

WHAT DO THE PUPILS THINK ?

PUPILS' PERCEPTIONS OF THEIR MATHEMATICS LESSONS

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***Abstract:** The work described here was carried out in two primary classrooms. This research forms part of a wider study investigating the nature of teacher-pupil interaction in the mathematics classroom and focuses on pupil's perceptions about mathematics lessons as seen in the pictures drawn by the children. The data suggests that the pupils perceive their lessons in very different ways to each other, often choosing different things to include in their pictures. The findings in this paper, which are part of an ongoing doctoral study, will contribute to the wider discussion of teacher-pupil interaction within the mathematics lesson.*

BACKGROUND

Theories about how children think and learn have been put forward and debated by philosophers, educators and psychologists for centuries. E. B. Castle, in his book "The Teacher" (1970) explores the historical influences that have helped to shape modern views about children. One of the observations Bruner (1966) made in his book "Toward a Theory of Instruction" was that schools and the social roles they have created (such as 'teacher' and 'pupil') are relatively modern inventions. However, now that we do have these inventions, accounts from children, teachers and researchers all contribute to the image of classroom events. Each view is necessary for a full picture, and each perspective should be treated equally.

My previous research towards an MA dissertation considered the importance of identifying particular opportunities within the classroom from a teacher's perspective, and examined the impact of these moments for both teacher and pupil (Borthwick 1999). Jaworski (1994) recognises the importance of the relationship between teacher and learner, while Bauserfeld (1985) also addresses this teacher-pupil partnership when he writes of "the delicate process of negotiation about acceptance and rejection." This paper begins to look at the pupils and their perceptions of the mathematics classroom in the hope to contribute to the wider discussion of teacher-pupil interaction.

Desforges and Cockburn (1987) reported that to understand how children respond to mathematical activities in the classroom, the teachers need to grasp the children's responses: "Were the children happy and successful with their work? What work practices did they employ? What skills did they evince? What feedback was potentially available to the teachers as their children set about the tasks assigned?"

These are important questions, and while some of them are addressed in this paper, Doyle (1986) is also one to acknowledge that children's responses to their work might play a part in informing the role of the teacher.

METHOD

The findings reported here form the first part of a study into pupil's perceptions concerning their mathematics lessons. The project will consist of three phases. Phase one involved the children drawing a picture of their mathematics lesson. Phase two will be discussions with the children about their pictures, and phase three will involve discussions with the teachers and will consider their response to the children's drawings. While the first two phases focus on the children, phase three is intended to return to the teacher to consider their views of the study. Phase one is being conducted at the time of writing this paper, while phase two is due to be completed in the next 3 months.

The choice of methodology for phase one of this project was inspired from reading Patricia Palmer's book "The Lively Audience" (1986). This is a study of children around the TV set, where she examines the relationship children have with the television and what this means in today's media driven world. Various methods of research were used, but paramount to this project was the perceptions the children had. She writes that "the perspective of children should be sought and used in delineating research questions" (1986). The book includes children's drawings, which form part of the analysis of their views and perceptions.

My own data was collected in two Primary schools in Norfolk, UK. One hundred children from four different classes (Years 5 and 6; ages ten and eleven) were asked, by their class teacher to draw their perceptions of a mathematics lesson. The written brief to the teachers specified that no guidance or details must be given; the only criterion necessary was that the children must include themselves within the picture. Each teacher was given a set of A4 paper, which had several different computer drawn borders on them. The borders were intended to act as the frame for the picture. The choice of border was left up to the children. They were given approximately an hour to draw their pictures. The lesson took place in the children's usual learning environment.

While these single types of observations yield interesting and informative data, I recognise it provides only a limited view of the situation. As Smith (1975) says 'research methods act as filters', however, phase two of this project is an attempt to validate the data further through talking to the artists about their drawings. The drawings are, however, a rich source of enquiry, and allow the research to focus in and narrow down on the significant issues (Delamont and Hamilton 1984).

