

# USING THE PLENARY TO DEVELOP REFLECTIVE AND CRITICAL THINKING AND TO ENHANCE METACOGNITIVE AWARENESS: STUDENT TEACHERS' PERCEPTIONS AND SCHOOL-BASED EXPERIENCES OF THE DAILY MATHEMATICS LESSON PLENARY

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*This paper describes how practitioner research was used to investigate use of the plenary as a vehicle to develop reflective and critical thinking and to enhance metacognitive awareness with undergraduate mathematics specialist student teachers. Students' perceptions and experiences of the Daily Mathematics Lesson Plenary were explored to assess the impact of the research on their perceptions and/or practice in school. The research findings suggest that student teachers who are introduced to plenaries to promote reflective and critical thinking may have the confidence to take these ideas forward into their own practice in the primary school. There was also evidence of students' practice impacting on the practice of teachers in school.*

## INTRODUCTION

This small-scale practitioner research project took place between September 2002 and December 2003 and was undertaken for my Masters Degree dissertation. In a previous Masters module I had been grappling with the vexatious problem of how I could determine if changes to my practice actually did lead to an improved learning experience for the students. In an attempt to use my 'sense' of the success or otherwise of my teaching, I asked my colleague and my students to record their perceptions of one of my sessions so I could compare them with my own perceptions. Students were asked to do this at the end of the two-hour teaching session. At this point I had a 'sense' that the students 'just wanted to go out to play'. This event made me think about the plenary in the Daily Mathematics Lesson and those children who 'just want to go out to play'. I wondered if I could develop worthwhile and engaging activities for the plenary. I was able to determine that there was scope for research into the purpose of the plenary from Ofsted reports which suggested the plenary continues to be the 'weakest part of the daily mathematics lesson'. (Ofsted HMI 554, 2002: 2). My research questions were:

- What is the purpose of the plenary in the Daily Mathematics Lesson?
- Who is the plenary for?
- What might be done in the plenary?

## AIMS OF THE RESEARCH

There were two broad strands to my research. Firstly, I wanted to research the effects of changing my own practice. I decided to include 'worthwhile' plenaries in my

teaching sessions with my first and second year undergraduate mathematics specialism students and to evaluate the impact of these on the first year students' assignments. I attempted to use the plenary to focus on supporting students' ability to reflect on their learning and to develop their metacognitive awareness where metacognition is '...the ability we have to reflect upon our own thinking processes.' (Fisher, 1990: 11) Secondly, I decided to research students' perceptions and experiences of the plenary in school in an attempt to explore if 'my' plenaries were impacting on their thinking or practice in school. My research was underpinned by three assumptions:

- Student teachers who are able to reflect upon their own learning experiences will have a 'better' understanding of the teaching and learning process.
- Students who can think critically may be able to question the 'given' curriculum.
- Students who have metacognitive awareness will understand their own learning strategies and may also see the benefit of encouraging children to use metacognitive strategies.

I decided upon the following success criteria for 'my' plenaries:

- The quality of students' written reflections of their learning from the module would be enhanced.
- There would be evidence that the students had taken forward ideas used in 'my' plenaries into school.

## DATA COLLECTION

Data were collected from first, second and third year mathematics specialist students on the BA (QTS) programme. First year students were experiencing 'my' plenaries but had very limited school-based experience and, as such, I was able to suggest that my approach to the plenary was a strong influence on their perceptions of the plenary. Second year students were experiencing 'my' plenaries and also had undertaken three school placements. Third year students were not introduced to 'my' plenaries so I was able to claim their perceptions were formed through either their mathematics curriculum sessions or from their school-based experiences; in scientific terms, the control group. Additionally data were collected from a colleague in the mathematics division and another colleague who is heavily involved in Continuing Professional Development at St. Martin's College. Data collection tools included extensive use of a reflective diary to record my 'noticing' (Mason, 2002) of student responses during the plenary, questionnaires, first year student assignments, in-depth interviews with students and colleagues and a video-taped group discussion with the second year students.

## FINDINGS

Through reading the first year student assignments, I was able to identify five areas which they commented on and which I suggest they were sufficiently concerned (Dewey, 1926) about to commit to paper. Thus I argue these areas are evidence of their learning from the plenaries. I call these Dimensions of Learning and I define them below:

**The Social Dimension** – This is related to students' awareness of how teaching and learning was organised in terms of drawing on the resources and thinking of others in relation to self and others. All students commented on the Social Dimension of their learning, for example:

“...this took lots of teamwork, with all of us helping each other out – just hearing one little word from somebody else can spark off a whole load of new ideas for you and set you off thinking in a new direction.” (Lucy)

**The Emotional Dimension** – I define this Dimension as students' awareness of emotional responses to learning and their awareness of how emotional state impacted either positively or negatively on their learning. There were allusions to emotion in all the assignments:

“The importance of this investigation was for us to feel the emotion of being stuck and the frustration of not reaching a conclusion. It taught me strategies and other thought processes to combat these emotions and that we can still learn a great deal without actually solving a problem to its final outcome.” (Gary)

