996; Solomon, 1998).

In our 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. A major aim of the project was to provide a resource for teachers that would help them to enhance their practice by increasing the opportunities for children's talk that promotes thinking and reasoning and to become more dialogic in their teaching (Alexander 2005).

Two research questions were reported on at the ESERA 2005 Conference, namely: *In what ways can puppets be used to enhance children's engagement and promote talk in science lessons*? and *What is the impact on children's talk involving reasoning when puppets are used in science*? (Naylor, Keogh, Downing, Maloney and Simon, 2005). In the research reported on here we analyse further the teachers' involvement in this reasoning talk and changes to their professional practice. The question guiding our research was *What is the impact of using puppets on teachers' beliefs and practice in relation to talk*?

Methodology

The project began with a pilot phase, involving eight teachers working across the primary age range. These teachers attended workshops to become familiar with the use of puppets, after which each teacher was audio and video-recorded during a science lesson where puppets were used. The pilot study identified issues relating to the use of puppets, including their suitability for a variety of ages and contexts. It also enabled an analytical framework for teacher/child discourse to be developed for the main study. A further 16 teachers, teaching across age ranges 7-11, were involved in the main study, drawn from primary schools in London and Manchester covering a range of social, cultural and ethnic backgrounds.

The 16 teachers were observed and video-recorded teaching a typical science lesson. They were interviewed to obtain their views on the nature and value of children's talk and details

about how they taught science. These initial observations and interviews provided a baseline against which future lessons could be compared.

The teachers attended a preparation meeting to provide guidance on how puppets might be used effectively, including issues such as role and characterisation of the puppets. Video clips and transcripts from the pilot phase were used to illustrate aspects of the teacher's role and how puppets might interact with the children. After a period of several weeks, in which teachers could become more confident in using the puppets, a second lesson in which puppets were used in science teaching was video-taped and the teacher was interviewed about the impact of the puppets in their lessons. For each teacher, both of the lessons observed were based on their normal science curriculum; the puppets lessons were not 'special' in any other respect.

Interviews with groups of children were video-recorded to provide data from the children's perspective, and some audio-recording of small group conversation was undertaken. The range of data sources and collection methods allowed extensive triangulation and cross-referencing of the data. A follow-up meeting with the teachers provided feedback on the longer-term impact of using puppets, including whether and how they continued to use puppets in their science lessons.

The analytical framework was developed using an open-coding approach (Strauss and Corbin, 1998), in which transcripts of conversations involving teachers, puppets and children were provisionally coded. The coding system was discussed between researchers and refined during the study. An extensive range of codes was developed to pick out episodes of discourse which seemed significant in the lessons. Codes focused on either the teacher, the puppet or the children. Those which focused on the teacher included codes for asking questions that require reasoning; asking non-reasoning questions; use of argumentation to challenge or justify ideas; providing information; encouraging children through praise or positive comments; and use of narrative and characterisation to contextualise scientific ideas.

Examples of the codes used included:
TQ: teacher asks a question which requires a reasoned answer
TP: teacher gives procedural information or instruction
PS: puppet creates a story, which provides a contextualising narrative for scientific ideas
PE: puppet encourages by offering praise or positive endorsement

Video-recordings of each lesson taught (with and without the use of puppets) were analysed and categorised using these codes on an observation schedule with 30-second time intervals. This analysis enabled us to make comparisons between the time spent in various types of discourse. In addition to these codes, data were also recorded in relation to grouping of children (such as whole class, small group or individual), children's activity and interactions (such as listening, discussing, practical work, off task), the role of the teacher (such as asking questions, instructing) and the role of the puppet (similar to teacher). This enabled us to make more general judgements about the nature of the lesson, the roles of the various participants and the nature of children's interactions. A reliability check was performed by different researchers independently coding the same piece of video, and then comparing codings.

The analytical framework enabled us to make comparisons between the typical science lessons without puppets and those where puppets were used. In this way any changes in aspects of the teachers' practice could be identified.

Data

The total number of instances of each of the different types of teacher discourse are shown in the table. In the lessons with puppets the numbers indicate the totals for the teacher and the puppet together.

Type of teacher discourse	Lessons without puppets	Lessons with puppets
Non-reasoning questions	388	273
Reasoning questions	73	263
Providing information	329	235
Use of argumentation	111	199
Encouragement	132	200
Use of narrative	4	66

The interview data shows that all of the teachers felt positive about using puppets in their science teaching, saying that they enjoyed using them and were pleased with the children' responses. All of them intend to continue to use puppets in science lessons. All the teachers appear to have settled on an arrangement in which puppets are used near the start of a lesson to present problems to children. This is when the puppets appear to have most impact and when the purpose of using them is most evident. The teachers also used puppets at the end of their lessons to explore with the children what new learning has taken place.