One of the features of this research is the way the data will be derived from three different sources, but integrated in a way which makes sense and allows the teacher-pupil interaction to be viewed coherently. Jick (1979) is one of the many researchers to write about this process. His view that the researcher is like a "builder or creator,

piecing together many pieces of a complex puzzle into a coherent whole” suggests that this enables the researcher to “capture a more complete, holistic and contextual portrayal of the unit(s) under study.” The final report will be written as a single account of pupil’s perceptions within the study of teacher-pupil interactions.

In this paper I focus on two characteristic drawings from the set of one hundred collected from the children for the purposes of Phase 1.

FINDINGS

Five questions were written prior to the collection of the data:

1. Is the teacher included in the picture?
2. Is there any mathematical equipment included?
3. Is there any mathematical notation drawn?
4. Is it a happy picture?
5. Are the children working together?

(These questions –their meanings and origins - are described in more detail further on in this paper). Each drawing was then analysed against these questions and the overall responses were collated.

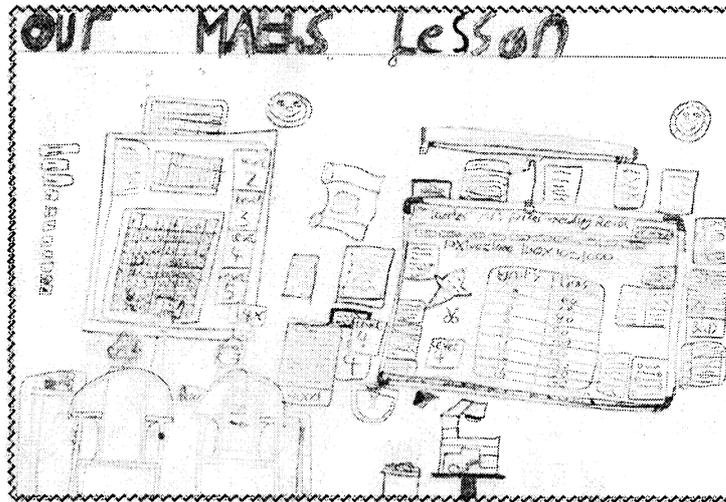
	Yes	No	Can't Tell
Is the teacher included in the picture?	24	76	
Is there any maths equipment included?	8	92	
Is there any maths notation drawn?	75	25	
Is it a happy picture?	35	11	54
Are the children working together?	20	80	

These questions are written in a closed format ensuring a ‘yes/no’ response as an initial source of quantitative data. If a ‘yes’ answer is produced further questions are then asked to provide more specific data. For example, if the teacher is in the picture, what does s/he appear to be doing? All the questions bear a certain relevance to today’s mathematics curriculum and the influence of the National Numeracy Strategy (DfEE 1999). The Strategy talks about the teacher as key to the teaching process, and encourages ‘interactive teaching’ throughout the lesson; an increase in the use of mathematical equipment used is encouraged, such as hundred squares, number lines and digit cards; the use of mental jottings as aide memoirs to solve calculations is central to the approach on calculation strategies; the importance on children enjoying their mathematics is supported through both the Strategy and also outside projects such as ‘Count On’ (the government endorsed project which

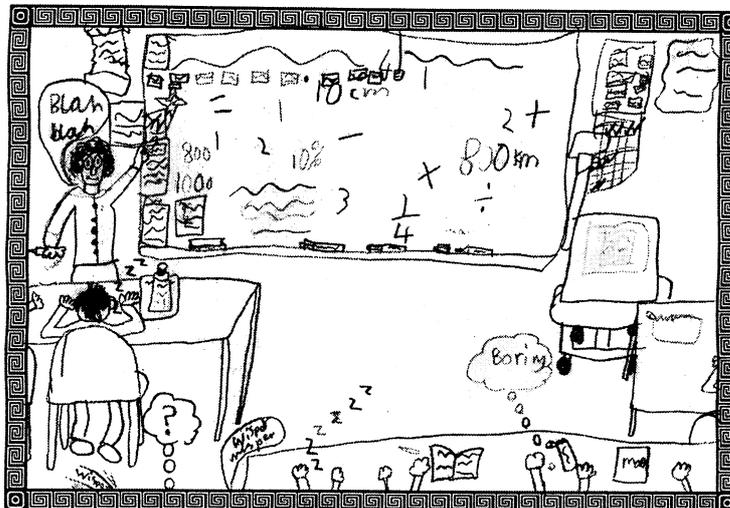
aims to change the public image of mathematics); children working in different groupings, such as pair or group work is also a feature of the Strategy.

