Children's perceptions of, and attitudes towards, their mathematics lessons

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Among the reasons attributed to the crisis in mathematics education, disaffection with pupils remains high. While there are studies that investigate this pupil disaffection at secondary school, there are few that consult younger children in order to ascertain their views of mathematics. The research study examines this issue by using drawings as the primary source of data collection, followed by interviews. It offers a view of how some children perceive their mathematics lessons and what this could mean for the future of the subject.

Introduction

Standards of mathematics have been much discussed and criticised over the past three decades (e.g. Buxton 1981, Cockcroft 1982). Adults frequently claim dislike or incompetence towards the subject, while many pupils choose not to pursue mathematics post-compulsory education. Recent reports (e.g. Smith 2004, Brown et al 2008) evidence a shortage of people qualified in mathematics in the U.K. The primary school curriculum has undergone several changes in an attempt to raise standards in mathematics. One of the most recent changes was the implementation of the National Numeracy Strategy (NNS) (DfEE 1999) across primary schools in England. However, in a climate where mathematics has continued to have a lack of support from both adults and pupils this study aims to explore the perceptions that primary pupils have about their mathematics lessons in order to understand how these lessons may be framed to enhance both academic and socials gains and attitudes.

Among the reasons attributed to the crisis in mathematics education, disaffection with pupils remains high. While there are studies that investigate this pupil disaffection at secondary school, there are few that consult younger children in order to ascertain their views of mathematics. One of the potential reasons for the lack of studies involving young children may be the difficulties in consulting them.

This study addresses this issue by using drawings as the primary source of data collection, followed by interviews. I acknowledge that using children's drawings to consider their perceptions of mathematics lessons is an unusual way to approach a difficult area on which to gather firm evidence. However, while the research is therefore speculative I also propose that this methodological tool is a catalyst to provide a forum for teacher discussion and reflection.

Literature review

The practice of consulting pupils is not new. In 1989 an international framework was introduced to change the way children and young people were viewed and treated by societies. The United Nations Convention on the Rights of the Child (1989) stated that the rights of children are that of autonomous individuals and that it was imperative that they should have a voice in matters concerning their lives. This included giving their views on education. However, Davies and Kirkpatrick observed that

> England and Wales seem to be out of line with the rest of Europe in the way that young people have no legislated and government-supported ways to participate in

> decisions about their education. There are no ways in which they can be consulted regularly about Educational policy.
>
> (Davies and Kirkpatrick 2004, 20)

In 2001 the DfES published a White Paper called '*Schools: Achieving Success'*. This paper stated that 'we will encourage students' active participation in the decisions which affect them about their learning and more widely' (DfES 2001, 28). Flutter and Rudduck (2004) carried our much research into the consultation of pupils with the aim of improving teaching and learning in schools. Another study by Arnot et al. (2004) looked at pupils' own perspectives on classroom learning and teaching. They recognised that the provisions for pupil consultation had risen over the years through such means as school councils and that there seems little doubt that 'from an early age, young people are capable of insightful and constructive analysis of their experiences of learning in school' (2004, 4). The findings from these studies (and many more) are encouraging in showing that the consultation of pupils about their learning is now being more actively sought, but there remains a lack of research material in primary mathematics education.

Just as the practice of pursuing pupils' perceptions is not new, neither is the use of a collection of drawings as a way of gathering data. Psychologists and art therapists have used drawings for years as a way of gathering information about emotional and psychological aspects of children. For example, Cox (2005) chose to observe children while they constructed their drawings while Matthews (2003) looked at why children's visual representations and expressions are important in showing adults their expressions and emotions about certain issues. Other examples include studies that have explored children's experiences of school (e.g. Prout and Phillips 1974 and Klepsch and Logie 1982) and children's perceptions of mathematicians (e.g. Rock and Shaw 2000 and Picker and Berry 2000).

Malchiodi (1998) claimed that using drawings provides a multi-dimensional view of children. I believe that it can also provide a catalyst for teachers to engage in reflection on their own teaching practices. Drawings could provide an alternative way (to current methods such as lesson observation and attainment results) to encourage teachers to adopt a more reflective approach to their practice.

Methodology and context

Four schools covering the primary age range were selected to participate in the collection of data. All of the schools were based in Norfolk. One teacher per school was identified based on their teaching experience, their interest in the use of drawings and their access to more than one year group. Using the script below the teachers asked the children to draw a picture of their mathematics lessons.

> *I would like you to draw a picture of your mathematics lessons. Your picture should show what you think mathematics is like in your classroom. I will give you a plain piece of paper on which to do your drawing but you can choose whether to use your normal pencil or coloured pencils. The drawings are going to be looked at by someone else who is interested to see how you view mathematics lessons. Try to think about the mathematics lessons you have and what your drawing could include. From looking at your drawing someone should be able to see what your mathematics lessons are like and how you view them.*

Figure 1. Copy of the script the teachers read aloud to the children

In total 162 drawings were collected. In line with other studies that had used drawings (e.g. Macphail and Kinchin 2004) I decided to reduce the number of pictures to a more manageable number to use in a more detailed way. I pursued a content/item analysis (Di Leo 1983, Gamradt and Staples 1994, Finson et al 1995) approach as the procedure for interpreting the drawings. This was used to create categories which defined and objectified content. In this way I looked for either a representational or symbolic style, or both, evident in each drawing.

