

THE INVISIBLE CHILD IN THE MATHEMATICS CLASSROOM: A PRELIMINARY REPORT ON QUIET DISAFFECTION

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The number of pupils choosing post-GCSE mathematics and achievement in pre-GCSE mathematics are affected by pupils' attitudes towards mathematics as a school subject and by their experiences in the mathematics classroom. We have been awarded an ESRC research grant to study quiet disaffection in secondary mathematics classrooms and to uncover the reasons for pupil disengagement from school mathematics. Here we review relevant literature on pupils' attitudes towards the learning of mathematics and on sources of disaffection and under-achievement: in particular, we discuss the effect on pupil achievement of their confidence and interest in mathematics and of the learning environment of the mathematics classroom. We also present examples from our preliminary classroom observations.

Choice of mathematical studies as well as performance in mathematics are partly influenced by attitudes towards mathematics shaped principally at school level. Therefore negative attitudes towards mathematics may lead to underachievement and reluctance to pursue further mathematical instruction. Research often focuses on disaffection in the mathematics classroom as evident in disruptive behaviour, absenteeism or special needs: thus it ignores a group of pupils whose disaffection is expressed in a tacit, non disruptive manner, namely as disengagement and invisibility. Ignoring this often large group implies that the mathematical potential of these learners may remain defunct.

Aims and origins. Our study aims at examining these under-researched pupils' experiences of quiet disaffection in the mathematics classroom and at suggesting re-engagement strategies. This integration of cognitive and affective perspectives on mathematical learning, namely one that merges the study of pupils' attitudes towards and achievement in mathematics, has been highlighted (McLeod 1992) as a potentially fertile ground for research in an area where traditionally the distinction between cognition and affect has been dominant but often counterproductive: as studies of mathematical cognition have tended to miss important characteristics of performance, they failed to gather crucial data on students' affective responses. Furthermore studies of performance, unlike affective studies, have had a stronger influence on curriculum development and teacher education, and an integrated perspective is likely to enhance the influence of findings relating to affective issues.

Our study originates in the first author's previous involvement with a study of disaffection in secondary education and the second author's previous school-based research and teaching experience in the area. Results from the now concluding disaffection study indicate that there is a wealth of evidence specific to mathematics to be explored with regard to this form of disaffection. Therefore research which offers an extension of this study and addresses this rarely explored, but significant, topic is timely.

This three-year study, now nearing completion, was funded by the Teacher Training agency and conducted by the Norwich Area School Consortium, a partnership between the University of East Anglia, the Norwich LEA and eight local secondary schools. The Consortium was created in order to conduct research on disaffection in its member schools. This process has allowed approximately 70 teachers to be involved in small-scale action research projects (Elliott 1991) within the Consortium over the course of three years. The first author has been involved with NASC at its later stages as a mentor. A relatively small percentage of these projects were specific to a curriculum area and hardly any were specific to mathematics. However, in a number of these projects, some crucial observations were made regarding a relatively under-researched type of disaffection: quiet disengagement and invisibility. Since a root of our study can be found in these observations, let us make a brief reference to one of these projects, the *RHINO Project*.

Within one of the eight NASC schools, a qualitative study (Oakley 1999) was conducted in which a small number of quietly disaffected students (RHINO: Really Here In Name Only) were identified, observed and interviewed. Subsequently intervention strategies, tailored to the students' individual needs, as identified in the research, were applied and evaluated. As the first author was invited to comment as an evaluator on the NASC school-based research projects, a scrutiny of the study alerted her to the difficulties of identifying RHINO pupils as well as to the necessity and potential richness of research in the area within specific curriculum subjects such as mathematics where this type of disaffection is quite common.

Theoretical Background. This study is on disengagement in the secondary mathematics classroom and on re-engagement strategies: our focus, for the former, has been mostly on studies that go beyond the classical divide between cognition and affect (as explained above we find this distinction particularly unhelpful). For the latter, we have focused on works that recommend reinforcing the confidence of the quietly disengaged students. Given that we are currently at the early exploratory stages of our investigation, we review briefly a small part of the former section of this literature, which currently drives our thinking. We then conclude with a concise description of our data collection and an example of our preliminary data.

Non-mathematically specific research (e.g. Keys and Fernandez 1993) suggests that it is likely that, as pupils proceed to the later years of their schooling, they often become more disenchanted with the education process. 'Teaching and learning practices' ranked highly in the students' questionnaire responses to what made them positive towards school and school work. Regarding mathematics lessons, the students expressed a preference for 'working with their friends', 'making' and 'discussing things'.

The above resonate with the findings in Jo Boaler's comparison of two schools with different approaches to mathematics teaching (1998): in the first school, which used a traditional text book approach, despite being 'repeatedly impressed by the motivation of the students who would work through their exercises without complaint or disruption', the students' three most frequent descriptors of mathematics lessons were 'difficult', comments related to the teacher and 'boring'. Students believed that mathematics just involved memorising and routine execution of rules. In the second school which used an open-ended project approach despite having 'very little control, order, and no apparent structure to lessons' students were expected to be responsible for their own learning and the three most frequent descriptors of mathematics lessons were 'noisy', 'a good atmosphere' and 'interesting'. Elsewhere (1997) Boaler discusses also gender related differences on the same issues.

