The SiMERR Experience in Tasmania

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Abstract

The National Centre for Science, Information and Communication Technology, and Mathematics in Rural and Regional Australia (SiMERR) was funded by DoTARS from 2005 to 2008 and based at the University of New England. Each state and territory had its own Hub of SiMERR with the University of Tasmania hosting the Tasmanian Hub. The purpose of SiMERR was to provide a national forum for addressing issues relating to the key areas of science, ICT, and mathematics, particularly as they concern rural and regional communities. In Tasmania 14 projects were completed over three years, as well as one focus group project nationally funded by DEST as part of a national survey organised by SiMERR.

This paper is the result of the culminating evaluation and report prepared for a Tasmanian SiMERR Summit held at the end of the project. With funding from the original sources being expended, the issues of the continuation of the Hub within the Faculty of Education and of its continuing funding and purpose provided motivation for a meta-evaluation of the work of the Hub. What had the projects accomplished? What difficulties did they encounter? What could the members of the Hub offer to rural and regional communities in the future?

The methodology employed for carrying out the analysis was based on a design model with input based on the purposes of the establishment of SiMERR. The individual components of the model were the 15 projects, providing case studies on implementation and outcomes in relation to objectives set for each. The data from these case studies took various forms and were analysed using various descriptive methods, being clustered and combined to address the research questions. The outcomes of the meta-analysis move forward from the beginning objectives of SiMERR to making realistic suggestions for future directions of educational interventions in rural and regional areas of the state.

The National Centre for Science, Information and Communication Technology (ICT), and Mathematics in Rural and Regional Australia (SiMERR) was funded by the Department of Transport and Regional Services (DoTARS) from 2005 to 2008 and based at the University of New England in Armidale. Each state and territory had its own Hub of SiMERR with the University of Tasmania hosting the Tasmanian Hub. The purpose of SiMERR was to provide a national forum for addressing issues relating to the key areas of science, ICT, and mathematics, particularly as they concern rural and regional communities. Issues of teacher shortage, teacher expertise, and teacher retention in rural and remote areas were influential in making the case to fund SiMERR, as well as lower student retention rates and rates of progression to university (e.g., Jones, 2002; Roberts, 2005; Squires, 2003). Low perceived expectations of students were also a concern, in addition to the relatively poorer average performance of students on PISA testing the further away from metropolitan areas their schools were located (e.g., Cresswell & Underwood, 2004; Thomson, Cresswell, & De Bortoli, 2004). The rural education literature contains much documentation of the difficulties of students living in rural and remote communities across Australia, as well as around the world (e.g., Alloway, Gilbert, Gilbert, & Muspratt, 2004; Colangelo, Assouline, Baldus, & New, 2002).
Each Hub was funded with matching funds from a local university (cash and in-kind) and the National Centre. Subject to approval by the National Centre, Hubs were allowed considerable freedom in how local projects were carried out and evaluated. At the University of Tasmania, the conscious decision was taken to use SiMERR funding to assist in building the research profile of less experienced academics in the Faculty of Education who had discipline expertise in the areas of science, ICT, or mathematics. Whereas most Hubs in SiMERR consisted of four members, one each representing Science, ICT, Mathematics and Diversity, the Tasmanian Hub began with seven members, two with expertise in ICT, two in mathematics, and three in science. Throughout the project members alternated in representing the four arms of SiMERR National, and six of the seven contributed to initiating, collaborating in, or mentoring of the projects carried out with Hub funding.

At the same time as fostering the Hub’s researchers, there was a desire to cater for needs perceived by rural and regional teachers and schools. The Hub hence advertised through the state’s education systems and within science-based parts of the university for suggestions for collaborative projects. In the initial round of funding, sixteen proposals were received by the Hub, of which eight were accepted and subsequently approved by SiMERR National. Further projects were approved through larger collaborations with the Department of Education Tasmania and the Australian Association of Mathematics Teachers (AAMT), or on the initiative of Hub members.

