THE BALANCE OF POWER IN THE MATHEMATICS CLASSROOM

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Some psychologists see power as a dimension of self-esteem – having power over ones situation maintains high self-esteem. Within the classroom the teacher can be seen to have the power to 'direct learners' and be the 'holder of knowledge'. Learners are' the directed and the receivers of knowledge'. This papers aims to explore whether these relationships are necessary and unavoidable or in need of change. The paper focuses on low achieving children, who initially presented as powerless. After a 3 month teaching project, analysis indicated a change in this position and indicated some possible reasons for this.

BACKGROUND

This paper explores ideas about the nature of power and pupil voice in the mathematics classroom. Research on pupil voice tends to concentrate on strategies such as school councils and circle time. I have a different focus - the teacher/learner interface in the mathematics classroom. The presentation aimed to help those present to think about the relationships involved. I began with the assumption that, generally speaking, a teacher has more power in the classroom than learners. I asked if learners should have more voice and, if so, how this could be accomplished.

LITERATURE

Psychologists (Coopersmith 1967, Kavussami and Harnish 2000) have described four dimensions of self-esteem – feeling competent, having power over ones situation, feeling of value to others and having a sense of self-worth. I want to concentrate on the dimension 'having power over ones situation' although I found that the dimensions intertwine.

Pollard with Filer (1996) describe how children manage their identity. They describe how *'teachers and children negotiate a mutual understanding of the social rules and expectations which underpin classroom order'* (page 309). This understanding reduces risk for children because they know what is expected and reducing risk enables children to engage more readily with a task. They go on to say that *'where teacher power is less constrained by such negotiated understandings, then academic failure is more threatening'*.

This paper uses Pollard's work (1987) on goodies, jokers and gangs as an analytical framework. In a classroom there is a working consensus, usually set by the teacher, and peer culture. How the children react to these two pressures determines whether the children are goodies, jokers or gangs. He said that children are interested in maintaining their dignity and self esteem, controlling stress and enjoying the lesson. They enable this through learning or membership of a peer group. He described goodies as children who want to conform to their teacher's wishes so that stress can be controlled. Jokers also conform but can be non-conformers in small ways. They

like to enjoy lessons and often joke with their teacher. Gangs do not conform to the working consensus, seeing peer culture as more important. Their primary interest is to maintain their self-esteem. Pollard noted that all children need to retain dignity. He attached power to control of stress, so goodies are mostly at risk. He said that it is the teacher who has the power to put children under stress by their reaction to the children's efforts.

THE TEACHING PROJECT

The methodology was an action research teaching project similar to classroom enquiry in that it aimed to change the way children thought about mathematics and themselves as learners of mathematics and the way I taught mathematics. The project lasted 11 weeks and included 55 consecutive daily mathematics lessons. The content timetable and lesson formats given in the National Numeracy Strategy (1999) were not used. The main data collection method was video, which was supported by my lesson plans, the children's writing and pre and post project interviews. The analysis was multi-layered. During the project I reviewed the data daily, so I could plan the next lesson, and each weekend to see patterns. At the end I viewed all the lessons to get overall impression. I then looked at each lesson in detail. The study took place in an English primary school with six 10 year old children who had been classed as low achievers since year 1. They were not expected to achieve the required level (4) at Key Stage 2 assessment later in the year.

THE CHLDREN

During pre-project interviews and test lessons it became clear that Fran, Laura and Sally were goodies. They liked to get things right and talked negatively about getting things wrong. Fran described being worried and bad, Sally being nervous and in trouble in mathematics and Laura getting answers wrong because she could not keep up with the class. Mike was probably a goodie but he said so little that it was difficult to judge. His primary interest was to avoid attention and if asked a question he gave a silent shrug. He said he felt miserable when asked a question because he would not be able to answer correctly. These children were under stress and had little enjoyment. Angela was a joker in class and was above average in all other subjects. In mathematics she struggled to fit in. Her interview was full of anecdotes about being teased, doing baby work and getting simple questions wrong. She was able to maintain the normal joker balance in other lessons but could not in mathematics because she lacked the learning skills to please the teacher. She found it difficult to maintain her dignity and control her stress. Lance was in a gang in class. He said that he was not bothered about mathematics, he had tried earlier but had given up. During the project he did not have his peer group to impress, which he found difficult.