15 categories were identified. Whilst many drawings contained features pertinent to more than one category each drawing was coded using the most significant and overwhelming features initially. The table below shows the number of drawings in each category.

Category	**Label**	**Number of drawings from KS1**	**Number of drawings from KS2**	**Total number of drawings**
Positive showing affection	A	2	8	10
Negative showing disaffection	B	0	17	17
Pair of pupils	C	7	3	10
Pupil with multilink tower	D	6	0	6
Counting	E	15	0	15
Several pupils but no teacher	F	0	7	7
Whole class	G	0	6	6
No indication of lesson type	H	2	7	9
One teacher and one pupil	I	1	4	5
Thinking skills	J	2	16	18
Defensive, worried, anxious	K	0	8	8
Pupils in a group with the teacher	L	1	4	5
Child with back to drawing	M	1	4	5
No teachers and no pupils	N	0	14	14
One child with examples of mathematics and or resources	O	18	9	27
Total Number of drawings		*55*	*107*	*162*

Figure 2. 15 categories that represent the collection of 162 drawings

In order to establish reliability towards the categorisation of the drawings I approached two independent reviewers. As Finson et al. (1995) point out, this helps to reduce the chance of a particular thematic content area being duplicated or missed out. Both individuals were given the collection of the 162 drawings, the 15 category titles and definitions and were asked to sort the drawings into the categories I had previously defined. Overall, despite a few minor discrepancies, both reviewers placed the drawings into the same categories as I had done previously.

Once the drawings had been sorted into the categories I chose one drawing to represent each category. These 15 drawings, I believe, are the exemplars of each

category. A few weeks later after the completion of the drawings I interviewed 11 (from a possible 15) of the pupils. The interviews were carried out in two groups according to key stage. There were 5 children in one group (key stage 1) and 6 children in the other (key stage 2). The interviews were to provide further validation towards the interpretation of the drawings.

Findings and discussion

Within the two aims of the research – to explore the perceptions that pupils have with regard to their mathematics lessons and to consider how the use of drawings can support this inquiry – four themes were explored. These themes were:

1. Evidence of the children's emotions and attitudes in mathematics lessons.
2. Evidence of the children's perceptions of their peers in mathematics lessons.
3. Evidence of the children's perceptions of their teacher in mathematics lessons.
4. Evidence of mathematics in the drawings.

Whilst the first and last themes are indicative of the two main aims of this research the other two consider areas that the NNS (DfEE 1999) considered important within this phase of primary mathematics education. The first was that children should be encouraged to work more collaboratively while the second suggested that teachers should play a more dominant role in making lessons more interactive with themselves as a role model. The drawings offer potential perceptions of some of the children towards these two issues.

The following section offers two drawings under each of the four themes in an attempt to provide a flavour of the drawings and the perceptions of the children.

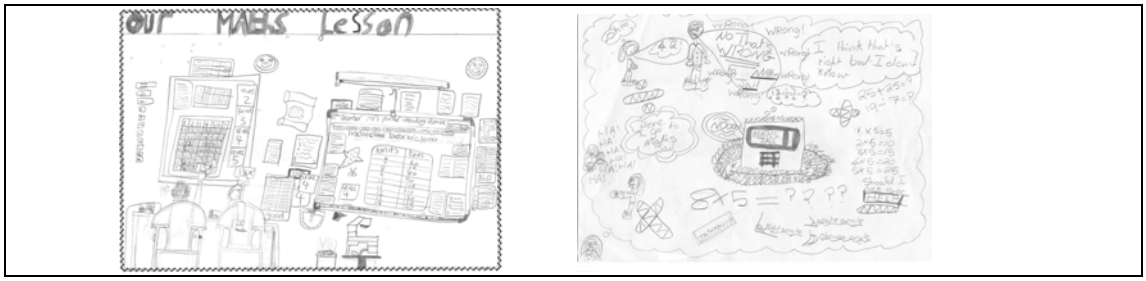

Figure 3. Theme: Evidence of the children's emotions and attitudes in mathematics lessons.