Although teachers were not explicitly asked to change their practice in any other way, changes in practice did indeed occur. Of the 11 teachers for whom interview transcripts are available, 9 of them claimed to have changed aspects of their practice. Five teachers noted that their lesson plans included a greater emphasis on discussion and more opportunities for the children to talk. One teacher described how he normally took on a didactic role in teaching science, but when using puppets he thought more about getting the children to talk with each other rather than just to him. Another teacher said she had planned more talking tasks and that without the puppets:

> *I didn't give them opportunities to talk even if they would. I didn't know whether they would (talk) because I didn't give them many opportunities to talk so that's definitely increased the amount of time for talking.*

She also said her lessons had become more relevant to the children as she had linked the science they were doing to their experience.

One teacher from the pilot phase claims to be a more interesting teacher in other subjects as a result of using puppets in his science teaching. He claimed that using puppets had helped him to see the value of children's engagement and raised his awareness of how to interact with children to maximise their engagement. Another teacher described how the puppets:

… have opened me up and changed my practice to ways of thinking and ways of getting the children involved in open questions. . . it's altered the way I deliver the curriculum.

Conclusions and implications

The data show a decrease in the number of non-reasoning questions and an increase in the use of reasoning questions when puppets were used. This is consistent with the way that puppets present a problem to the class. When teachers used puppets they were more likely to ask open, thought-provoking questions which created opportunities for children's talk. This contrasts with their typical science lessons, which were more dominated by recall questions.

There was a decrease in the amount of information provided by the teachers and an increase in the use of argumentation in science lessons when puppets were used. This created more opportunities for children's thinking and reasoning talk in the puppets lessons compared to the typical lessons without puppets. Again this indicates a shift in teaching style towards more thought-provoking lessons.

The other differences in the teaching style used were an increase in the use of contextualising narrative, which helped to provided a rationale for the activity, and greater use of encouragement to children to talk and share their ideas. Both of these changes indicate that teachers are providing a more positive learning environment in which talk is valued.

It appears that the use of puppets has enabled the teachers to become more dialogic in their science teaching, and that introducing puppets into the classroom has influenced some fundamental aspects of their pedagogy. Chi-squared tests show that each of the changes indicated above is significant.

The literature on teacher change is consistent in suggesting that change in teacher practice can be difficult to achieve in a short period of time (e.g. Adey, Hewitt, Hewitt and Landau, 2004; Fullan, 2001). However we found that using the puppets had a greater effect on teacher practice over a short period of time than we would have anticipated. Most of the teachers involved in the project changed their practice in significant ways as a consequence of using puppets. The follow up meetings and ongoing contact with some of the teachers suggest that these changes have been long-lasting and that they have continued to use puppets to generate talk in their science lessons. These changes occurred after only a short preparation session and with the teachers working entirely within their usual science curriculum. There were no changes in lesson timing, lesson objectives, practical activity or scheme of work. In this respect the introduction of puppets appears to compare favourably with some other innovations in science education, where more far-reaching changes are viewed as necessary for the innovation to be successful.

The project appears to have the potential to have a positive impact on primary science teaching. The research is now entering a phase in which the impact on secondary science teaching and learning in the 11-16 age group will be identified. Funding has been secured from GlaxoSmithKline plc and Millgate House Publishing to support a programme of professional development for teachers, along with provision of resources, including puppets and scenarios in which the puppets can operate.

A number of factors have emerged from the research which appear to be relevant in ensuring that this programme of professional development is effective. These factors include:

- The project is entirely located within the existing primary school science curriculum. Teachers do not have to put on special puppets lessons which fall outside the usual science curriculum. They do not have to invest any additional curriculum time in using puppets, but can incorporate puppets within their current Schemes of Work.
- The training programme and level of commitment that teachers are required to make to the project are modest. Teachers do not need to invest extensive amounts of time, energy or resources in introducing the project to their school.
- Teachers do not need to make major shifts in their professional practice before they try the approach in their teaching. Although involvement in the project may well lead to changes in professional values, beliefs and practice, this is not a pre-requisite for using puppets successfully. This is consistent with what we have found in other projects, where teachers may be willing to take on an innovation which does not appear to require any fundamental change in professional values and practice, only to find that fundamental changes then take place as a consequence of taking on the innovation.

These factors lead us to believe that teachers are likely to welcome the professional development programme, and that professional development decision-makers will be keen to gain access to the project for their teachers.

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