Concept Mapping and Vee Diagrams

Project Title	Concept Mapping and Vee Diagrams: Innovative learning in science and mathematics. Effective teaching strategies and tools
Project Team	Associate Professor Karoline Afamasaga-Fuata'i (SiMERR NSW); Professor John Pegg (SiMERR National Centre); Dr Greg McPhan (Science Concept Mapping Consultant, School Teacher)
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Funding Agency	Australian Schools Innovations in Science, Technology and Mathematics (ASISTM – Round 1)
Organisational Base	SiMERR NSW

Description

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International studies such as TIMSS and PISA have shown that a number of students, particularly in rural areas compared to their city counterparts, struggle in mathematics, They have difficulties applying what they know to solve problems, especially when problems are dissimilar to ones they have successfully solved. Students need to be more critical and analytical in their approaches to problem solving and scientific inquiry, and be more efficient, effective and innovative in the ways they communicate for critique, what they know and understand publicly.

Concept Mapping and Vee Diagrams introduced teachers and students from two local schools, to two meta-cognitive tools: hierarchical concept maps and vee diagrams (maps/diagrams) to help them with critical inquiry, the analysis of mathematics and science content, and problems and activities. Teachers were trained to use maps and diagrams as planning, instructional and assessment tools. Students became proficient in using them as learning, presentation and communication tools.

The program included a series of workshops and reflection sessions on classroom practice. Teacher Associates visited the schools to motivate students and encourage practice in using maps and diagrams as efficient learning and assessment tools. The project included a one-day workshop where teachers showcased their maps and diagrams, including those constructed by their students.

A final workshop allowed the participating teachers to critically reflect on, and evaluate their experiences in the program. The exchange of ideas with invited teachers, and subsequent discussions resulted in some broadly defined areas for future research directions and classroom applications.

Participants

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10 primary and secondary mathematics and science teachers and their students (about 200).

Findings

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Teachers and their students became proficient in constructing hierarchical concept maps and vee diagrams of mathematics and science topics. Teachers incorporate concept maps and/or vee diagrams into the teaching, learning or assessment of student learning. A major highlight of the project was the successful adaption of concept mapping by the indigenous teachers and students (K-Year 1 and Years 5/6) as a part of their normal classroom practice.

Outcomes

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Published refereed papers

- Afamasaga-Fuata'i, K., & McPhan, G. (2008). Concept mapping and moving forward as a community of learners. Paper accepted for the Proceedings of the Third International Conference on Concept Mapping, Estonia and Finland.
- Afamasaga-Fuata'i, K. (2008). Concept mapping and vee diagramming a primary mathematics sub-topic: "Time". Paper accepted for the Proceedings of the Third International Conference on Concept Mapping, Estonia and Finland.

- Afamasaga-Fuata'i, K., (2008). Vee diagrams as a problem solving tool: Promoting critical thinking and synthesis of concepts and applications in mathematics. Published on AARE's website http://www.aare.edu.au/07pap/afa07202.pdf.
- Afamasaga-Fuata'i, K., & McPhan, G. (2007). Vee diagrams: as a tool for teacher professional development: learning, reflecting and planning. Education in the Pacific. Proceedings of the NZARE National Conference 2007, University of Canterbury, Christchurch, New Zealand. CD_ROM. Code AFA07143.
- Afamasaga-Fuata'i, K. (2007). Using concept maps and vee diagrams to interpret "area" syllabus outcomes and problems. In K. Milton, H. Reeves, & T. Spencer (Eds.), Mathematics essential for learning, essential for life. Proceedings of the 21st biennial conference of the Australian Association of Mathematics Teachers, Inc., pp. 102-111. University of Tasmania, Australia, AAMT.
- Afamasaga-Fuata'i, K., & Cambridge, L. (2007). Concept maps and vee diagrams as tools to understand better the "division" concept in primary mathematics. In K. Milton, H. Reeves, & T. Spencer (Eds.), Mathematics essential for learning, essential for life. Proceedings of the 21st biennial conference of the Australian Association of Mathematics Teachers, Inc., pp. 112-120. University of Tasmania, Australia, AAMT.
- Afamasaga-Fuata'i, K., & McPhan, G. (forthcoming chapter). Concept maps as learning and assessment tools in primary classrooms. In K. Afamasaga-Fuata'i (Ed.), Multiple Perspectives on Concept Mapping in Mathematics: Research into Practice. Final manuscript submitted on August 1, 2008 to Springer US.
- Afamasaga-Fuata'i, K. (forthcoming chapter). Analysing the 'measurement' strand using concept maps & vee diagrams. In K. Afamasaga-Fuata'i (Ed.), Multiple Perspectives on Concept Mapping in Mathematics: Research into Practice. Final manuscript submitted on August 1, 2008 to Springer US.

Conference Presentations

In addition to the conference presentations that were part of refereed conferment publications in the list above, the following were also provided:

- Afamasaga-Fuata'i, K., & McPhan, G. (2007, April). Narrowing the gap: From documents to doing using concept maps. Paper presented at the conference of the Centre of Science, Information and Communication Technology, and Mathematics Education in Rural and Regional Australia on educational disadvantage, University of New England, Armidale.
- Afamasaga-Fuata'i, K., (2007, November). Innovation and peer collaborations through concept mapping in two indigenous primary classrooms - ASISTM Concept Mapping and Vee Diagram Project. Paper presented at the National Summit of the Centre of Science, Information and Communication Technology, and Mathematics Education in Rural and Regional Australia, Canberra.

Impact

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Concept map and vee diagram outputs from the teachers and students serve as authentic samples of what can be achieved as a result of professional collaborations and partnerships with school teachers and students. These would be useful to guide and inform the preparation of preservice teachers to teach in rural and regional schools particularly those students who are at-risk of not achieving their numeracy and scientific literacy outcomes.

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