For this paper, I examine two drawings in more detail. These two drawings are quite contrasting in their content and are characteristic of the many views the children expressed in the whole sample.

Picture A



Picture B



Is the Teacher Included in the Picture?

For this question, I had to be able to identify the teacher in the drawing by their name, the clothes they are wearing (if the other persons were wearing school uniform for example) or the written speech included.

Picture A does not include a drawing of the teacher, although the work on the board suggests that s/he is present somewhere in the lesson. The two children also have their hands up and are holding some type of card with possibly an answer on which

would suggest a question has just been asked. Furthermore, one child has actually turned around in his chair, perhaps to look at the teacher, with his answer.

In picture B I assume the person at the board is the teacher, determined from the clothes, the body language, the speech bubble and the children's reactions. However, in contrast to picture A, the teacher does not appear welcome in the room, or is seen to be valued as an important part of the learning process – notice the children's comments, "boring, whisper, whisper" and also their reactions – 'zzzz' indicating that two pupil's appear to be asleep!

Is there any mathematical equipment included?

By mathematical equipment, I am referring to items such as number fans, hundred squares, number lines and calculators, not pencils and rulers.

Picture A includes three pieces of mathematical equipment: a hundred square, a board protractor and the number cards the children are holding. The way the protractor has been drawn – on its own hook – indicates its permanent residence. The portrayal of the hundred square is interesting as it represents the most common type of hundred square currently seen in primary classrooms. I.e. one which starts with one in the top left hand corner, and then consecutive numbers follow up to ten and a new line begins with eleven. However, this square, while following these conventions, appears to 'run out of space' at seven! The third piece of equipment is the cards the two children are holding. Many teachers will give out cards for children to select, in response to questions, while others will ask children to write down answers or parts to questions they want. Either way, it is interesting to see these included in the picture, as it suggests their regular use and association with the mathematics lesson.

Picture B, in contrast, has no equipment included, even though it is quite a detailed picture.

Is there any Mathematical Notation Drawn?

By mathematical notation I am referring to universal signs and symbols, either drawn individually or within a calculation. If any notation was drawn, I categorised it into three areas of primary mathematics: number and calculation, shape and space and handling data.

Picture A contains lots of mathematical notation within it. On the right hand board an example of the commutative law for multiplication is drawn, while underneath, place value for tens and units appear. The signs and symbols drawn all appear to be presented in a neat and organised way and suggest it is part of the current lesson. To the left of the picture, mathematical signs are displayed and include addition, subtraction and the equals symbol. These appear to be drawn on card and therefore suggest that they are permanently displayed on the wall.

Picture B also contains mathematical notation. The signs and symbols are all drawn onto the board, with no evidence of a wall display. The notation is drawn in a rather

haphazard and disorganised way, but perhaps they are questions or answers to a test, which may explain the range of notation included. Percentages, metric distances, fractions, decimals and whole numbers are drawn with the subtraction, multiplication, division and equals signs also represented.

Is it a Happy Picture?

For this question the children needed to look happy (e.g. with smiles on their faces) or have included positive comments. If they appeared unhappy (e.g. down turned mouths) or negative comments were written, this was counted as a 'no'. If neither conclusion could be drawn, it was attributed a 'can't tell'.

