

Scientists in Schools: Benefits of Working Together

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Abstract: *The Scientists in Schools program (SiS), funded by the Australian Government Department of Education, Employment and Workplace Relations and managed by CSIRO Education, has completed its fifth year. Around 3300 ongoing partnerships have been made between scientists and teachers in primary and secondary schools. Currently, there is at least one partnership in 12% of Australian schools. During its lifetime, SiS has been subject to three comprehensive evaluations carried out on the Pilot project in 2007, Stage One in 2009, and most recently, at the end of 2011. This paper provides a synthesis of the nature of SiS based on the outcomes of these evaluations, focusing particularly on the results of the most recent. This evaluation was based on online surveys of nearly 1000 teachers, scientists, and mathematicians and interviews with key personnel, particularly the SiS project officers, but also partner teachers and scientists whose partnership had existed for at least one year. Attention will be given to the pattern of SiS partnerships, including the factors affecting their success and longevity, the benefits to SiS partners and to the students involved, and recommendations for getting the best out of a SiS partnership.*

Keywords: scientists, teachers, partnerships, primary, secondary

1. Introduction

The perceived advantages of connecting scientists with schools have resulted in a range of programs internationally in which various means of having scientists interact with schools have been tried. Some interactions are simply visits by scientists to a classroom to make a presentation, either content-based or about the potential of a career in science. Others are class visits to research or industrial institutions to see scientists at work. However, some scientist-teacher programs are longer term, with scientists making repeated visits to schools, building a joint program with teachers. According to Walker et al. (2005), who reported on a long-term program, successful partnerships required aligned, partner-centred goals and clear expectations between partners. Pelaez and Gonzalez (2002) described success as attributable to true collaboration between scientist, the teacher and the students. Drayton and Falk (2006) reviewed a number of longer-term partnerships in which students carried out projects and concluded that success revolved around careful negotiation of the scientist's expertise, the teacher's and students' interests, and a clear purpose for the project. From a quite different perspective, Rahm, Miller, Hartley and Moore, argued that a major outcome from scientist-teacher partnerships is the understanding by students of the processes of science that comes about from dealing with real scientists in ways that are meaningful for them in a real world.

For the past five years in Australia, the Scientists in Schools (SiS) Project has been funded by the Australian Government and managed by the Commonwealth Scientific and Industrial Research Organisation's Education branch. The SiS Project now includes Mathematicians in Schools (MiS) and the aims are to

- bring the practice of real world science and mathematics to students and teachers,
- inspire and motivate teachers and students in the teaching and learning of science and mathematics,
- provide teachers with the opportunity to strengthen their knowledge of current scientific practice and mathematical applications,
- enable scientists and mathematicians to act as mentors or role models for students,
- broaden awareness of the types and variety of careers available within the mathematics and science fields,

- enable teachers, scientists and mathematicians to share ideas and practices with other teachers, scientists and mathematicians, and
- increase scientists' and mathematicians' engagement with the broader community, thus raising public awareness of their work and its social and economic importance.

The third evaluation of the SiS Project was undertaken during the fifth year, and it confirmed that, within the limits of its current resources, the project is achieving those objectives (see Rennie, 2012, and also Howitt & Rennie, 2008, Rennie & Howitt, 2009).

In this paper we synthesise the evaluation findings relating to the patterns of SiS partnerships over time, the contribution of the SiSPOs, the benefits of SiS to participants, factors affecting the success and longevity of partnerships, and the impact of SiS. Finally, we suggest recommendations for the future of the SiS Project.

2. Research Design

The research design was a mixed method study, based on the collection of both quantitative and qualitative data. The targets for data collection were the scientists, mathematicians and teachers involved in the Project, particularly those in long term partnerships, as well as those persons who were responsible for the management and monitoring of the SiS and MiS implementation. Qualitative data were collected using focus groups and interviews, conducted by email or telephone, from all 9 SiS Project Officers (SiSPOs), 2 assistants, 20 scientists/mathematicians, and 14 teachers. Case studies of 13 SiS and MiS partnerships from five states and territories were constructed. Online surveys gathered quantitative data from 514 scientists/mathematicians and 462 teachers, who came from every Australian state and territory, every school type, and from schools located in capital and regional cities, rural and remote areas.

3. Findings of the evaluation

3.1. Patterns of SiS and MiS Partnerships

A partnership is defined as a relationship between one teacher and one scientist/mathematician during the time they work together to achieve the aims of SiS.

At 28 November, 2011

- there were 1456 SiS and MiS partnerships involving 1310 teachers and 1190 scientists/mathematicians in 1118 of Australia's 9581 schools; at least one partnership in 12% of Australian schools.
- the median length of partnerships is 19 to 24 months or nearly two school years. Over the life of SiS 3267 partnerships had been made.
- a change in circumstances preventing continuation of one of the partners is the reason for nearly half of partnerships ending. Lack of communication between partners accounted for about 20% of terminations, and lack of time, motivation, or incompatibility (often a lack of flexibility) between partners accounted for nearly 30%.

Factors that underpin successful partnerships are stable circumstances, effective communication, and sufficient time, flexibility and commitment to support the partnership, and the need for partners to have reasonable expectations of each other.

3.2. The Contributions of the SiS Project Team

SiS is managed by a Project Team of 3.7 fulltime equivalent personnel in CSIRO Education Headquarters in Canberra and a total of 5.5 fulltime equivalent SiSPOs located in every state and territory. The SiSPOs are the face of SiS in the field, dealing with recruitment, matching partners, monitoring partnerships, and arranging information and networking events. To undertake their role effectively, SiSPOs need the coordination and support of the other members of the SiS Project Team located in Canberra. The SiS website facilitates online registration in the Project and contains a

range of information and support materials for partners. A large database is maintained to keep track of partnership progress.

3.3. The Benefits of SiS and MiS to Participants

3.3.1. For students, the benefits of SiS and MiS are

- increased knowledge and understanding of the real world and contemporary science,
- considerable fun and excitement,
- opportunities to experience scientists as real people, and as role models/mentors,
- increased ability to ask questions about the world around them, and
- increased awareness of the types and varieties of careers available in science.

3.3.2. For scientists, the benefits of SiS and MiS are

- communicating with teachers, students and sometimes the community, about their work,
- increased communication skills from working with students and teachers,
- enjoying themselves, by having fun and indulging in their passion,
- getting a better understanding of what schools are like, and
- realisation that teaching requires time and effort!

3.3.3. For teachers, the benefits of SiS and MiS are

- the ability to work and communicate with scientists,
- access to knowledge and understanding of “real world”, contemporary science,
- enjoyment of collegiality and seeing benefits for students,
- opportunities for their own professional development,
- increased confidence in teaching science, particularly for primary teachers,
- access to resources and expertise, and
- increased awareness of the types and variety of careers available in the science.

4. Summary and Recommendations

The SiS project has been operating for nearly five years and three evaluations of its outcomes have demonstrated achievement of its objectives to an increasingly high level. It is now an established program with considerable momentum. Its key strength (and uniqueness internationally) is it that enables students and, importantly, their teachers to experience face-to-face contact with scientists and mathematicians, usually for an extended period of time, and thus experience first-hand the wonder and excitement of science and mathematics as they are practised outside of school. Further, it is a program which has developed efficient and effective management procedures, implemented by dedicated, personable staff.

In addition, the program offers opportunities for scientists and mathematicians to participate constructively in the education of the future generation of people, some of whom will step into science-related careers, and others who will simply become more scientifically and mathematically literate. Instead of making one-off visits to a school as an outside expert, SiS allows scientists and mathematicians and teachers to plan together. Thus SiS provides a means for scientists and mathematicians to reflect upon the nature and practice of their discipline and how its significance can be communicated effectively to a public that would benefit from a higher level of scientific awareness.

At the present time, with new, national curricula in science and mathematics being phased into schools, an established and proven program such as SiS can offer students and teachers in schools opportunities to augment the new curricula with experiences that bring relevance and meaning to science and mathematics in schools. The following recommendations are made with these points in mind.

4.1. Continue the SiS Project

This evaluation found that the SiS Project achieves demonstrable benefits for scientists and mathematicians, teachers, and students. Further, the efficiency of management has been streamlined and the benefits are cost-effective. The current SiS Project Team, including the SiSPOs, is fully occupied. Expansion would require increased levels of staffing if quality, efficiency and effectiveness are to be sustained. It was recommended that funding for SiS should be continued at least at its present level. At the current funding level, supporting 1500 partnerships is realistic and sustainable.

4.2. Maintain the Management Structure of SiS

The work of the SiSPOs as the regional face of SiS is essential to the progress of SiS, but they must be supported by leadership from a coordinating central team. Increasing the effectiveness of SiS, particularly in terms of converting assigned to active partnerships, depends on enhancing the process of matching partners, ensuring they get started and monitoring them judiciously. Consequently, it was recommended that the SiSPOs should maintain their regional focus and give close attention to ensuring that partnerships get off to a strong start. It is important to ensure that SiSPOs are coordinated and supported centrally, both personally and with technology. Face-to-face meetings between SiSPOs should continue both for information exchange and support.

4.3. Support SiS and MiS Partnerships

Establishing and maintaining partnerships requires a variety of support measures that are appropriate for the stage of the partnership. Networking events and workshop sessions are important for partnerships and for those unable to attend, the website and newsletters are alternative means of keeping up-to-date on current issues, and obtaining ideas to enhance partnership activities. The SiS Team should continue to provide flexible, responsive support for partnerships, including using face-to-face events and online technology.

4.4. Support the Implementation of the New Australian Curriculum

SiS is currently preparing relevant science and mathematics curriculum support materials for the website and has already delivered a series of workshops nationally that relate to the new Australian curriculum in science. It is important that the SiS Project Team continues to monitor curriculum implementation so that relevant information about curriculum continues to be provided to partnerships.

4.5. Continue to publicize SiS

The outcomes of SiS are positive and deserve attention by a wider audience. Continuation of efforts to achieve publicity will aid recruiting as well as give support to those scientists, mathematicians, teachers and schools so that SiS can continue to make a difference. It is important to continue to increase awareness and recognition of SiS and its outcomes through a coordinated media plan.

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