A COMPARISON OF STUDENT THINKING IN A MATHEMATICS AND A SCIENCE CLASSROOM

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INTRODUCTION

The research reported in this paper was undertaken to investigate the thinking of four grade eight students in their mathematics and science classrooms. During an earlier study (Edwards & Marland, 1982), students suggested that contextual variables, such as the particular subject area being taught, coerced different thinking on their part. Mathematics was specifically mentioned as one area where students believed that more intensive information processing commonly took place. This study was designed to reveal the in-class thinking of students in the subject areas of mathematics and science and thereby to allow some comparisons to be made.

The study was conducted within the mediating process paradigm (Doyle, 1977) in which students are represented as active agents in their own learning, directing, monitoring and, where necessary, redirecting their own mental efforts. Accepting that the learner determines the 'received lesson' just as much as the teacher seems a fundamental premise in better understanding the teaching-learning process.

METHODOLOGY

Access to students' thinking during classroom instruction was obtained using a post-lesson interview technique, with recall of in-class thinking being stimulated by means of lesson videotapes. This stimulated-recall interview technique (Clark & Yinger, 1979) has been widely used in process-tracing research to study the mental functioning of people in a range of environments.

Four grade eight students from a moderately large independent secondary school in a provincial city in Queensland participated in the study. Each was chosen by means of a preliminary interview from a cross-sectional group nominated by the two teachers involved, one in maths, the other in science. Criteria used in the selection included expressional clarity, openness, ability to articulate their thinking, and willingness to participate.
Three lessons were videotaped in each subject over a period of one week, with two cameras being used to produce a split-screen recording. One camera focussed on the teacher, the other on the four students and their near neighbours.

Stimulated-recall interviews were held immediately after each lesson, involved one student at a time and one of the two researcher/interviewers, and were each of approximately forty-five minutes' duration. Students were asked to recall all in-class thinking as fully and accurately as possible, with anonymity and confidentiality assured. Each interview was audiotaped, then transcribed for subsequent analysis.

The teachers involved were the regular maths teacher and science teacher for the class. All data were collected in the school setting in regularly time-tabled lessons and rooms, and the teachers were asked not to consciously vary their regular or planned approaches to the lessons. The only disruption was that caused by the presence of the cameras and the technician.

THE LESSONS

MATHEMATICS. Almost all of the time in the three lessons involved the teacher explaining mathematical problem-solving techniques and going through problems on the blackboard. Students were questioned regularly and there were whole-class discussions. The last third of lesson 2 involved students doing problems on the board while the teacher moved around discussing issues with the whole class, small groups or individuals.

SCIENCE. In lesson 1, after a brief introduction, the teacher demonstrated from the front the procedures for using a microscope. The students followed on their microscopes, discussing, answering questions, listening to explanations and drawing diagrams of the microscope. The teacher gave individual remediation towards the end of the lesson. After a brief revision, lesson 2 involved the students studying cheek cells under the microscope. The teacher moved around the room working with individuals or pairs of students, occasionally drawing whole class attention to particular points. The lesson was rounded off by the teacher highlighting important points that had arisen. Lesson 3 was a continuation of lesson 2.

THE STUDENTS

All four students were between 13 years and 13 years 7 months and thought both teachers were good teachers with whom they related well. Susan rated herself in the top third of the class academically, while the other three felt they were in the middle third. Below is some other brief background information: