QUESTIONING THE TEACHING OF SCIENTIFIC GENRES

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ABSTRACT

This paper questions the practice of teaching major scientific genres, such as the laboratory report, in the junior secondary and primary years. It argues that less formal expressions of understanding are more appropriate because they allow greater opportunities for students to clarify their ideas and make sense of their experiences.

The established link between language and learning has led to the inclusion of language policy statements in most syllabuses and curriculum frameworks, but not surprisingly, perspectives of how language should be developed through the curriculum vary considerably. The particular variation that concerns me here is the degree of emphasis placed on the teaching of scientific genres (cf Christie, Martin & Rothery, 1989; Lemke, 1988, 1990; Sawyer & Watson, 1989). I am concerned that an over-emphasis on teaching scientific genres (the conventional forms of writing used for particular purposes, e.g., laboratory reports) may reduce the engagement of children in the process of making sense of their experiences.

My concern is backed up by recent pre-course survey responses from my third year primary teaching students. Figure 1 illustrates how one student represented her perception of teaching science. Note the familiar format of a laboratory report! Another student requested that the course should deal with laboratory reports so that she could learn how to teach her students "the right way" to write-up laboratory reports. Of course, these views are not restricted to pre-service or primary teachers. A beginning secondary science teacher recently advised me that it was her department's policy that laboratory report writing was to be taught and assessed as early as the first year at her school.

Figure 1: Representation of a Primary Teaching Student's Perception of Science Teaching
Lemke (1988, 1990) identifies two types of scientific genres:

The "minor genres" of science are the shorter, simpler forms like descriptions, comparisons, definitions, and syllogisms.... The "major genres" of science, like the lab report, are usually longer, more complex, and more specialized to the work of science (1990, p. 171).

The major reason Lemke provides for those students who are not able to pick up the rules of formal genres by themselves. He argues that:

When education fails to empower, few have the opportunity to realize their full potential, and fewer have the tools to challenge the limits others place on their opportunities. An education in which the genres of power are not shared and the thematics of empowering disciplines are left obscure to all but a few, is the severest limitation of all (1988, p. 89).

While science teachers have been trying to make school science more accessible to all children for some time (eg. "Science For All" policy) an overemphasis on report writing might alienate the very children Lemke seeks to empower. When children play the game of completing cook book practicals followed by the tedious task of writing-up their formal reports they miss out on valuable time which could have been better spent clarifying their own understanding. As one student admitted:

If the experiment doesn’t work we go to somebody else and get their results... you have to hand it up and it looks better when you get results that you are suppose to. When you read the aim of the experiment you get a good idea of the type of result you are expected to get. And if you don’t get that result and you put it down, it’s pretty obvious you won’t get as good a mark as someone who got it to work (Fordham, 1980, p. 114).

Historically, the laboratory report has a long tradition in school science, as part of the preparation of professional scientists. However, in a neat critique on the emphasis of laboratory reports, Sutton (1989) argued that this sort of training suppressed first thoughts, conjectures, preliminary beliefs, and reasons for doing experiments which leads to "...both a misrepresentation of science and an interruption in the development of the learner’s own thought" (p. 142). His recommendations for the role of language development in science for general education appear to contradict Lemke’s (1990) position. Sutton asserts:

The main purpose of writing will not be to report experiments, but to help the learners to reformulate their own understanding - reflecting on what they are learning, coming to terms with new ideas, building up fluency in using these ideas to interpret aspects of the everyday world. Where writing is associated with practical work, there will be more emphasis on first thoughts, but generally writing will be less closely tied to experiments than at present. A more important kind of writing might be ‘Our understanding of what the book is arguing’. Certainly the stylized laboratory report is not how a learner would write to get to grips with ideas. An educated citizen should know about such reports, see some and perhaps practice trying to write that way once or twice. He or she will not engage in poor mimicry of the scientists’ ways week in week out for years (p. 154).