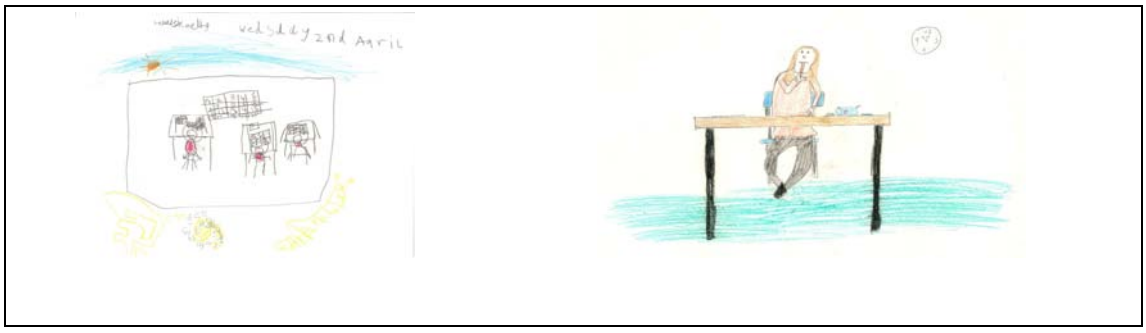

Figure 4. Theme: Evidence of the children's perceptions of their peers in mathematics lessons.

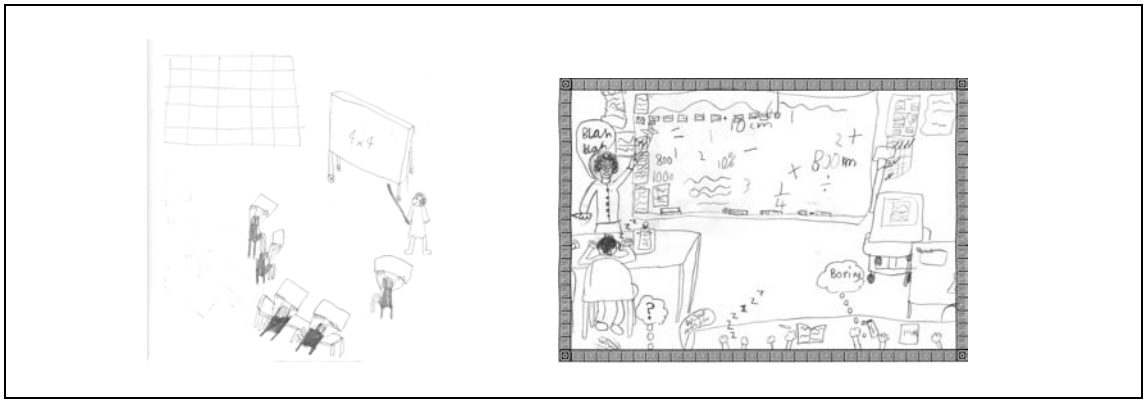

Figure 5. Theme: Evidence of the children's perceptions of their teacher in mathematics lessons.

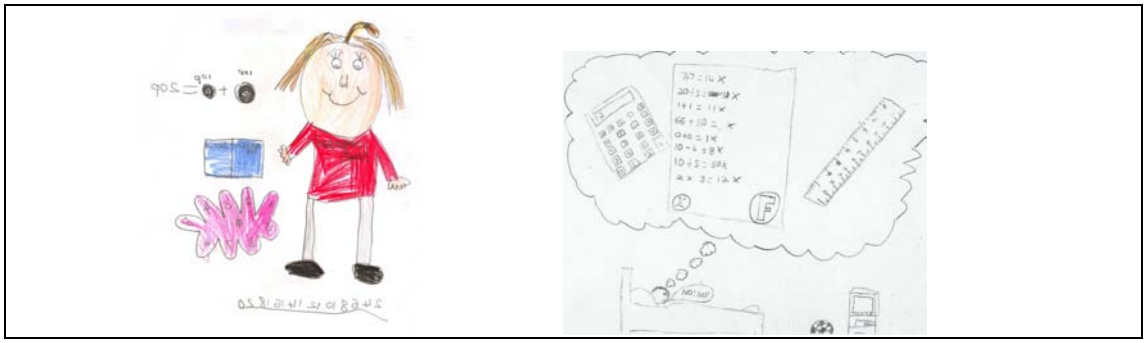

Figure 6. Theme: Evidence of mathematics in the drawings.

Conclusion

If we are to address the current crisis in mathematics education we need to find ways of consulting pupils earlier than we currently do. This study has revealed that certain elements of the NNS (DfEE 1999) are not as secure as perhaps policy makers presumed they were. Whilst a range of emotions were exhibited towards mathematics by the children in the study, already early elements of disaffection were beginning to show from the younger boys. Whilst some children drew themselves sitting in groups, they did not perceive that they worked as a group, despite their preference to (as evidenced in the interviews). Many of the drawings did not include a teacher. Whilst much could be drawn from this, these drawings offer an opportunity for reflection among teachers and the ways they present themselves in the class. Finally the drawings were dominated by number and calculations references, but little other mathematical content, yet for some children it is the other bits of mathematics that appeal and engage interest. Whilst the data revealed only potential issues and reasons for perceptions and attitudes towards mathematics lessons in primary schools, I believe it is a good starting point and may prove an effective means of influencing teachers' thinking and actions.

The results of this study revealed that we can discover what primary aged children think about their mathematics lessons. Drawings offer a unique way of discovering these perceptions. It is as Saint-Exupery (1958) writes, that grown ups cannot, on their own, understand the world from the child's point of view, and therefore they need children to explain it to them.

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