PUPIL PARTICIPATION IN 'INTERACTIVE WHOLE CLASS TEACHING'

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One particular result of recent policy and practice changes in mathematics teaching in English primary (elementary) schools, is that pupils are increasingly involved in 'interactive whole class teaching'. Longitudinal case study data are informing our examination of the different ways that pupils engage in such sessions and manage their participation. Drawing on observations of three children we develop the argument, that within whole class sessions, pupils are becoming skilled at presenting themselves in ways that enable them to appear to be engaged with the mathematics in the way that the teacher expects them to be, while in actual fact they are engaged in other ways and for reasons other than interest in the mathematics.

INTRODUCTION

The English National Numeracy Strategy (NNS), officially introduced from the September 1999 has begun to affect the teaching of primary mathematics profoundly. It is rare now to find primary mathematics lessons that do not follow the form and content set out in the NNS document 'Framework for Teaching Mathematics'

A central tenet of the NNS is the need for increased emphasis on 'interactive whole class teaching'. All mathematics lessons are expected to begin with a ten minute 'oral and mental' starter, where the whole class joins in activities that often either require everyone to show answers (through, for example, use of digit cards or individual white boards) or have the expectation that individuals may be called upon to respond to questions posed. The end of each lesson is also expected to have a whole class 'plenary' which may also involve question and answer interactions about the lesson.

Our observation of some 150 lessons over the past year indicate that these interactive whole class sessions have become the norm. Moreover as recommended, the main part of lessons, between 'starter' and 'plenary', also frequently including a substantial element of 'public' answering of questions in order to prepare for a period of group or individual work. Indeed, the use of questioning is promoted as a major teaching tactic with resources, equipment and 'exemplary' videos supplied to school to encourage this. There is also strong encouragement for lessons to have 'pace' and much of the whole class work that we have observed places emphasis on speed as well as correctness.

Thus a strong 'performative' element, viz. being seen to take part and being able to produce correct answers to closed questions and appropriate answers to questions

inviting explanation is entering into English primary mathematics lessons. The strategies that children develop in order to be seen to participate in such sessions are likely to affect learning outcomes and is the focus of this paper.

THEORETICAL BACKGROUND

Our theoretical starting point for examining the sort of learning that might arise through such whole class sessions is analysis of pupils 'participation in sociocultural activities' (Rogoff, 1994). Working together in the whole class ‘mental and oral starter’ provides a microcosm ‘community of practice’ (Rogoff, 1994). Similarly, Coffield (1999), discussing post 16 education and arguing for a social theory of learning sees learning as

> located in social participation and dialogue as well as the heads of individuals; and it shifts the focus from a concentration on individual cognitive processes to the social relationships and arrangements which shape, for instance, positive and negative 'learner identities... (p. 493)

But while all pupils are, in a sense, participating collectively in such sessions, in that the teachers set up activities to involve everyone and monitor participation, the ways in which particular pupils manage their involvement and what motivates them to engage with the activities will vary from individual to individual. A shift in attention away from the individual to the collective might also be accompanied by decreased focus on innate ability. As Claxton (1999) points out, the ability to learn in a flexible way in our current age of uncertainty needs to emphasise the importance of engagement rather than 'ability'. But, as the examples that follow demonstrate, the reasons that children engage with activities may be far removed from enthusiasm to engage with the mathematics.

Rogoff (1994) argues that ‘adult run models of instruction’ problematise children's conceptual engagement. Pollard and Triggs, et al. (2000) provide an example of this in their case study of four to seven year olds found that:

> children had only a vague idea of teachers' instructional objectives. Rather than engaging in some synergetic process between teacher and pupil to extend existing understanding, most children were simply concerned to do what they needed to do to avoid being embarrassed or told off or having to do the work again. We found that children felt pressured by classroom constraints to develop task engagement. (p. 302-303)

Pollard also finds that it is ‘necessary to facilitate emotional engagement as well as intellectual challenge’ (Pollard with Filer, 1996), an issue explored in detail by Goleman (1996). Part of the emotional engagement will rest upon maintaining a successful ‘presentation of self’ (Goffman 1959) and may well be a ‘necessary precondition of stable engagement with learning’ (Pollard with Filer, ibid. p310.)

DATA SOURCES

The Leverhulme Numeracy Research Programme (LNRP) is a longitudinal study of the teaching and learning of numeracy *investigating factors leading to low attainment in primary (elementary) numeracy in English schools, and testing out ways of raising attainment*. Two cohorts of children, one starting in Reception (four and five year-olds) and one in Year 4 (eight and nine year-olds), are being tracked through five years of schooling. Pupil data are being collected at several different levels ranging from large scale, twice yearly, assessments on each of the two cohorts (some 1700 children in each cohort) through to detailed case studies of six children from each cohort in five schools, each of whom are observed for two weeks of mathematics teaching each year of the programme (Brown, Denvir, Rhodes, Askew, Wiliam, & Ranson, 2000). While the large scale assessment data provides insights into pupil progress at a general level, the case study data enables us to gain insights into how individual children respond to specific teaching. To explore more deeply our notions of participation we draw on data for three case study children now aged seven years: George, Meg and Oscar.