To be fair to Lemke, however, he does recognise the limitations of teaching scientific language and recommends the use of some interesting alternatives:

[Teachers] need to understand that it is all right to talk about science in other ways, and that the formal scientific style is not the whole of science... Teachers should use all the stylistic and rhetorical means available to communicate science to students, including narrative and dramatic presentations; humor, irony, and metaphor; fiction and fantasy; reference to actual scientific activities, disputes, and persons; personal anecdotes and historical examples (1990, p. 174).

My point is that these less formal styles of language are those which should be emphasised in school science, particularly in the junior secondary and primary grades.

**ALTERNATIVES**

It is not my intention to discuss the application of all the informal styles of language suitable for school science but rather to highlight those which could be used as alternatives to the laboratory report. White and Gunstone (1992) describe several alternatives worth trying, two of which I have used in teacher workshops with some interesting outcomes: drawing and what they call POE (Predict, Observe and Explain).

Drawing in science has several advantages. It:

- can reveal to the teacher and student the ideas held by the student;
- can be fun to do;
- enables teachers to discuss learning with students as well as helping students to reflect on their own learning, both of factual content and of attitudes (White & Gunstone, 1992); and
- allows less literate students to express their thoughts visually.

 can act as a bridge to using scientific language,
While several Australian researchers (Hayes & Symington, 1989; Lowe, 1987; Symington, Boundy, Radford & Walton, 1981) have been arguing for greater recognition of drawing as an effective teaching/learning strategy for some time, it was only recently that I became a "convert". It wasn't until David Symington asked workshop participants, in Canada of all places, to draw the human skeleton that I appreciated the learning potential of this technique (as well as Leonardo da Vinci's marvellous talents). Even though I had seen illustrations and models of the human skeleton many times, questions like: "How many vertebrae are in the neck?", "How does the scapula form part of the shoulder joint?", and "What keeps the pelvis in place?" raced through my mind. Not only can drawings be used to determine student understanding, but also to help children express their first thoughts. For students who experience difficulties getting started when asked to describe their observations it might be helpful to encourage them to draw what happens first. In this way, drawings could be used in conjunction with POE.

POE stands for Predict, Observe and Explain. Most investigations in junior school science can be based on students' questions. Of course, the teacher, from time to time, might wish to use an investigable question to focus attention on a particular concept. In teacher workshops, to demonstrate how POE might be used to help guide students investigate questions, I have used the question "What happens when you mix oil and water?" More than half of the teachers involved in one workshop predicted that the water would float on top in spite of seeing media reports of the effects of oil spills. Some thought that the order of pouring the liquids affected the results while others thought that there must be some other property of liquids which had them confused (i.e. viscosity). In all cases, several additional questions for investigation emerged. The teachers were motivated to seek solutions to their own questions in order to make sense of their experience and this is exactly what we would expect of children too. In POE the formal writing that is associated with lab reports is replaced by a more natural expression of understanding, which can include the use of drawings for predictions and observations.

CONCLUSION

I am unconvinced that laboratory reports and other formal writing in junior school science are the best ways to help students make sense of planned experiences. The less formal techniques of drawing and POE give more time for clarifying ideas and understanding, and yet still result in a permanent record.

While I have questioned the role of report writing I have not discarded it totally. My point is that learning this genre, should not be at the expense of science learning and student enjoyment. As the level of science instruction increases (i.e., the closer one gets to becoming a professional scientist) so too should the skills/techniques (eg report writing) of the profession be introduced and mastered. Laboratory reports could be introduced in the upper secondary school as students become more clear about their careers. Initially, these reports could be extended from the POE, emphasising the continuing need to design investigations from questions.

<table>
<thead>
<tr>
<th>Prediction</th>
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<tbody>
<tr>
<td>Oil floats on water</td>
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<tr>
<td>Water floats on oil</td>
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<tr>
<td>Oil and water mix</td>
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Reasons for prediction

Oil is thicker than water so it should sink.

Observation

Oil floats.

Explanation

Oil must be lighter than water unless it was the order which made a difference.
What would happen if water is poured on oil?

Figure 2: POE Script - Oil and Water
Techniques which promote language development (cf Scott & Keystone, 1991) in science should be used in such a way that they actively contribute to the major purpose of school science - to help children make sense of their experiences.

REFERENCES


