

Consulting pupils about mathematics: a straightforward questionnaire?

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We reflect on experiences of working with staff of a primary school to ascertain pupil views of mathematics. Our focus is on methodological issues. We consider the process of building on existing questionnaires to develop one appropriate for a particular school, identifying how discussions with school staff illuminated school practices. We discuss how pupils responded to the questionnaire, considering whether we can learn from the questions they found difficult to answer. A key observation is that researchers and teachers are likely to approach pupil consultation in different ways, that are likely to impact on findings.

Keywords: pupil consultation, primary mathematics, attitude scales

Introduction and rationale

We report on a pupil consultation about mathematics carried out jointly between a primary school's staff and researchers. The original reason for collaboration was concern from the head teacher and mathematics co-ordinator about whether some girls were hampered by negative attitudes to mathematics. Following discussion, it was acknowledged that the situation was more complex; the focus became consideration of the image of mathematics held by all children: how pupils perceive school mathematics and how far they see mathematics as part of life outside and beyond school. In discussion about possible methods of enquiry, it emerged that a priority from the staff's viewpoint was a method which would enable every pupil to be consulted. Interview methods were excluded and we designed and administered a short questionnaire.

Questionnaire design, development and administration

The questionnaire drew on existing studies' content and design features, enabling us to verbalise our approach, deciding for example against an anxiety rating, a theme common in the literature after Richardson and Suinn (1972), but were examining attitudes more broadly. In designing the questionnaire we consulted the Modified Fennema-Sherman Attitude scales, by Doeppen, Lawksy and Padwa (2009) based on Fennema and Sherman's earlier work. We felt their theme of gender might be appropriate, though they are clearly designed for older students. These scales have a key identifying the four themes the items cover which are: personal confidence about the subject matter (C), usefulness of the subject's content (U), subject is perceived as a male domain (M) and perception of teacher attitudes (T). We decided not to include T in our study and M was also not mentioned directly, though it was implied in questions about who uses mathematics. We did want pupils' views about school mathematics, including but not limited to their confidence, so that became a theme. Our second theme was mathematics outside school, including usefulness and perceptions of who does mathematics.

For questionnaire format and for some details, we used questionnaires conducted with younger children as a starting point. We drew, for example on a study with 9 year olds by Thomas and Dowker (2000 cited in Dowker 2005 page 239) which asked pupils to rate both mathematics in general and six specific aspects of mathematics, namely written sums, mental sums, easy maths, difficult maths, maths tests and understanding the teacher. We used these categories as a starting point, but also wanted to include consideration of mathematics outside school, a theme mentioned in the survey used by Flockton and Crooks (1997) with year 4 and year 8 students in New Zealand. We also adopted the use of smiley faces as a rating scale, as used in the Flockton and Crooks study and in a survey used by Sun (2009) with children aged 3 to 6 years old in China.

In consulting these questionnaires, we became aware that the language used varied and we suspected that not all the statements about particular aspects of mathematics would be familiar to our target pupils. In particular we needed to take decisions about whether to use phrases such as ‘mathematics in books’, ‘mental mathematics’ and ‘practical mathematics’. We also debated whether the same questionnaire could be used across the 4 to 11 age range, administered in different ways, making selection of appropriate language particularly important. At this point we discussed the questionnaire’s detail with the mathematics co-ordinator to find the wording she thought most appropriate. Our intention was purely to improve question design, but the process led to extended consideration of issues such as whether pupils would recognise the phrase ‘practical maths’, what was meant by ‘problem solving’ and whether the youngest children routinely carried out calculations on paper.

A joint decision was made at this stage to include some open questions in addition to ratings, as we wanted detail, about the types of mathematics children liked or disliked and about how mathematics might be useful outside school. Finally, we decided to ask children to draw a picture of a mathematics lesson, to facilitate a different form of response. The piloted questionnaire appears in appendix 1. In the following sections we consider the questionnaire responses only from a pilot carried out with one class of seven and eight year olds. The questionnaire was piloted with the class of 12 girls and 10 boys in lesson time, with the co-ordinator reading the questions and other adults available to help with spelling.

Pilot questionnaire results

The completed pilot questionnaires were read jointly by researchers and school staff. We were interested in what this particular class had to say and whether the questionnaire appeared appropriate to use with the whole school. For the purposes of this paper, we will consider the results for this class, as a route into considering methodological issues.

How children perceived mathematics lessons

Responses to questions about school mathematics were very encouraging, with 18 positive, 3 neutral and 1 negative response to the general question about mathematics lessons. Ratings for different aspects of mathematics showed some variation, but even the least popular category, ‘hard maths’, was rated positive by 11, neutral by 9 and negative by 2. Almost all children found maths interesting as a subject and most said they usually do well at it. Gender differences were very small, though the girls appeared slightly more positive about mathematics than the boys. It is inappropriate to draw conclusions about this given the small sample size, but we nevertheless note that

this is inconsistent with larger studies; Hargreaves, Homer and Swinnerton (2008) found that even when girls achieved the same results as boys their confidence in the subject was lower.

