PAIRED INTERVIEWS IN MATHEMATICS EDUCATION

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We consider the advantages and disadvantages of carrying out interviews with pairs of children. Although the Mathematics Education literature contains examples of this method, there is relatively little detailed discussion of the rationale for its use, nor of its consequences. We draw on examples from the literature and from our own task-based interviews with pairs of ten and eleven year-olds. We develop a simple typology of this type of interview, and we propose that children respond differently in the three different contexts. Researchers therefore need to differentiate carefully between them, and to consider their findings in the light of the exact type of paired interview used.

INTRODUCTION

In this paper we discuss issues associated with the use of paired interviews in mathematics education. Our interest arises from use of interviews with pairs of children in the course of our own research. This raised our awareness of some of the advantages and disadvantages associated with this method and posed more fundamental questions about the nature and purpose of paired interviews.

Our decision to interview children arose following a project in which we analysed the answers given by ten and eleven year-olds to written questions which we felt offered potential for algebraic thinking. In common with others (eg. Watson 1999), we felt that we would learn more about children's responses by interviewing them, and we chose to conduct interviews both on questions the children had previously completed in writing and on a question they had not seen before. We hoped that the interviews would enable us to explore possible misconceptions as well as seeing whether children could extend the given question. The children were interviewed in pairs in the hope that this would provide opportunities for interaction and discussion as well as putting the children at ease. We also had in mind that the balance of interviewees to interviewer would be better and that there are advantages in outside researchers using this method given current child protection concerns.

METHODS: BACKGROUND

Individual, group and paired interviews

For the purpose of this article we take paired interviews to mean that there are two interviewees and one interviewer. This is also called joint interviewing, for example by Arksey and Knight (1999) who advocate this method partly because they feel it is easier to establish an atmosphere of confidence with two interviewees and also because the interviewees may 'fill in gaps' for each other and their interaction may also be of interest. In general, discussion of paired interviews is sparse in the literature, much of which assumes that interviews are normally conducted one-to-one

(e.g. Kvale 1996). There is more discussion, however, of group interviews where several interviewees are involved. For example, Lewis (1992), in a detailed consideration of group interviews with children, suggests they may be useful for exploring consensus views and may generate richer responses by allowing participants to challenge one another's views. It has also been pointed out (Watts and Ebbutt 1987) that group interviewing changes the interviewer's role, which may become more that of a facilitator or moderator. The possible domination of individuals is considered to be a possible disadvantage of this method (Breakwell 1990) and it is also acknowledged that the method raises practical issues such as difficulties with transcription (Ebbutt 1987). Our position in this paper will be that although paired interviews may carry some of the advantages and disadvantages of group interviews, they are essentially different from both individual and group interviews.

Interviews in mathematics education

Many of the writers mentioned above are concerned with interviews in the field of education, but they are not writing specifically with mathematics education in mind. Interviews in mathematics education can differ from more general educational interviews. We consider there to be two broad types of interview in mathematics education. The first of these, the 'affect-related' interview, concerns the attitudes, approaches and beliefs of interviewees in relation to mathematics. Usually such interviews are discussion-based, though occasionally interviewees are asked to do something such as draw a mathematician or describe an ideal mathematics lesson. The second type of interview is 'task-based' where the focus is on carrying out a mathematical task or tasks. Such interviews vary in type, as discussed by Ginsburg et al (1983). One method known as 'talking aloud' (Newell and Simon 1972), involves a description of the technique used with minimum intervention from the researcher. In contrast, clinical interviewing involves flexible intervention by the researcher. It is acknowledged that it is possible to use a mixture of talking aloud and clinical interviewing.

Related research methods in mathematics education

Also relevant is work which involves two or more students working together on a mathematical problem. Some studies either interview students while they carry out a mathematical task together or question them about a task they have previously completed. Although this research is strictly speaking not paired interviewing, there are clear similarities. Much of this work stems from Schoenfeld (1985) on mathematical problem solving, which aims to capture part of the problem-solving process by listening to the reasons that students give to each other. Categories proposed by Schoenfeld for analysing the problem-solving process have since been used and adapted in more recent work analysing problem-solving amongst pairs and small groups (Artz and Armour-Thomas 1992, Goos, Galbraith and Renshaw 2002).

EXAMPLES FROM THE LITERATURE

Despite the scarcity of articles discussing paired interviews as a research method, they are not uncommon in mathematics education research. Accounts of such interviews vary in the detail of justification given for working with pairs of students and the information about how the pairs were selected. Sometimes such information is completely omitted.

Some paired interviews are affect-related, for example interviews by Boaler (1997) with pairs of secondary school students about their experiences of learning mathematics. Because our interest is more in task-based interviews, we will look in a little more detail at some examples of paired task-based interviews. Bills, Ainley and Wilson (2003) conducted interviews with 12 year-old pupils paired by their teacher to make compatible pairs of similar attainment. The pupils were given questions in written form at the start of the interview and questions were also read aloud to them. In a study with pairs of eleven to fourteen year-old students, Cooper (2003) gave them a problem in the interview which they had previously solved and asked them to read it aloud and explain to each other how to solve it. The technique of interviewing pupils about a task they had previously solved was also used by Fujii (2003) who started his study with a written task given to junior high school pupils. As a result of students' responses to the task, pairs were selected for interview so that pairs of students held 'inconsistent conceptions'. This was done in order to create a conflict in the interview context in the hope that students would express their ideas explicitly to each other.