PLANNING THE TEACHING PROJECT

When thinking about the power dimension of self-esteem, I planned strategies that would give the children power over their mathematical learning. Some were successful, some partially successful and some unsuccessful. Successful strategies

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were to do with how the children participated in mathematics. The children chose strategies, shared in assessment and participated in discussion. They also took complete responsibility for resources and at the of the project nothing had been lost or broken. Partially successful strategies included adding ideas to some tasks, particularly games where they would suggest new rules, and creating a replica real life context after a visit to the local delicatessen. The children were not able to design tasks or resources because they lacked the experience to do so.

CRITICISM AND PRAISE

My use of criticism and praise changed as the project progressed. Early in the project an incident changed my planned approach to criticism. During a discussion task Angela began to watch a spider spinning a thread from the ceiling. I criticised her behaviour. After the discussion ended we moved onto a number line task. This task began with a reprise of a task we had done the day before when Angela had taken the lead. I asked her to begin the task today, reminding her of her achievement the day before. She was unable to do the task and became stressed. In my analysis that evening I thought that my criticism had caused the problem. I decided to remove all criticism. This decision helped the children to control stress and retain dignity. My personal teaching style did not include the use of what I saw as ‘ false praise’. This was a somewhat vague idea I took into the teaching project. During the project this vagueness went as I learned what to praise. Praise became focused on learning strategies not correct answers. I praised children for struggling with tasks (particularly when they were stuck), correcting errors on their own, using interesting strategies and asking questions. Making errors and finding mathematics difficult was treated as normal. So criticism was attached to meeting the children’s emotional needs and praise towards cognitive needs. Both were important but I believe that removal of criticism had to come first.

EXPLORATORY TASKS

Exploratory tasks were used extensively during the project as preparation for teaching tasks. Before teaching a new concept, I began with a number of questions about the children’s mathematics – what did they know and what misconceptions did they have. Exploratory tasks were emotionally risky for the children because during the tasks their usual mathematical support from me was withdrawn and the tasks were designed to push them to a point of failure. I provided affective support by sharing the aim and results of the task. Working in pairs, never alone, provided emotional support from their peers. The following three examples are taken from teaching tasks that followed exploratory tasks. They concern engendering emotion, asking questions and negotiation of mathematical ideas and are representative of other tasks in the project.

Engendering emotion

The children had done fractions in years 4 and 5. We had also worked with fractions on a number line learning how to write fraction symbols. In an exploratory task each

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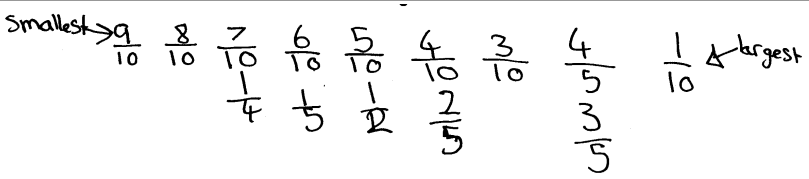
pair were asked to order a set of fraction symbols from smallest to largest. Fran and Laura's ordering and explanation is given in figure 1.



We know	*'that the smaller the number the bigger the fraction (for tenths), 1 half is the same as 5 tenths, quarter goes halfway between start and half'*
We worked out	*'that 2 tenths same as 4 fifths and 2 fifths same as 4 tenths'*
We guessed	*'where 1 fifth and 3 fifths went'*

Figure 1: Fran and Laura's exploration of fraction ordering

During the teaching task that followed they were asked to repeat the task using a set of fraction shapes. They realised they had made an error with the ordering of tenths. They broke down emotionally becoming angry, refusing to accept the fraction shapes were correct, arguing, crying and becoming very upset with me. My role was to tolerate this because the children needed freedom to express how they felt and this is just as valid as talking about mathematics. Once the emotion had been expressed we tackled the problem in such a way as to retain their dignity. We worked through fractions with numerator 1 so they understood where their idea had come from. I was then able to show them that we were moving on to something new.

Asking questions

The children confused decimals and negative numbers. In an exploratory task they were given a range of numbers, including decimals, fractions and negative numbers, and asked to circle those that they thought were numbers. The children circled positive whole numbers and zero. At the start of the teaching task that followed I said *'All of them are numbers'*. The children intervened with exclamations of surprise. Then Angela interrupted and a question and answer session took place. She clarified her changing ideas about numbers, asking *'Minus numbers aren't decimals?'*; *'Minus numbers aren't fractions?'* and *'Fractions aren't decimals?'* .