Through this case study data we seek to elaborate the notion of participation and, in particular, to ask:

how do pupils present themselves during whole class sessions?

what motivates pupils' to take part?

is it fruitful in terms of mathematical learning?

MEG

Episode 1.

As part of a whole class session, the teacher is working on halving numbers. Each child has an individual white board and marker pen with which to display answers.

Teacher: Half of 36?

Meg starts to lift her board up to show the teacher. She has written '15', but before she shows it she notices that others around her have '18'. She quickly changes it; the teacher does not notice and says, 'Well done, Meg.'

Teacher: Half of 72

Meg puts on an act. She takes the top off her pen, pushes it back again and looks puzzled. She appears to be counting - her lips are moving but it is not clear what she is saying. She turns round and sees what George has written then turns back again and wrinkles her face (as if to say, 'I'm concentrating hard'). Then she looks around at several boards and see what answer others have got. Next she closes her eyes and screws up her face. After a time her face lights up as if she's just made a big discovery and she writes down '36'.

Episode 2.

The teacher is using a counting stick (metre length rod, with ten divisions but no number marked) to count on from zero in 10s, 5s, 2s going up to 100, 50 or 20 respectively. The children each have a number fan to show their answers. From the way that Meg looks at the rod and nods her head, it seems that she relies a lot with the higher multiples on counting from zero (as opposed to, say, knowing that when counting in 5s the other end is 50, so the ninth mark must designate 45). She is often still searching for the two digits on her fan with which to show her answer when the teacher has moved on to the next question.

After two counting on in 10s questions (where Meg was not quick enough to show her answer) the teacher changes to counting in 2s. She points to the 8th division and asks for its value.

Meg, again, repeats her nodding and looking at the divisions from zero, notices that the boy sitting next to her has set his fan to show 16. She stops counting on and puts out 16.

The teacher then points to the 9th division. Meg nodding and counting from zero, puts out 18 on her fan, the teacher asks her how she got the answer.

Meg: You count in ones to nine and then go backwards and then its like double again.

Teacher: Meg is using what we did last week, like doubling and halving.

While it is possible that Meg was multiplying by 2 her actions suggested otherwise. Once she had counted along to the number she went straight to showing it on her fan, that is that she arrived at the answer by counting on in twos. There was little suggestion that she was carrying out any operation on a number such as counting along to nine and doubling it. If she had realised that she could get an answer quicker by doubling it is not clear why she talked about "counting in ones to 9" or "going back".

It seems that Meg is not trying to explain her method but only striving to take part in the ‘game’ of providing an explanation. Time and again, we have observed Meg produce post hoc explanations which do not match what she did but are sometimes not even mathematically correct (add on 9 by adding on 10 and taking off 6). She can do it with great conviction, and even present it in a way that covers up the nonsense.

It is not that she is not capable of invoking a learning orientation. On those occasions where she has been encouraged to slow down and think about the mathematics rather than investing her energy to convince others that she knows it all her delight at succeeding is palpable. She often resists admitting that she might need help on. In another incident when she was attempting to shade one quarter of various rectilinear shapes drawn in her book she protested that questions from the researcher were making her terribly confused, rather than saying that she wasn't sure about the work. But when asked if she would welcome some help she looked both pleased and

interested, listened carefully and seemed to take on board intelligently the suggestions offered.

What motivates Meg when she is relating to the teacher, here and in other examples, is her status. Throughout the four years that we have been observing Meg, her teachers say she is able, hardworking and reliable. Meg strives to continue to appear like this to the teacher. In relation to other children, Meg behaves differently, enjoying having power and some control over them. In one incident, having been entrusted with a set of cards for a fraction game for her group, she insisted they all sit still and quiet while she, playing 'teacher', took her time choosing who she would allow to set them out.

GEORGE

Episode 1

The teacher and the class are playing a game where the teacher has a hidden shape and the children have to ask questions with a yes/no answer to figure out what it is.

Teacher: It's a shape. You're going to have to guess what shape. It might be a solid 3-d shape or a 2-d shape. Put your hands down (they've already got their hands up, presumably to guess) and I'll tell you some clues first.

Teacher: It's got, 6 faces, all square

George: (immediately, calling out, not loudly but still quite clearly): cube

Teacher: It's got 8 vertices, 12 edges which are all the same length.

George: (Putting hand up this time) Is it a cube?

Teacher repeats all this information. There are now 6 hands up.