Picture A appears to be a very happy picture. The child turning around has a smile on his face, both children have their hands in the air, indicating their desire to participate, and there are even two 'faces' drawn on the wall with huge smiles on them. Work is neatly displayed on the boards. The display is a central part of this picture, suggesting that pupil's work is valued and worthy of display. Even the waste paper bin is 'steaming' with the amount of work (perhaps jottings now not needed) produced this lesson, which indicates a good working environment.

Picture B, in contrast, portrays the children as either asleep or bored, suggesting scenes of unhappiness, while the teacher seems to be the only happy person. Other indications are the scribbles on the books and the writing on the board, which is written without care. While there are several pieces of work on display, the artist has managed to convey scenes of a bare undervalued classroom by the lack of work on display. Another contributory factor to this interpretation of unhappiness is the speech bubble coming from the teacher. The "blah blah" phrase could suggest either boredom on the part of the children listening to it, the monotony of the teacher's voice, or even the length of time she has been speaking for. Perhaps she has been speaking for so long, the words pale into insignificance as their concentration wanes.

Are the Children Working Together?

For this question, working together meant children sitting together in either pairs or groups. Often whole classes will work together, although the children will still be working alone, and therefore this was not included in this phrase.

In picture A the two children appear to be sitting next to each other at one table, although from their individual cards I assume they are working alone in this activity. However, the fact that a pair of children are sitting together indicates this group work occurs.

In picture B children also are drawn sitting next to each other, but as in picture A, there is little indication that they are working together currently.

DISCUSSION

The evidence examined in this phase of the study and exemplified in this paper raises several questions about how pupils perceive their mathematics lessons. At this stage

of the study, the analysis provided is preliminary and further commentary from the artists themselves will support further interpretation. While Palmer (1986) provided the inspiration to use drawings as a source of evidence, the ongoing research will look to form a theoretical framework from which to analyse further the visual data.

Perceptions remain a fascinating source of data. What do you think you are thinking? While you may think you are drawing an accurate representation of your thoughts, perhaps you are not. Perhaps you are clouded by other influences, such as the pencil you are using, the border you have chosen or even how you are feeling at this particular moment? Often thoughts are only challenged when you are questioned about them and are asked to justify and exemplify them. This is what makes the data at this stage so interesting to analyse.

However, while the data remains somewhat tentative, it still offers much to celebrate. The images offered are rich and quite versatile. There are many different interpretations to draw upon in this initial stage. For example, have the children chosen one aspect of mathematics to draw, such as a problem solving lesson or even taking a test, or did they choose to represent a holistic image of their lesson? This would certainly influence the outcome of their picture. The decision to include the teacher or otherwise may have been a conscious decision depending on the type of lesson they are thinking about, or simply a forgotten element. Only talking to the children can verify or falsify these points. However, this absence of the teacher or equipment for example, is arguably attributable to the pupil's own experience and perceptions of mathematics.

These findings suggest different children perceive their mathematics lessons differently. These two drawings suggest very different views. Picture A appears to emit many of the values the mathematics curriculum aspires to today – children enjoying their lesson while actively contributing to it and using mathematical equipment, unlike picture B, which does not. It is possible through my analysis that I have focussed attention on some things to the neglect of others, as observed by McIntyre and Maclead (1978) and so the information must be treated with caution. However, the two pictures do raise issues, which based on how pupils perceive their mathematics lessons raises concerns for the teachers in them.

Research shows that “pupils learn more when their teachers know their attainment and can act on this information” (Askew and Wiliam 1995). Picture B suggests the teacher was not aware of the children's desire not to learn. There is an increasing interest into consulting children. Kings College in the UK, as part of its Leverhulme Project (Brown 1997 – 2002), interviews children into what makes an effective teacher, while Essex County Council undertook a year long action research project into the use of children's perceptions as a tool for school self-evaluation and development (McCarthy 2001). They concluded that asking children does make a difference, both for celebration and development issues.

All teachers have considerable scope to influence the quality of experience in their classrooms. One way is the recognition of potential teaching and learning experiences (Borthwick 1999) and another is the value that the perceptions of pupils can offer. The ongoing research will continue to explore possible answers to the issues raised above.

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