

Linking School Science and Mathematics with Industry and Community

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Background

There is increasing government concern about the uptake of students into post compulsory physical science and mathematics courses. Many studies in Australia and internationally have shown increasing disenchantment with science and mathematics over the secondary school years, linked to perceptions of lack of relevance, challenge, and restricted teaching strategies. Further, there is a current and looming shortage of teachers of mathematics and physical science. Further than this, there is abundant evidence of disadvantage, particularly in mathematics and the ‘enabling’ sciences, in rural communities where student performance and retention figures lag behind those from metropolitan schools. The SiMERR National Survey provided compelling data in this regard.

Description

There is evidence of many successful rural schools linking with community science organizations to introduce innovation into the curriculum, as well as provide a range of tangible benefits to the school and wider community, including teacher professional learning. It seems likely that rural schools are particularly able to do this because of the close links that exist between schools and rural communities. The project uses this observation as its starting point to study a number of such projects for the insight they may provide into productive ways forward to engaging rural schools and students in significant learning in the sciences. The project has used an interpretive methodology to build insights into the conditions surrounding successful school – community – industry linked projects (innovation sites), the pathways along which the initiatives progressed, and the nature of student outcomes.

The innovation sites were selected to represent a range of types. Eight sites were studied. Data was collected from members of school communities involved in these successful initiatives: teachers, principals, students and community members. Document analysis, particularly curriculum documents and student work, was analysed to examine the nature of embedding of these projects, and student outcomes.

The research questions driving the study were:

1. What is the nature of the innovation represented by these initiatives?
2. What are the outcomes of the projects for students, teachers and communities?
3. To what extent, and under what conditions, are the innovations sustainable?
4. To what extent to these projects offer a model for rural schools to re-imagine the science curriculum in a way that engages students in significant learning?

Project Participants

The school clusters/schools which participated were:

- Corryong School Cluster
- You Yangs Learning Community
- Leongatha School Cluster
- McKillop College, Werribee
- Ovens Secondary College
- Yarrawonga School Cluster

Many community and professional organisations, industries and service providers including:

- Australian Defence Industries
- CERES (an environmental education resource centre in Melbourne)
- Charles Sturt University
- Wodonga TAFE
- Werribee Open Plains Zoo
- Wonga Wetlands

Project Activities

Identification of a range of successful school-community linked projects.

Conduct interviews with teachers (9), students (14), and other participants in school/community linkages (5)

Analyse the interview data and prepare case studies;

Communicate findings.

Project Findings

- There are valuable examples of rural schools and school clusters working with community in the school science program. Rural schools are in a strong position to develop such linkages and hence this approach has the potential to redress the disadvantage experienced by rural students in science, technology and mathematics education.
- While projects were often the vision of one person this vision was usually adopted by others;
- The dominant driver of the projects was to increase student engagement with school science;
- While frequently the drive for the linkage came from schools community organisations also have initiated school/community linkages around school science;
- The projects involved students in a range of forms of activity which differ from the traditional science classroom activity;
- The response of students interviewed to the initiatives was uniformly positive;
- Significant school/community linkages were formed which are likely to last beyond the immediate projects;
- While the projects were proposed to increase student engagement with science they proved to also provide quality professional development for teachers.

Project Outcomes

Refereed journal articles:

Tytler, R., Symington, D., Kirkwood, V., & Malcolm, C. (2008). Engaging students in authentic science through school – community links : learning from the rural experience. *Teaching Science, the Journal of the Australian Science Teachers Association*, 54(3), 13-18.

Conference presentations:

Tytler, R., Symington, D., Malcolm, C., & Kirkwood, V. (2008). Innovation in rural science, mathematics and technology education through school–community partnerships. Presentation at the SiMERR (Science, ICT and Mathematics Education in Rural and Regional Australia) Forum. March, Geelong.

Tytler, R., Symington, D., Kirkwood, V., & Malcolm, C. (2007, July). Engaging rural students in authentic science through school – community links. Paper presented at the conference of the International Council for Associations of Science Education, Perth.

Tytler, R., Symington, D., Kirkwood, V., & Malcolm, C. (2007, August). Engaging rural and regional students in authentic science through school – community links. Paper presented at the

conference of the European Science Education Research Association, Malmo, Sweden, August 2007

Following, and related to this SiMERR project, the team has completed a study for the Australian Department of Education, Employment and Workplace Relations, of 16 exemplary ASISTM projects which has generated a greater understanding of school-community linkages.

Tytler, R., Symington, D., Smith, C., & Rodrigues, S. (2008). An Innovation Framework based on best practice exemplars from the Australian School Innovation in Science, Technology and Mathematics (ASISTM) Project. Canberra: Commonwealth of Australia. This report can be accessed at http://www.dest.gov.au/sectors/school_education/programmes_funding/programme_categories/key_priorities/asistm/default.htm#ASISTM_Exemplary_Practice_Report

Impact

- The project was for the team at the Hub a starting point for a range of activity which has contributed, and will continue to contribute, to a greater understanding of possibilities which can arise from school-community linkages around school science programs and how these can be most effective.
- Presentation of this work at a number of forums has promoted this approach.
- The team is currently in process of completing a professional development package which will assist schools to develop effective school-community linkages around school science programs.
- Members of the team are currently putting together an ARC linkage bid to further explore these issues, and other researchers at Deakin are linking with this work as part of a larger research initiative.

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