In the open question about an interesting or exciting maths lesson, the most frequently mentioned activity was playing games, which was included in the answers of all 12 girls and 6 out of 10 boys. More traditional aspects of mathematics were also popular, with nine children mentioning times tables and five including other specific aspects of number. Five mentioned shape as an enjoyable aspect. It appeared from the completed questionnaires and from discussion with the adults present, that children were able to answer all the questions dealing with mathematics in school.

Children's views on mathematics outside school

The closed questions about mathematics outside school suggested that most of the children use maths outside school, expect it to be useful to them in the future and know lots of people who use mathematics. Gender differences were again slight, with girls slightly more likely than boys to see mathematics as part of their future. However, open questions about mathematics outside school proved more difficult for the children to answer. This is evident in the completed questionnaires and was supported by the staff present. Thus, nine of the twenty-two children did not list anyone they know who uses maths outside school, despite being encouraged to answer by the adults. When answers were given, several included male and female close relatives. Other answers mentioned particular jobs or activities with shopping and shop keepers by far the most common. Many had difficulty listing jobs that used mathematics or those that did not, leaving these questions blank or listing things which did not seem to be jobs. Where names of jobs were given, shopping was again a key theme in jobs using mathematics, followed by building. It was harder to analyse answers about jobs not using mathematics, though mentions of busses or bus drivers may be due to the fact that local bus drivers no longer handle cash.

The difficulty these children had in linking mathematics to practical uses is consistent with Ashby (2009) who obtained similar responses from focus group interviews with seven and eight year olds. Another small-scale study (Cuffy and Houssart (2009) found that even secondary school pupils could not really explain how mathematics was used in employment, despite many of them making general statements about its usefulness and pervasiveness. It is interesting that they still appear to accept its usefulness. It is unclear to what extent they believe this, or whether they are simply repeating what they have been told and think adults want to hear. It would be interesting to explore this further using other methods.

Reflections on questionnaire design and pilot implementation

A key reason for piloting the questionnaire was to identify questions the children appeared unable to answer, in order to adapt or remove them. On reviewing the pilot's results, we were less certain about this. Open questions about mathematics outside school appeared difficult for the children, but this in itself was informative and the partial answers gave clues about children's understanding of the issue. In contrast, closed questions gave limited information, though using these questions with the whole school would enable some comparisons. A final issue was the validity of answers to closed questions about school mathematics. Although we have no reason to doubt positive responses, we feel that the way the questionnaire was implemented could be more likely to result in them.

Conclusions

The pilot survey told us something about the professed views of this group of children, their views of what mathematics consists of inside school and what it can be used for outside school. A more general message was that answers to questions requiring detail indicated they could not always exemplify statements made in response to closed questions.

Our experiences in trying to find a readymade survey suggest that a survey is more appropriate if it is designed, or at least a particular school's practices, a process itself likely to provide insight into practices and values within the school.

Our final reflection concerns the different views and approaches of school staff and university researchers to such an initiative. A pupil attitude survey conducted by school staff as part of their everyday activity is likely to be conceptualised and conducted differently to an apparently similar survey conducted by academics as part of research. To one group there is an expectation that all pupils will participate, that surveys will include pupils' names and be handled and discussed by teachers. Researchers work within guidelines requiring pupils to opt in and which anonymise responses. Working together in this way enabled both groups to discuss the reasons for their approaches. They are likely to lead to different findings and both are potentially problematic.

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Appendix 1 Questionnaire

Name _____ Class _____

Colour the face that best matches how you feel:

In mathematics lessons I feel ...			
Doing easy maths I feel ...			
Doing hard maths I feel ...			
Doing maths in my head I feel ...			
Doing maths in on paper I feel ...			
When I am asked maths questions ...			
When I am doing maths with equipment ...			
When I am solving maths problems ...			

Tick the sentences that are true for you, cross them out if they are not true for you:

Maths is one of my favourite subjects.

I usually do well in mathematics.

I am not very good at maths.

Maths is usually interesting.

Maths is useful to me outside school.

I only use maths in school or for homework.

I think maths will be useful to me in the future.

I know lots of people who use mathematics.

When I leave school I will not use mathematics.

Try to think of some maths in school that you found interesting or exciting. Write about it in the box below.

If you could design a perfect maths lesson, what would it be like? Write about it in the box below.

Do you know anyone who uses maths outside school? Use the box below to tell us who and what maths they use.

Can you list some jobs that use mathematics?

Can you list some jobs that do not use any mathematics?

Can you draw one of your maths lessons? Please draw this on a separate page.