In the study mentioned earlier, Keys and Fernandez refer to disillusionment with and dislike of school; lack of interest and effort in class and homework; boredom with school and schoolwork; dislike of certain teachers or types of teachers; resentment of school rules; belief that school would not improve career prospect; low educational aspirations; low self-esteem and poor academic performance, as factors associated with disaffection or disengagement. They also discuss the concept of motivation as intrinsic (arising from interest in the subject being studied) or extrinsic (depending on the availability of external rewards). Norwich (1999) adds to these reasons two more categories: identified (e.g. recognition of the importance of mathematics) and introjected (e.g. parental pressure). In his work, introjected reasons were the stronger influences on satisfactory learning and behaving whilst intrinsic reasons were the stronger influences on unsatisfactory learning and behaving. This substantial reciprocal relationship between attitude towards and achievement in mathematics has been made in another recent quantitative study in the United States (Ma 1997) with the three attitudinal measures being Importance, Difficulty, and Enjoyment and with Achievement as the Outcome. Significantly Ma contends 'making difficult content easy to learn is barely enough to improve mathematics achievement. It is more important to ensure that difficult mathematical content is presented in an interesting, attractive and enjoyable way'. And: 'It is inappropriate to assume that high achievers in mathematics have few attitudinal problems.'

Outline and methodology. Participants of the research are mathematics teachers and pupils based in 3 Norwich schools, previously involved with NASC. This previously established contact and willingness to participate (all schools were approached but our selection was based on school response, pilot lesson observations and timetable constraints). The field of the research are Year 9 mathematics lessons. This is a one-year project and is funded by the Economic and Social Research Council (Award No R000223451).

The second author observes mathematics lessons in which the participating mathematics teachers are involved and, also through consultation with the teachers, is now engaged with identifying a group of mathematically disengaged pupils. In the near future an attitudinal survey administered to the pupils will complement this process (but will be the main source of evidence for the more quantitative study that she needs for the completion of her MSc in Research Methods).

This extensive observation of the mathematically disengaged pupils will be supplemented with interviews of the observed pupils (these will be interviews of the whole class cohort in groups of approximately five pupils to avoid the implication of the observed pupils noticing their 'singling out' for observation): these will be semi-structured interviews in which the researcher will draw the pupils into an exploration of particular classroom incidents relating to disengagement as well as their general attitudes towards mathematics and its teaching. Occasional interviews with the teachers will support this process.

The researcher keeps fieldnotes of the lesson observations and the interviews will be audio-recorded. She then passes her fieldnotes on to the project director, the first author, who annotates those with comments of a substantive and of a methodological nature. This commented upon document is the Observation Protocol and there is one such document for each lesson. This process is carried out on a weekly basis so that the researcher's technique is constantly informed by these comments and our subsequent discussion of those comments.

We conclude now with an example of a Disengagement Incident identified in the Observation Protocols of Week 1: Jade is a candidate for the group of children whose performance and attitudes we wish to probe further (see above methodology). [...] signifies omissions from the fieldnotes and italics the observer's own comments. Jade is in Set 4 in a school with 8 Sets in Year 9: students are allocated to a Set on the basis of success in Modern Foreign Languages or Mathematics. Therefore her Set is fairly mixed in ability with talented linguists who may not be talented mathematicians. The school is currently using new SMP draft materials.

EXTRACT from Lesson [school]1.2: 01/11/00 Wednesday P4 1:25 — 2:25

From Susan's Field-Notes

I sat next to Jade, Charlotte and Ellie

I talked to Jade who seemed to confidently start the first question but then couldn't believe she could do it. *She didn't want me to sit next to her*

Jade: "I'm no good at maths. I've never been any good at maths"

Me: "What about last year or in Middle School?"

Charlotte: "It was alright last year with Mr. J."

Jade: "He didn't make you work"

Jade gave up completely when she thought her two friends had a different answer to her — looked at her watch and sighed.

[...]

Jade approached by student teacher — body language suggested that she just wanted to be left alone. She could not believe she had done it right especially when it was pointed out that only the diameter was needed in this qu. And she had worked out the radius.

She started drawing margins in her book and writing down qu. nos. — *avoid maths activities*

[...]

Stud. Teacher went back to Jade: "I really don't like maths"

Me: "What do you do when you don't understand"

Jade: "Wait till she's free and ask her"

Me: "Do you put up your hand?"

Jade: "Sometimes or otherwise I ask them (friends on table) — she's too scary"

[...]

The 3 girls talk about their next lesson

Ellie: "He (another subject teacher) sent me out for saying his jokes are rubbish *c.f. maths where she never says anything to the teacher*

Jade: "I don't like any teachers"

Is this an expression of disenchantment of school in general not just maths in particular?

A brief comment on a Disengagement Incident. In the above Jade's body language and verbal statements indicate her quiet disengagement during the specific mathematics lesson. Despite a confident start, her encounter with the first question proves crucial in her subsequent decreasing willingness to engage with the task. Her withdrawal is also becoming an increasingly private matter as she indicates to the researcher her unease with being observed (a signal repeated later towards the student teacher). Despite this, she still engages in a conversation with the researcher and sums her view of her mathematical ability as 'no good at maths'. Her withdrawal from the task is complete a few minutes later when she realises that her answer does not match that of her friends at the same table and followed by various displacement activities. Significantly, her response was only inches away from being correct (she calculated the radius instead of the diameter).

In the extract Jade's statements provide numerous potential sources of her disaffection with and withdrawal from this mathematical task: disenchantment with her teacher (regarding availability and welcoming of questions), self-imposed pressure regarding the success of her peers, limited persistence on a question that turns out to be well within her problem solving capacity... In the ongoing data gathering and subsequent reflection on the data, clarification and refinement on these and other sources of quiet disengagement is what we hope to achieve. Once progress on this has been possible, we will then align our efforts towards the development of re-engagement strategies.

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