

ADOPTING KNOWLEDGE BUILDING PEDAGOGY TO SUPPORT EPISTEMIC AGENCY AND COLLABORATIVE CONTRIBUTION IN SCIENCE CLASSES: A CASE STUDY IN NEW ZEALAND SCHOOLS

This presentation draws on how secondary science teachers from three schools have helped to develop a knowledge building community with their junior classes. Four themes will be discussed:

- *Theoretical frameworks of knowledge-building.*
- *Adopting knowledge-building as a pedagogy to support epistemic agency and collaborative contribution in science learning.*
- *Challenges of multi discipline contexts.*
- *Notable shifts and towards meaningful integration.*

The aim of a knowledge building community (KBC) is to produce new ideas and knowledge, which is useful to, and useable by the community (Scardamalia, 2002). Knowledge building has been described as a community process where students are empowered in knowledge creation as legitimate contributors (Lai, 2014). This phase of idea creation and improvement is at the heart of the knowledge building pedagogy.

This paper reports on an inter-school collaborative project that aimed to gain critical insight into knowledge synthesis and contribute approaches to model knowledge creation. A design-based research methodology was employed in this multi-site case study where students applied collaborative critiques to develop as knowledge creators and where teachers scaffolded questioning-evaluation processes. Qualitative data was collected from teacher interviews and professional learning meetings. Audio taped student recordings in class interactions were integrated into the analysis.

Integrating a knowledge building community into a science programme was both challenging and complex, however through the exploration on classroom pedagogy using the 12 KBC principles (Scardamalia & Bereiter, 2010), notable findings were revealed in the quality of student discourse, student informed sense making across curricular links such as maths/history/technology, greater capacity to act and make decisions about the world using science concepts, and the challenges of adopting interdisciplinary contexts into inquiries.

Keywords: Collaboration, knowledge building, epistemic agency

A MODEL OF KNOWLEDGE SYNTHESIS

The opportunity to participate in a knowledge building community project facilitated teachers' ability to develop an empathetic and multifaceted model of knowledge synthesis (See Figure 1). A demanding exercise, juggling theory with classroom reality fuelled teacher debate on developing better student agency and collaboration. Exploration of the relationship with the Nature of Science (Lederman & Lederman, 2004) and the 12 knowledge building principles (Scardamalia & Bereiter, 2010), provided teachers a crucial understanding of the active role they as practitioners play in supporting their students to be able to critique, reflect, and create knowledge.

Made up of four parts of a wheel, describing *Thinking scientifically*, identified as the part to develop the Nature of Science strand accompanying the science concepts and theories. Here the students begin to investigate their own ideas about science, the teacher's role is that of a mediator between the world of the student and the world of the scientist. Students develop and learn about scientists' ideas about science. Members of the group/community have a responsibility in *Working Together/Community* to inquire, collect evidence and build trust of science ideas collaboratively, using a range of sources of data. Collaborative critiques of the progressing science inquiries help students make thoughtful decisions about how to generate further questions. *Epistemic Insight* is where students make sense of knowledge. Importantly this is where ideas can be improved, where the student has insight to progress from their own ideas and conceptions to considering other perspectives, such as scientific, cultural and ethical views. Epistemic agency was a term used throughout the project that refers to knowledge or knowing and agency is the capacity to act and make judgments (Lai, 2014). Developing epistemic agency was a crucial objective to foster interdisciplinary expertise as students seek answers to their inquiries which could link with other curriculum areas such as technology, history, culture and mathematics. *Meaningful and Authentic Contexts*; these contexts expose the learners to situations where they are motivated to make personal decisions and judgements connected with a scenario. The four parts of the wheel take place in the knowledge building process, science ideas are interpreted, new ideas and questions are formulated through student experience. The hub was interpreted to be the knowledge built from the four parts of the wheel.

Knowledge Synthesis Wheel

- Sense making, taking on other perspectives
- Improvement and creation of ideas
- Personal learning reflection
- Justification of ideas and generating further questions



- Observation and Inference
- Investigation skills
- Understanding of the science concepts
- Understanding of NoS

- Collaborative contribution-all learners are invited to contribute
- Collective responsibility
- Progressive inquiry

- Personal decisions
- Ethical consideration
- Personal experience
- Open ended
- Culturally situated

Figure 1. Knowledge synthesis wheel model

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