**The Mathematical Dimension** – This is students' awareness of the mathematical strategies they were introduced to and used during the module, for example:

“...I realised I could have controlled one of the variables. By doing this the data is more restricted.” (Paul)

**The Metacognitive Dimension** – This refers to students' awareness of their own learning strategies and learning styles and how they might use this to enhance their learning in future:

“I became aware that I need to see it built [domino bridges] to obtain an idea about numbers. I had not previously been aware that my method of learning might be visual or kinaesthetic.” (Mandy)

**The Professional Dimension** – This is students' awareness of learning in others and the transferability of their own learning experiences to the primary classroom. There was no suggestion students should mention the implications of their learning for teaching and learning in the primary school in the assignment criteria so it was interesting to see these comments. Lucy wrote the following:

“I feel that these new ideas that I have will help me greatly in the classroom, as if you can get across to children that it is okay to be stuck, it's about the paths you take, then that

will greatly boost their self-confidence and encourage them to try new things and keep trying.” (Lucy)

In addition to the five Dimensions of Learning, students made explicit reference to the plenary:

“Then at the end of the lesson came something I had never experienced as a mathematician before, the plenary. This invaluable end of the lesson drew everyone together to contribute his or her feelings, problems, achievements and questions. The reason I feel the plenary is so useful is that everybody learns from it. The teacher learns how well the group has got on and can add further information if necessary and stop any misconceptions. The individuals in the group gain valuable insight into how maths is done, what people think and pick up useful tips from others.” (Barry)

The above extract does suggest that for one student at least, the plenary was seen as a valuable and ‘worthwhile’ part of the lesson. This led me to think that I could use the Dimensions of Learning to analyse the other data I had collected to attempt to assess the impact of ‘my’ plenaries on the students’ practice, perceptions and experiences whilst also triangulating the data with my colleagues’ views.

### **STUDENTS’ PERCEPTIONS AND EXPERIENCES OF THE PLENARY**

Third year students’ perceptions and experiences of the plenary were confined to the Mathematical Dimension, for example:

“To consolidate what the children have done and assess what the children have learnt.”  
(perception)

“It is either not done or used to repeat what has been taught using same technique, like a test.” (experience in school)

This was similar to my mathematics colleague’s view:

- FL        So you think, in your experience, the plenary of the mathematics lesson is always about mathematics?
- BS        Yes, it’s always about the mathematics we did in that lesson because that’s the interpretation that has been put on it in school and the way you read your Numeracy Strategy would seem to indicate that.

The data from the second year students provided evidence of perceptions and experiences in all the Dimensions of Learning and also evidence of the students’ practice impacting on teachers in school. This suggests that their experiences in College were impacting upon their practice in school:

- LD        I did that in my P.E. lessons. I did that in both of my P.E. lessons. I asked children to tell me what they liked about the lesson and what they didn’t like and what they liked doing and what they didn’t like doing. And my teacher, who was observing the lesson put: that’s the best way of evaluating the lesson. She said she’d use it herself from now on because she’d liked it.

First year students' data suggested that in terms of perceptions of the plenary in school they saw the plenary in terms of the Social Dimension, the Emotional Dimension and the Mathematical Dimension. There were no overt references to the Metacognitive Dimension. My explanation for this was that whilst students were able to identify metacognitive strategies for their own learning, they were perhaps unable, at this stage in their professional development, to see how teachers can support children's development of metacognitive skills.

In addition to the findings from the data, my own thinking changed over the course of the research. I began to think that in fact the plenary was 'simply' a vehicle to support the reflective and critical thinking and metacognitive behaviour:

Actually there is a bit more to this plenary business than is immediately apparent, for example does the plenary always have to be at the end of the lesson if we are going to focus on how we learn? Also should we have 'times' during the lesson when we stop and think about what we are doing and jot down any thoughts that might have come to us so that we have captured them. Initially the teacher might designate these 'stop 'n reflect' times but eventually the students might have the confidence to tell the teacher they want a 'stop 'n reflect' time. (Reflective diary)

## SUMMARY AND RECOMENDATIONS

My research found that:

- I was able to develop my practice. Student assignments were enhanced.
- Students who had been experiencing 'my' plenaries had a broader view of the scope and purpose of the plenary.
- There was evidence of students taking 'my' plenary ideas into school and hence being able to critique the given curriculum.

My research found that I was able to help students to think 'outside the box'; that is the 'prescribed curriculum box'. Thus I make the following recommendations:

- Teacher educators may wish to consider how they might encourage students to think beyond 'this is how it is' and model for them a 'this is how it could be' interpretation of the plenary.
- Teacher educators might consider ways in which they can encourage students to think about thinking, to think about learning and to think for themselves and thus help students to take their first steps towards becoming autonomous and critically reflective professionals.

As a result of this research I believe I have enhanced my practice though systematic and continuous self-reflection on, and self-evaluation of, my teaching. My students' comments about and evaluations of their teaching and learning experiences during our plenary discussions have provided me with another perspective on my practice which in itself could be a rationale for encouraging students to think critically.

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