The examples above suggest that task-based interviews can be carried out in two ways, which we will call 'seen' and 'unseen'. Seen interviews involve asking children to discuss the solution of a task they had worked on previously. In unseen task-based interviews, the task is presented for the first time during the interview.

OUR RESEARCH

Our interviews were carried out with nineteen pairs of ten to eleven year-old children who had previously completed a short written paper. The children were drawn from three schools and pairings were selected in a variety of ways which included careful choice by teachers based on their knowledge of the children as well as friendship pairs chosen by children and pragmatic decisions based on who was available.

The interviews started with invitations to them to discuss questions on the paper and they had their written answers with them to assist with this, though they were not told whether the answers were correct. One question in particular gave rise to discussion by the majority of pairs of children. This involved a sum and difference problem which we knew from our previous research on written answers often gave rise to an incorrect answer (Evens and Houssart 2004). Although we had not intended to pair children on the basis of their written answer, it happened that many pairs included one child who had answered the sum and difference question correctly and one who had answered incorrectly. This raises the issue of comparison with the work of Fujii

(2003), who aimed to set up cognitive conflict in paired interviews by pairing children with different answers. In our interviews, it was comparatively rare for children to change their incorrect answer as a result of being with a child who explained the correct answer and an appropriate method. Some were more inclined to try to justify their own approach rather than consider that of their partner and the justification was sometimes based on non-mathematical reasons. A related issue is the degree of interaction between pairs of children and, although some pairs interacted and discussed their work with each other, some did not really do so. For some children, the seen part of paired interviews consisted mainly of turn-taking where one child explained their answer to the interviewer and this was then followed by the other child giving an explanation that was not always influenced by what they had just heard. We plan to carry out further analysis of this part of our work and one area of interest would be to consider which factors encourage children to engage with each other's ideas and possibly reconsider their own answers.

The second part of the interview was unseen in that children were shown a question they had not previously worked on. This question concerned what happened as a result of a game involving spinners. Although we had previously given this question as part of a written test (Houssart and Evens 2005) we considered it particularly suitable as an interview question as it included potential for making general statements and justifying answers. Part of the question was open, allowing a range of answers and we hoped that the interviews would help us explore whether children were aware of the range of options available. Our preliminary analysis of the data indicates that this part of the interview also resulted in differing levels of interaction within the pairs. Some children started by taking turns to explain the first part of their answer to the interviewer. Notable here was the fact that in some pairs, even though they abided by this turn-taking, the second child to speak made reference to the first answer, for example by saying in which way their work was similar. In some pairs, however, interaction between the two children started very early on in the interview. In one case, this occurred because one boy had misread the question, leading to a discussion between him and his partner that resulted in the mistake being acknowledged and corrected. For some pairs of children, this part of the interview was also used to make and explore suggestions and to extend the original question. There was also clarification of misunderstandings, often between the pairs of children. It is possible that children were more willing to consider and even change their answer in this unseen part of the interview than in the seen part, where some of them seemed to feel the need to defend their previous written answer.

One of the initial reasons for carrying out the interviews was the hope that it would tell us more about how the children approached the questions. This was usually the case, especially in the second part of the interviews. However, there are clear dangers in saying that the interviews simply tell us more about the answers of the individual, as this ignores the presence of their interview partner. This is just part of the problem about how to proceed which we were faced with, when moving on to more detailed analysis of the interviews. It no longer seemed appropriate to classify each child's

answer individually, as the interaction between children now assumed more importance. For the seen interviews, we were also interested in whether or not children were prepared to change their mind during the interview and this offered another possible classification. For the unseen interviews, a possible way to proceed was to treat the interview as a paired problem-solving situation and hence use protocols developed for that purpose. Overall, the interviews challenged our original, somewhat naïve assumption that they would give us more information about what individuals 'could do.'

SUMMARY AND FURTHER QUESTIONS

Our research and brief examination of the literature have raised many questions about paired interviews in mathematics education. We have tentatively identified three types of paired interview: affect-based, those based on seen tasks and finally unseen tasks. The first category can be seen as having some similarity with other interviews in educational research. The final category is perhaps more closely related to paired or group problem-solving. The middle category is particularly interesting and our experience suggests that for some pairs they were closer to affect-related interviews while for others they were closer to task-based. Children appear to respond differently according to the type of interview used. The method that has been used in any given research needs to be specified and the results considered accordingly.

There are many other questions about paired interviews, for example how the pairings might be chosen, what the role of the interviewer is and what types of question are particularly suited to this method. Ways of carrying out analysis were a further problem, and an underlying question is what the interviews are actually telling us. Our data suggests that, inter alia, interviews offer complex information on children's mathematics, their interaction and their confidence. A key question is whether it is possible, or even desirable to try to separate these factors.

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