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Inquiries into the state of mathematics and science education in Australia express the need to make the curriculum more relevant and meaningful to students’ lives. However, such a vision requires that teachers understand how relevance can enter mathematics and science classrooms in a meaningful and appropriate way. This paper asks, how is relevance thought of in mathematics as compared with science, and what problems might this pose for teachers moving between mathematics and science? Snippets of classroom practice and interview data with six mathematics and/or science teachers are used to highlight “stories” that teachers used to relate mathematics and science to students’ lives. The teachers were seen to relate the subject matter to students’ lives in different ways, depending on teachers’ beliefs relating to effective teaching and their disciplinary background. Four approaches are identified as categories of meaning-making. Each category presents the subject differently. The analysis has shown that relevance is a multi-faceted construct and that teaching across subjects requires an understanding of not just the stories that can be told, but also an understanding of what is appropriate for making the subject matter relevant to students’ lives.
Experiencing relevant mathematics and science through story

1) Background, aims and framework

The disparity between the science and mathematics education being offered and the needs and interests of students continue to be of growing concern (Department of Education Science and Training, 2003; Goodrum, Hackling, & Rennie, 2001). The Education Training Committee (2006) found that one of the major factors contributing to student disengagement in secondary mathematics is the lack of connectivity between students’ lives and mathematical problems. Similarly in science, the Committee recognise a need for curriculum approaches that focus on, among other things, relevance to students’ lives. However, a move towards relevant curriculum will depend on teachers understanding how relevance can enter mathematics and science classrooms in a meaningful and appropriate way.

This paper uses snippets from classroom practice to explore how six mathematics and/or science teachers attempted to make the subject matter meaningful for their students. The paper asks the questions, how is relevance thought of in mathematics as compared with science, and what problems might this pose for teachers moving between mathematics and science? These attempts are referred to as “stories” or “narratives” because it was through discussions about stories that many of these ideas emerged from the teachers, and as “stories” they “help students organize their knowledge into explanatory frameworks which serve them as interpretive lenses through which to comprehend their experiences” (Milne, 1998, p.178).

2) Methods

This comparative study aimed to explore how teachers of mathematics and science in lower secondary school experienced the subject cultures of mathematics and science; identification of those pedagogies that appeared to be representative of the subject cultures; and ways in which pedagogy was shaped by teachers’ experiences with the subject cultures. Various qualitative methods were used over 18 months to periodically observe, video and interview six secondary science and/or mathematics teachers: Donna, Pauline, Rose, Simon, Ian and James. I observed teachers’ classroom practice during a sequence of teaching in mathematics and/or science, and two of these lessons were videoed for each teacher. A reflective interview with each teacher followed a private viewing of video footage from their classrooms—a modified video stimulated recall process (Clarke, 2001; Senger, 1998). For four of the teachers, a focus group discussion and a second round of observing, videoing and interviewing followed. The use of stories to make links between students’ lives and subject matter emerged during a preliminary analysis of classroom and interview data, and was seen to be more prevalent in science than in mathematics classes. A following thematic analysis of the interview transcripts explored the various ways that teachers explicitly or implicitly made these links.

3) Results
All teachers believed it was important to relate the content matter to students’ lives; however, they seemed to approach this issue of relevance differently, both in practice and in their stated beliefs about what it means to teach effectively. For example, Pauline, a science teacher who also teaches maths, used stories in science to show how science relates to students’ lives, but struggled to find and use stories in maths. Donna emphasised the need for students to develop their own stories as contexts that students could explore familiar phenomena in both subjects. Rose’s use of stories in maths often modeled the use of mathematics in everyday life.

Four types of pedagogical approaches were found to be representative of how the teachers recognised what needed to be made meaningful and relevant and how this could be portrayed for students. These were labeled as categories of meaning making. Mathematics and science are presented differently in each category, and the stories serve to focus on different aspects of both the subject matter and the place that this has in students’ lives.

**Category 1: Illustrations of relevance**

The first category included illustrations of relevance. These were often referred to by teachers as examples of stories they would use to relate the subject matter to students’ lives. They acted as examples that gave shape, meaning, relevance and sensibility to explanations given in class. A teacher needs to be aware of not just the concept under study, but also the various phenomena that students might be familiar with and have an interest in that will give the abstracted concepts a concrete application.

In mathematics, the examples illustrate how the subject matter provides a tool to represent patterns recognisable in society, particular ways of thinking that students may carry out or encounter in their lives, and thinking processes that they may have experienced or where they can see the application. In science, they are illustrative of how science explains natural phenomena. Science illustrations emanate more naturally from students’ experiences than in mathematics.

**Category 2: Explorations of contexts**

The second category included those instances where contexts were used to challenge students to think more deeply about the subject matter. These contexts were built around the students’ interests, or were generative of new interests. The power of this category lies in the way a complex series of ideas are pulled together and given meaning through an application. Connections are made between the subject matter and ideas or phenomena that are already understood by the student or that hold intrigue. The result is a coherent and deeper understanding of the subject matter.

In mathematics, such stories can be used to develop “problem solving activities” or “open-ended tasks”. In science, “regurgitating questions” can be replaced by student-generated questions, for example, exploring refraction by investigating lighthouses, which are a prominent part of the lives of these students.
Category 3: Humanising stories of historical and contemporary “heroes”

The third category included stories that were used either implicitly or explicitly to *humanise* the subject. I observed these stories in science, but not in maths. The stories focused on the discipline of science, and included stories about *historical and contemporary “heroes”* that contributed to the development of scientific knowledge. These stories have the potential to demonstrate the development of science and mathematics ideas over time.

Category 4: Representations of the human endeavor

Other stories related to the ways teachers modeled or emphasised in their teaching the *human endeavor* of science and mathematics, including how mathematics and science provide the means by which we can live our lives as functioning human beings. They included examples of how mathematics and science affect our lives and teachers’ personal encounters with mathematics and science, and were dependent on the extent of teachers’ experiences with and knowledge about the discipline.

4) Conclusions and Implications

All teachers felt that it was important to relate the subject matter to students’ lives in some way, so relevance could be considered a fundamental and powerful discourse. However, the fact that different teachers emphasised relevance in different ways by using different strategies suggests that a teacher’s decision about what to tell and why they tell it is dependent on a teacher’s beliefs, knowledge, experiences and commitments in relation to mathematics and science.

Understanding how teachers of mathematics and science conceptualise relevance and how they connect subject matter to real life can inform teaching practice in two ways. Firstly, comparing the role of relevance in mathematics and science illustrates the various meanings that relevance can have for teachers. Relevance is then a multi-faceted construct. Secondly, it demonstrates that expecting teachers to make the curriculum relevant is not necessarily unproblematic because the meaning of relevance is not collectively understood, nor is it the same for mathematics and science. Therefore, teaching across subjects requires an understanding of not just the stories that can be told, but also an understanding of what is appropriate for making the subject matter relevant to students’ lives. For teachers moving between mathematics and science teaching, especially when moving into a subject for which they have limited appreciation or experience, understanding how the subject can be made relevant for their students and themselves is valuable information.

Elbaz-Luwisch (2002) describes the practice of teaching as being constructed when teachers tell and live out particular stories. Teachers having stories to tell is important, not *only* in terms of sharing anecdotes in the classroom that reveal the teacher’s view of the subject in an effort to draw students into the subject, but it fundamentally reflects back on the teacher as part of their personal response to the subject. In this way, stories
have a reflexive character as they have the potential to give the teacher a confidence and level of commitment that may be evident as a passion for teaching the subject to students.

5) Bibliography