In Tasmania 14 projects initiated within the state were completed over three years, as well as one Focus Group project nationally funded by the Department of Education, Science and Training (DEST) as part of a national survey organised by SiMERR National (Lyons, Cooksey, Panizzon, Parnell, & Pegg, 2006). The internally initiated projects could be categorised into three groups based on the originators of the projects. Five small projects (approximately $5000-$6000) were proposed by individuals from outside the Hub: four from teachers, and one from a person in another university department. Each project in this group had a Hub member as mentor. Five other projects provided links to larger bodies, three with the Department of Education Tasmania, one with the Catholic Education Office, and one with the University of Tasmania Faculty of Science and Engineering in association with an Australian Schools Innovation in Science, Technology and Mathematics (ASISTM) project. These projects (ranging from $5000 to $40,000) had at least one Hub member as a significant partner. Four other projects were initiated and implemented by Hub members reflecting their personal research interest in science, ICT, or mathematics issues in rural and regional areas. The Focus Group project was organised by two Hub members, based on questions supplied by the National Centre, reflecting requirements from the DEST. The projects are summarised in Table 1.
Table 1

Projects of SiMERR Tasmania

<table>
<thead>
<tr>
<th>Ref</th>
<th>Title/Descriptor</th>
<th>Initiator</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>ICT on-hand in science</td>
<td>Hub member</td>
<td>Secondary</td>
</tr>
<tr>
<td>P2</td>
<td>ICT tools to support VET</td>
<td>Hub member</td>
<td>TAFE</td>
</tr>
<tr>
<td>P3</td>
<td>Game Making</td>
<td>Individual</td>
<td>Secondary</td>
</tr>
<tr>
<td>P4</td>
<td>Maths games at home</td>
<td>System</td>
<td>Primary</td>
</tr>
<tr>
<td>P5</td>
<td>Maths Power – tutoring at home</td>
<td>Individual</td>
<td>Secondary</td>
</tr>
<tr>
<td>P6</td>
<td>Linking rural Science to College</td>
<td>Individual</td>
<td>Secondary</td>
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<tr>
<td>P7</td>
<td>Supporting Primary Science</td>
<td>Individual</td>
<td>Primary</td>
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<td>P8</td>
<td>SmartBots – Robotics</td>
<td>System</td>
<td>Secondary</td>
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<tr>
<td>P9</td>
<td>On-line Learning Objects</td>
<td>System</td>
<td>Prim/Sec</td>
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<tr>
<td>P10</td>
<td>Resourcing Science teachers</td>
<td>Individual</td>
<td>Secondary</td>
</tr>
<tr>
<td>P11</td>
<td>Science literacy in rural schools</td>
<td>System</td>
<td>Secondary</td>
</tr>
<tr>
<td>P12</td>
<td>Pre-service Science teachers</td>
<td>Hub member</td>
<td>Primary</td>
</tr>
<tr>
<td>P13</td>
<td>Maths leadership in isolated cluster</td>
<td>Hub member</td>
<td>Prim/Sec</td>
</tr>
<tr>
<td>P14</td>
<td>Early career Maths, Science, ICT teachers</td>
<td>System</td>
<td>Primary</td>
</tr>
<tr>
<td>FG</td>
<td>Focus Group</td>
<td>SiMERR National</td>
<td>Prim/Sec</td>
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Many of the Tasmanian projects are described individually in publications and reports (Beswick & Brown, 2006; Beswick & Browning, 2007; Bound & Salter, 2007, 2008a, 2008b; Brown, Fluck, Wilson, & Fitzallen, 2007; Brown LeRoi, & Johnston, in press; Fluck, 2007; Hodgson, 2007; Kenny, 2007; Kenny & Colvill, 2008). This paper is the result of the culminating evaluation and report prepared for a Tasmanian SiMERR Summit held at the end of the project. Figure 1 provides a graphic representation of the elements that provided the background for the evaluation. With funding from the original sources being expended, the issues of the continuation of the Hub within the Faculty of Education and of its continuing funding and purpose provided motivation for a meta-evaluation of the work of the Hub. What had the projects accomplished? What difficulties did they encounter? What could the members of the Hub offer to rural and regional communities in the future? These and other questions formed the basis for the research described in this paper.
Methodology