Negotiation

In an exploratory task working with numbers to one decimal place, the children were asked to *'round to the nearest whole number'*. They successfully rounded 36.7 up to 37 but only Sally rounded 99.4 down to 99. The others thought it should be rounded up to 100. Fran in particular insisted that *'you always round up'*. In the teaching task that followed, I introduced a number line. Laura labelled the line from 99 to 100 and then added 99.4. Everyone except Fran then agreed that the nearest whole number was 99. Fran continued to say *'you always round up'*. I asked them to round 99.5, suspecting this may shed light on Fran's insistence. All the children except Fran said that the task could not be done because it was the same distance from 99 and 100. Fran shouted *'you round up!'*. It was clear to everyone where Fran's idea had come

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from. The task ended with Lance coming out unasked, walking back and forth across the line articulating a general idea about rounding.

These three examples illustrate the general working consensus of the classroom. The children were able to express emotion, ask questions and negotiate mathematical ideas freely. I did not halt their interruptions, either emotional or cognitive. Consequently they were not passive observers but active participants and as such could be said to have power in their situation.

DISCUSSION

During the project my original planning was developed into a new working consensus. In their post project interviews the children made comments that indicated that they understood and shared in this working consensus. They said that learning mathematics was difficult and needed struggle, that I would not let them quit, that they could argue their point and that they would not be criticised for errors. Initially they resisted the idea of struggle but came to accept this as part of mathematical learning (Pendlington 2005 tells the full story of this work). The change in the children's behaviour indicated a possible swing to joker behaviour as some routine deviance occurred, for example Mike shouted out answers. The 'goodies' no longer saw pleasing me as their main interest – their frequent arguments showed this to be the case.

There was a change in their interests. Pollard's observation that children were interested in maintaining self-esteem and dignity, controlling stress and enjoying the lesson was true initially. The development of the new working consensus changed this so they did not have to worry about self-esteem, dignity and stress and only enjoyment remained from Pollard's list. Lack of criticism was a major factor in this. The use of praise for learning strategies removed the stress of trying to get things right. These subtle power changes gave the children a voice and once they learned to use it they enjoyed the lessons. Since the children's interests changed and group membership was not an issue, it meant that learning moved to centre stage.

Analysis of the exploratory tasks indicated the reasons for this change in the working consensus. They were planned to help me understand the children's mathematical knowledge but it does not seem unreasonable that the children gained ideas as well, particularly since I was sharing my insights with them at the end of the task. Exploratory tasks played a subtle role in changing power relationships at crucial times in the teaching and learning process. Most of the critical incidents occurred during exploratory tasks and the teaching tasks that followed. The exploratory tasks gave the children prior warning of what they did not understand. So they were able to intervene in teaching tasks with questions and arguments and teaching became a dialogue rather than a one way input from me. The exploratory tasks gave them thinking time and enabled them to learn during these tasks. So during the teaching tasks, when the teacher's power can be said to be at its greatest, this pre-knowledge changed the power balance very subtly.

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Papert, when talking about Logo, referred to the idea of a *power principle* (Ainley et al 2006). When children use Logo they learn while they are using the program. This is a different situation from conventional pedagogy where a teacher tells rather than learners using. Papert said that the power principle is activated during use and the conventional situation is reversed. This could be one explanation for what happened during exploratory tasks, which were often practical tasks. This idea raises important questions about the use of a whole class question and answer session at the beginning of the daily mathematics lesson. Can low achievers control stress, maintain self-esteem and dignity during this time? Where is the opportunity to explore ideas first?

Finally it is important to know what happened when the children returned to class. They continued to ask questions and give opinions but recognised the class ethos and put their hands up before they did so. They also achieved the required standard in their Key Stage tests at the end of the year against all previous expectations.

LOOKING FORWARD

In the discussion that followed the presentation of the paper, comments were made about the importance of the psychological emphasis on the work done with the children and questions were raised about nature of power. Are the ideas described about power or about something else? If the '*balance* of power' changed, what was the nature of that change? I would value comments about these issues and any others raised by this paper.

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