This is the published version:

Hubber, Peter 2010, Teacher change in exploring representational approaches to learning science, in GIREP-ICPE-MPTL 2010 : Proceedings, Universite De Reims, [Reims, France], pp. 90-91.

Available from Deakin Research Online:

http://hdl.handle.net/10536/DRO/DU:30030937

Reproduced with the kind permission of the copyright owner.

Copyright : 2010, Universite De Reims
Teacher change in exploring representational approaches to learning science

Peter Hubber
Deakin University,
phubber@deakin.edu.au

The researcher worked closely with two biology-trained teachers to plan three teaching sequences in the topics of forces, substances and astronomy that were subsequently taught to Year 7 students. The sequences sought to develop a model of classroom practice that foregrounds students’ negotiation of conceptual representations.

The difficulties encountered by individuals in learning science point to the need for a very strong emphasis of the role of representations in learning. There is a need for learners to use their own representational, cultural and cognitive resources to engage with the subject-specific representational practices of science. Researchers who have undertaken classroom studies whereby students have constructed and used their own representations have pointed to several principles in the planning, execution and assessment of student learning (diSessa, 2004; Greeno & Hall, 1997). A key principle is that teachers need to identify big ideas, key concepts, of the topic at the planning stage in order to guide refinement of representational work. These researchers also point out the need for students to engage with multiple representations in different modes that are both teacher and student generated. A representation can only partially explain a particular phenomenon or process and has both positive and negative attributes to the target that it represents. The issue of the partial nature of representations needs to be a component of classroom practice (Greeno & Hall, 1997) in terms of students critiquing representations for their limitations and affordances and explicitly linking multiple representations to construct a fuller understanding of the phenomenon or process under study. The classroom practice should also provide opportunities for students to manipulate representations as reasoning tools (Cox, 1999) in constructing the scientifically acceptable ideas and communicating them.

Research question: What impact was there on the participating teacher’s practice through the adoption of a representational focus to teaching science?

Data collection included video sequences of classroom practice and student responses, student work, field notes, tape records of meetings and discussions, and student and teacher interviews based in some cases on video stimulated recall. Video analysis software was used to capture the variety of representations used, and sequences of representational negotiation.

The teachers in this study reported substantial shifts in their classroom practices, and in the quality of classroom discussions, arising from adopting a representational focus. The shifts were reported by them as a three-fold challenge. First, there was an epistemological challenge as they came to terms with the culturally produced nature of representations in the topics of force, substance and astronomy and their flexibility and power.
as tools for analysis and communication, as opposed to their previous assumption that this was given knowledge to be learnt as an end point. The second challenge was pedagogical, in that this approach was acknowledged to place much greater agency in the hands of students, and this brought a need to learn to run longer and more structured discussions around conceptual problems. The third challenge related to content coverage. The teachers sacrificed coverage for the greater depth offered by this approach, and were unanimous in their judgment that this had been a change that had paid dividends in terms of student learning.