Although each of the projects funded by the SiMERR Hub had its own objectives, methodology, and evaluation process, these are not described in detail here. This report focuses on the larger picture of the cumulative knowledge and understanding gained through the SiMERR process and the outcomes achieved. The methodology employed for carrying out the analysis is hence based on a design model (Cobb, Confrey, deSessa, Lehrer, & Schauble, 2003; The Design-Based Research Cooperative, 2003) with input based on the purposes of the establishment of SiMERR National and its Hubs. The individual components of the model were the 15 projects, providing case studies on implementation and outcomes in relation to objectives set for each. The data from these case studies took various forms and were analysed using various descriptive methods, being clustered and combined to address the questions that formed the basis for the evaluation (Miles & Huberman, 1994, p. 248). The outcomes of the meta-analysis move forward from the beginning objectives of SiMERR to making realistic suggestions for future directions of educational interventions in rural and regional areas of the state. This model for analysis is illustrated in Figure 2 and represents a type of non-linear action research procedure within the larger design framework.
The projects could have been clustered by their perceived main educational purpose, resulting in four groups related to creating a product to be used for or as part of student learning, to implementing existing technologies for student learning, to providing professional learning for teachers, and to focused research projects. It was, however, decided to use a clustering of projects based on the main target audiences of the intervention in the projects. A Home-School cluster was made up of two projects meant to foster school relationships with parents while benefiting student learning: the creating of maths game packs to be used at home by primary school students (P4) and the use of mathematics tutoring software, Maths Power, at home (P5). An Early Career cluster contained two projects with different perspectives on beginning teachers: teaching science by pre-service teachers (P12), and surveys and case studies of early career science, ICT, and mathematics teachers (P14). The Student Intervention cluster consisted of five projects that followed student involvement mainly involving ICT in some way: electronic robots built by students (SmartBots, P8), computer games created by students (P3), ICT to support VET (P2), use of pocket-sized hand-held computers in Science (P1), and senior secondary lab experiments to encourage rural students to enrol in science (P6). The Teacher Intervention Target cluster provided professional learning or resources for teachers but did not directly follow the intervention with students: science resources for a central cluster of primary schools (P7), mathematics leadership for an isolated cluster of schools (P13), evaluation of an ASISTM project providing materials for science literacy (P11), introducing Le@rning Federation Learning Objects to very remote schools (P9), and providing resource packs for secondary science labs (P10). The Focus Group (FG) project linked all four of these clusters by considering issues raised as important by teachers, students, and parents. Table 2 summarised...
the main and secondary targets of the projects, where the main targets were used to form the groups for analysis.

Table 2

Projects of SiMERR Tasmania with Main ( ) and Secondary ( ) Target Groups

<table>
<thead>
<tr>
<th>Ref</th>
<th>Title/Descriptor</th>
<th>Students</th>
<th>Teachers</th>
<th>Home-School</th>
<th>Early career</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>ICT on-hand in science</td>
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Following the clustering of the case studies of the projects by similar starting characteristics, two levels of synthesis were employed to extract the implications for future interventions based on the overall experiences. The first level describes the clusters in terms of the balance of achievement and dilemma in the regional, rural, and remote communities, in terms of the potential for further implementation and the requirements to be met for expectations of success. The second level coalesces these summaries to address the research questions.

**Results**

The first level of clustering arose from looking at the four groups of projects by their target audiences and extracting the outcomes and associated observations in terms of similarities, contradictions and dilemmas. Important in this part of the analysis are the observations that were not part of the initial objectives of the individual projects. These may relate to further unanticipated successes, to reasons suggested for lack of success, or to larger issues that were not anticipated at the beginning of the projects. The first level of analysis is summarised for the four groups of projects.
Home-School Target Projects [P4, P5]

The two Home-School projects illustrated the extremes that can be observed in projects with similar objectives, in this case to encourage students to develop mathematics skills at home with parental support. In one case the provision of game packs for primary students was considered highly successful, with a principal of one of the four schools participating saying that parents were enthusiastic and the games so popular that they were incorporated into some classrooms, as well as being used at home. The project was seen as reinforcing the bond between parents and schools in the rural communities. Parent feedback included surprise that “maths could be fun.” In the other case, introducing software to build mathematics skills with struggling high school students, or to make-up work skills missed at school, encountered many obstacles, including limited computer access at home (and school), poor parental support, difficulty of one teacher’s enthusiasm but other teachers’ lack of support. Some students admitted laziness in terms of using the software.

The potential for Home-School projects includes

- reinforcement of parental understanding of (mathematics) concepts and today’s curriculum objectives,
- engendering of parent-school collaboration,
- practice for student skills outside the classroom.

The requirements for success include

- school support and leadership beyond a single teacher,
- appreciation of need for supporting technology,
- on-going funding for replacement of materials,
- on-going introduction to the implementation process as turn-over affects staff membership.

Early Career Teachers Target Projects [P12, P14]

Focussing on different aspects of beginning teacher experiences, these two projects intended to contribute to an understanding of experiences that can enhance the desire of pre-service primary teachers to teach science and that can promote continued growth for teachers in the three areas (science, ICT, and mathematics) in the first few years that they are in schools. Whereas the pre-service project resulted in positive feedback in terms of students being encouraged to teach science when employed in schools and had the unexpected bonus of informing and encouraging their colleague teachers to include more science in their curricula, the outcomes of the surveys and case studies for beginning teachers in rural and remote schools were mixed, suggesting dilemmas for those working to improve the educational scene in these areas. It was common for early career teachers to report that small staff numbers in rural and remote schools meant that they were required to take on high levels of responsibility in their first years of teaching, to teach out-of-area, and to remain on site rather than take up professional development opportunities. Those still in these schools acknowledged that opportunity to develop a wide range of skills they felt would be useful in their careers, but also felt various levels of stress.

The potential for Early Career projects includes

- encouraging reflective practice in relation to science teaching,
linking pre-service and colleague teachers to the benefit of the colleagues’ teaching of science,
informing systems of the needs of early career mathematics, science, and ICT teachers in rural and remote schools.

The requirements for the future inferred from these projects include
acknowledgement of advantages to linking beginning and experienced primary teachers to enhance science teaching,
systemic and local mentoring of beginning teachers,
funding to enhance the teaching experience of beginning teachers.

**Student Intervention Target Projects [P1, P2, P3, P6, P8]**

Overall the feedback from students involved in projects aimed at enhancing the student experience was positive. Most students enjoyed and benefited from the pocket-sized hand-held computers in science, although occasionally not having them charged or leaving them at home introduced difficulties. The robotics activities, planned with assistance from a central on-line teacher, produced both increased knowledge and the challenge of being involved in the Robo Cup competition across Tasmania. A similar increased interest in mathematics accompanied the Game Making project with help from a central teacher in Hobart. The experience of coming to a Hobart college from a rural environment to observe “real” science experiments not available in local high schools was agreed by most students to increase their likelihood of enrolling in science at Year 11 and 12, when they would “come to town.” The learning outcomes for VET apprentices were judged by their teachers to be improved, especially in the area of critical thinking. The range of teacher development for these projects to proceed varied from very little for the Robotics and Senior Secondary visits, to a great deal for the TAFE teachers who were encouraged to change their practice in relation to the use of ICT with enhanced learning objectives and trajectories.

The potential for students involved in these projects included
increased enthusiasm for mathematics and science content,
greater exposure to and flexibility with recent technological innovations,
greater probability of continuing their education to senior secondary and tertiary levels.

The requirements for continued success include
need for skills development for a larger group of teachers,
acknowledgement of need for time for implementation of creative activities,
likelihood of need for continued funding for associated travel, equipment and materials, as well as teacher professional learning.

**Teacher Intervention Target Projects [P7, P9, P10, P11, P13]**

In some projects the funding and timing limitations did not allow for following up on teacher professional development with direct assessment and evaluation of student outcomes related to the teachers’ involvement in the projects. Feedback from teachers and those implementing the professional learning experiences indicated that many unexpected issues arose. On one hand the professional learning in science including CSIRO packs was welcomed by primary teachers, some of whom encouraged their students to take part in a
Science Quest. On the other hand many of the same teachers expressed a lack of confidence in teaching and assessing science, feeling their schools were ill-equipped and did not have K-6 policies for teaching science. One project found that providing resources for secondary science teaching is not enough; teachers may not know how to use them. Another found that working closely with teachers to develop resources was the best way to ensure implementation, whereas providing professional development on its own was less likely to ensure implementation and just providing materials without any professional development was unlikely to encourage take-up of the resources. The project introducing the Le@rning Federation Learning Objects proved to be quite expensive in reaching the very remote schools in the state and in some schools it was difficult to complete follow-up interviews. Some, however, because of personal contact with the consulting teacher, were very keen to take on both the Learning Objects and the interactive white board technology used to provide the professional learning. A similar experience occurred for a project to provide mathematics leadership in an isolated cluster of three schools. Four teachers were sponsored to attend the biennial conference of the AAMT in Hobart and a week’s professional learning was provided within the cluster. The take-up of opportunity to learn from their own teachers and from the professional development provided, however, varied among the schools, dependent on the enthusiasm of the leadership in the schools.

The potential for teachers involved in these projects includes
- opportunity to work closely with scientists in developing science resources for schools,
- exposure to new technologies,
- chances to experience professional learning in their schools rather than having to travel.

The requirements for continued success include
- a realisation by providers of the need for intensive interaction with teachers to create ownership of resources and learning,
- funding to reach remote schools,
- time release for teachers to absorb new learning and plan for their own teaching,
- continuing the process of professional learning to take into account teacher turnover.

**Focus Group**

The Focus Group project confirmed many findings of the SiMERR National survey (Lyons et al., 2006), as well as the other Tasmanian projects. Although the teachers interviewed were very dedicated, they perceived that those of their number who stayed in rural and remote postings were not appreciated for their commitment, and they pointed out the difficulties under which they worked. These difficulties included a shortage of subject matter expertise in the schools (often in mathematics, science and ICT), teacher turnover, beginning teacher inexperience, lack of resources and links to urban environments (both for themselves and their students), and difficulty in finding relief teachers to allow for professional development to occur. Parents in particular shared these concerns and students reflected the national outcomes in not seeing the value and opportunity afforded by tertiary education.

Among the suggestions made to address the difficulties for rural and remote teachers were
• offering favourable salary bonuses,
• providing low cost weekend accommodation in nearby major centres,
• upgrading teacher housing,
• offering short trial periods for transferring teachers,
• selling the life style benefits of rural and remote locations,
• promoting availability of distance education options for further study.

Another aspect that came out in the interviews was that money was not the only issue. The situation for teachers is also about the “whole person”:

• how teachers are valued for what they genuinely have to offer and how they can develop in the job,
• how they and their families fit unto the local community and the local customs,
• whether their partners can find jobs,
• whether they are happy sending their children to the local school, so they still have high aspirations and pathways,
• whether there is a professional community with which to engage.

Underlying these issues is a larger one about declining communities. What can the community do, not only to attract and keep teachers but also to attract and keep other professionals? How can communities thrive providing work opportunities to attract their young people back into a community once they have left?

Answering the Evaluation Questions

A second level of clustering across the four groups of projects and the focus group as summarised here suggests answers to the research questions.