Teacher: Lenny?

Lenny: (who is sitting next to George) A cube.

Teacher: See if that is right.

She pulls out the cube from under the puppet's body.

George: You gave too many clues.

Episode 2

The class are all on the mat, playing the guess the number game: the teacher has a glove puppet that is hiding a numeral and nods yes or no to children's questions.

George takes a lead role in this. He listens to the other information and uses this to frame his questions. Questions he asks include:

Is it a three digit number?

Is it under 300?

Is the second digit number 3?

Is it 444 (this shortly after someone has asked if all three digits are even (perhaps George is interpreting 'even' as all the same?) and knowing that it is between 400 and 450)

Somebody gives the correct answer of 428

George: Someone already said that.

In these examples George is engaged with the mathematics and is seeking to engage with the teacher and the class by using his mathematical insight. His motivation to engage comes from his interest in the mathematics as well as a desire to maintain his position as a clever, articulate boy. He appears to dislike behaving in a way that would make him appear the same as all the other children and frequently stands out by being seen to be doing something different. It is also possible that some of his responses are a challenge to the teacher to keep up with him, or to provoke more serious intellectual challenges being offered to him. Pollard (1996, p. 311) quotes a 1984 study by Doyle and Carter which observed how pupils and teacher collude to reduce the intellectual level of tasks by making them more routine. Perhaps George's habitual behaviour could be a response to his frustration at such routinisation.

OSCAR

Episode 1

The teacher is asking children to double and halve various numbers. Each time they write down their answers on a white board and show it to the teacher.

Oscar gets all of the answers correct. I can't see how he is doing them, whether he is doing them by himself or copying.

Teacher: Half of 36?

Teacher: Oscar how did you get 18?

Oscar: I don't know.

The teacher asks someone else.

Later in the same lesson the teacher is using a disk of card folded into four segments to stand for a cake:

Teacher: This one is cut into 4, into quarters . X comes along and eats a quarter. How much is left? Write it down on your boards.

Oscar writes 1/3

Teacher sees the researcher looking and looks herself.

She says, ' Oscar, How many is it cut into?'

Oscar: 'Umm, three, .., no four.'

Teacher: 4. So that's the number at the bottom. The other number goes at the top.

Oscar changes his 1/3 to 3/4.

Episode 2

Oscar's contributions to the whole class guess the number game.

Oscar: Is it lower than 100?

George Is it a three digit number?

Yes

Teacher to Oscar: So is it lower than a hundred?

Oscar says no and shakes his head.

Oscar: Is it above 400?

Oscar: Is it below 450?

The teacher, after the number has been found, picks up on this and says that the questions were good until they knew that the number was between 400 and 450, and asks what might have further asked.

Oscar: Is it above 410?

Teacher Or is it between 410 and 430?

As children leave the carpeted area to go to text book tasks, Oscar tell me he is in blue group and that he and George are best at maths in that group and ahead even of Harry.

Unlike George, Oscar seems to like being fairly unobtrusive in the classroom and keeps a low profile, offering 'safe' answers and, unlike Meg, sticking with 'Don't know' rather than risking an incorrect response when asked to describe his strategy. Initially he was identified by his teacher as 'average' in mathematical attainment. He used to work quite slowly, taking his time, capable and proficient. Now he works in the same group as George, identified as higher attaining throughout. George and Oscar now spend time together as a pair both inside and outside the classroom. The friendship with George is very important to Oscar and this maybe the reason for the culture of speed and competitiveness which is creeping into his work and which prompts him to fall back on getting the answers from George. His desire to maintain his position in the class as George's friend seems to compete with his inclinations to work slowly and steadily.

DISCUSSION

As Pollard (1996) notes, children who are ‘the most ‘effective learners’ are likely to be those children who can manage their classroom identities so that they derive support from both their teacher and other pupils’ (p. 310). The examples presented here show how children are in different ways simultaneously both learning and establishing or protecting their identities in the public forum of class ‘question and answer’ activity.

These examples support the idea that when children participate in whole class interactive teaching in mathematics they may not be participating in the mathematical thinking which is intended. This arises from other motivations than the desire to learn.

The emphasis on whole class interactive teaching does seem to be connected with the notion that all children should participate in shared discussions of mathematical ideas. A major concern is that the strong "performative" element referred to above prompts children to adopt classroom behaviours which mitigate against them developing good habits as learners. Pollard (2000 p.293) in discussing how children

develop a "learning disposition" quotes the New Labour election manifesto of 1997, *Because Britain Deserves Better:*

> Primary schools are the key to mastering the basics and developing in every child an eagerness to learn throughout life.

Certainly behaviours that are identified here especially Meg's need to maintain her image and George's experience of inadequate challenge seem unlikely to foster that "eagerness to learn".

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