What did the projects accomplish? First and foremost the projects linked the University and the name SiMERR across the state of Tasmania to a wide range of rural and remote sites. Although several SiMERR projects were linked to larger projects, such as ASISTM, of those Hub projects initiating involvement with schools, 74 schools were touched by SiMERR Tasmania. Excluding the associated projects, SiMERR worked with about 150 teachers across its projects. The positive response and appreciation for interest in their concerns by teachers were universal.

The SiMERR projects provided pilots for initiatives that could work if implemented on a system-wide basis, using both the achievements and the lessons learned. In many cases the provision of content knowledge in the three areas, as well as links to resources, should lead to continuing interaction and improvement, without continued intervention. The projects also provided stepping-stones to further research for Hub members.

What difficulties did the projects encounter? The difficulties that the SiMERR Hub experienced in some ways reflected the issues that created SiMERR, especially the tyranny and expense of distance in reaching out to remote communities. Other issues were the lack of sustainability of interventions over long periods of time, the difficulty of getting some principals to appreciate the needs perceived by the teachers and researchers, and the recognition of the special needs of beginning teachers.
Some projects worked at trying to solve one acknowledged problem and often came up against barriers of more embedded cultural attitudes, leading to a perceived lack of success of the project. In some cases, however, this created new understandings and questions to ask. The realisation, for example, by university scientists of the need for intense professional learning to accompany resources was another important stepping-stone for their future involvement with projects in education, an involvement to be encouraged.

A systemic difficulty for the SiMERR model is that once a project has been trialled and the money spent, there is then the question of how it is scaled up if successful, or able to be iterated until it is effective. Projects that involved significant partnerships with other organizations or funding bodies had greater potential for being embedded compared to smaller localised projects that often ended up only being one-off exercises despite their successes.

**What can Hub members offer to rural and regional communities?** The experience of these Hub projects has increased the Mathematics, Science, and ICT educators’ awareness of the issues of regional, rural, and remote communities and prepared them to collaborate with greater understanding in the future. Subject matter expertise, willingness to listen, and potential to assist in critical evaluation, have all been demonstrated. Further educational opportunity for teachers to be involved more directly in research through higher degree enrolment is another avenue offered by the Hub members.

Some of the issues identified lead to recommendations for systems. The projects implemented through SiMERR or evaluated by Hub members are pilots. To create change, systems need to invest resources on a long-term basis (1) to prepare teachers for rural and remote placements, (2) support teachers once there, (3) supplement resources, especially ICT for learning mathematics and science. Communities need to work with schools to support teachers and students. On the other side however, parents need to be open to new ideas to support their children, and teachers need to appreciate local norms and cultures, as well as be flexible in expectation.

**Conclusion**

This paper has sought to provide a meta-analysis of a group of singular projects, each addressing a specific issue or set of issues related to Science, ICT, and Mathematics in rural and regional areas of Tasmania. The focus was on the school and TAFE sectors due to the aims of SiMERR National and DoTARS. The outcomes achieved and lessons learned, however, suggest wider involvement with community organizations and councils, business and industry, as well as other government departments dependent on education for skilled and critical thinking employees. Encouraging and fostering links between schools and their communities is integral to such moves. Further mentoring of those appreciating the value of evidence-based research and evaluation and working with policy makers to create opportunities, are future goals of the Hub.

The hub is now in a process of developing connections and partnerships to develop new projects. The intention is to bring to this endeavour a wider understanding of the systemic issues and to design projects with collaborative relationships that can support embedding and co-research. The role of small projects able to be initiated at the “grassroots” level, however, also has advantages in enabling innovation to be trialled without large start-up costs or lead-in times. As long as outcomes emerging from such projects are shared, they can feed into larger understandings and possibilities. The process employed by SiMERR Tasmania has explored issues, contexts, needs, and outcomes, which continues as the members of the Hub consider other models of intervention for the future.
Acknowledgements

SiMERR Tasmania acknowledges contributions from DoTARS, DEST, AAMT, and the Faculty of Education at the University of Tasmania. The other Hub members are Kim Beswick, Helen Bound, Natalie Brown, Andrew Fluck, and John Kenny.

References


